

Before the storm: Pre-crisis analysis of the rice and coconut lumber market systems



Uswag Pa Leyteño Program

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In Partnership with:



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Acronyms

ARC	American Red Cross
BIR	Bureau of Internal Revenue
BRG	British Red Cross
CPI	Cash Preparedness Initiative
CTP	Cash transfer programming
DA	Department of Agriculture
DENR	Department of Environment and Natural Resources
DRR	Disaster risk reduction
EMMA	Emergency market mapping and analysis
FBF	Forecast based financing
FGD	Focus group discussion
GOVPH	Philippine Government
HH	Household
INGO	International nongovernmental organization
IPC	Integrated food security phase classification
KII	Key informant interview
LGU	Local Government Unit
MCNA	Multi-cluster needs assessment
MFI	Microfinance institution
MIC	More Income in the Countryside
MLG	Municipal Level Government
MOU	Memorandum of understanding
NDRRMC	National Disaster Risk Reduction and Management Council
NFA	National Food Authority
NHA	National Housing Authority
OCHA	UN Office for the Coordination of Humanitarian Affairs
PCA	Philippine Coconut Authority
PCIC	Philippine Crop Insurance Corporation
PCMA	Pre-crisis market analysis
PLGU	Provincial Local Government Unit
PHP	Philippine Peso (PHP 1 = USD 0.01930 = GBP 0.01452)
PRC	Philippine Red Cross
PSA	Philippine Statistics Authority
TTL	Tindog Tabang Leyteño
UPL	Uswag Pa Leyteño
VCA	Vulnerability and capacity analysis
WASH	Water, sanitation, hygiene
WFP	World Food Program

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1. Synthesis

1.1 Rationale and objectives

Uswag Pa Leyteño (UPL) is a Philippine Red Cross (PRC) two year development program in partnership with the American Red Cross (ARC), operating in four Leyte province municipalities affected by super typhoon Yolanda: Alangalang, MacArthur, Mayorga, and Tacloban City. The program aims to improve community resilience and chapter development, with key interventions including disaster risk reduction, infrastructure, volunteer management, and livelihoods between July 2018 and June 2020. The program builds on the preceding Tindog Taban Leyteño, a four year PRC-ARC recovery and resilience initiative that emerged from the Yolanda emergency response.

The PRC believes that conducting pre-crisis market analysis (PCMA) will help it understand local market systems for basic needs, and how shocks can affect their functionality. This understanding could enable the PRC to better plan, prepare, and mitigate possible effects to vulnerable communities in future.

PCMA is a practical approach to market assessment before emergencies in order to anticipate how markets might respond to a specific shock scenario. PCMA was formalized in 2014 by Oxfam and the International Rescue Committee, and helps agencies improve preparedness and contingency planning while contributing to the design of disaster risk reduction programs by identifying critical market system nodes that may be vulnerable to shocks. Increasing the speed of emergency responses and strengthening market systems before emergencies could help reduce disaster impact on lives and livelihoods, and begin to address deeper structural issues of poverty and vulnerability.

PRC and ARC agreed to pilot PCMA in UPL program areas of Leyte province. The pilot will inform whether it fits PRC's preparedness needs in relation to the resource requirements for completing and updating PCMA and PRC's history of using only international donor or Movement funds for cash programming at scale (i.e. not domestically-raised funds or for the smallest responses).

The analysis aims to intersect the four municipalities covered by the UPL program. This pilot engaged an external delegate to train and backstop 25 PRC staff and volunteers in conducting PCMA. The pilot also engaged a delegate from the British Red Cross Cash School, part of building global capacity in market assessment and analysis leadership. The two delegates collaborated throughout the process of design, facilitation, coaching fieldwork, analysis, and reporting in concert with PRC participants.

A five day training was convened 25 February to 1 March in Tacloban City. It was an intensely participatory workshop, empowering participants to work with global and local examples as a foundation to working with real data and contributing directly to development of this larger PCMA report, including two days of primary data collection, interpretation, and response analysis. A smaller team then participated in the full assessment. The workshop built on a 2017 interagency markets learning event in Manila, and together with the assessment could help inform Philippine PCMA beyond the PRC as the cash working group considers a national joint exercise to anticipate and mitigate a major earthquake event.

This report captures the combined input and analysis of the PRC PCMA training and assessment, and is complemented by a lighter activity report reflecting on the overall process. The overall objectives are:

1. To conduct PCMA assessment and analysis training for 25 PRC staff (including livelihoods, shelter, WASH, DRR, finance, and logistics).
2. Coaching and mentoring with the PRC team in practicing PCMA. The activity's specific objectives are:
 - To identify appropriate, market-aware responses to help vulnerable communities in UPL target areas in Leyte meet emergency and recovery needs, with an emphasis on market support activities.
 - To identify appropriate market strengthening and community preparedness response options to help reduce the impact of future shocks and disasters in UPL target areas in Leyte.
 - To be a valuable reference for UPL future programming, specifically on livelihood protection mechanisms such as market-oriented disaster preparedness, disaster risk reduction, early warning systems, and other multisectoral activities under UPL.
 - To strengthen the market analysis capacity experience of PRC staff and volunteers to maintain and update the PCMA assessments regularly.
 - To strengthen the speed and quality of the smallest and largest PRC emergency responses, particularly regarding cash programming, informed by evidence from market assessments.

1.2 Conclusions: Rice market system

How does typhoon affect the market system?

- Rice is a vulnerable crop during typhoon, thus the market system can be greatly affected. Tenant farmers are the most affected due to harvest losses and repeated, cyclical debts. Their ability to repay loans decreases from the increased borrowing and increased interest resulting from typhoon losses.
- The tenure system of tenancy agreements, power dynamics, and debt between market system actors (from farmers to landowners to traders and millers) is rigid and systemic, depriving farmers of the capacity to increase income opportunities and thereby reinforcing structural poverty and household disaster risk.
- Harvest losses reduce lower volume and farm gate prices, thus diminishing household income. Exports also decrease, while rice imports from regional and national suppliers increases to fill supply gaps.
- Due to the decrease of local supplies, local rice demand is met by regional and national traders that supply municipal traders and millers. The market system remains largely functional, but the estimated time frame of municipal traders to resupply their stocks from regional and national traders is estimated to at least 1-2 weeks.
- Even during normal times, smallholder rice profitability is already constrained by chronic household debt and tenancy agreements between landowners (who are the money lenders) and tenant farmers. Inasmuch as farmers would want to sell rice to other traders with higher purchasing prices, they are bound by the inputs and money borrowed, where the only term of payment is through harvested rice.

Can the market system respond to typhoon?

- The quality and volume of rice produced is greatly affected after a typhoon (70-90% harvest loss). Traders do not buy the low quality rice for export, so the low quality rice gets sold locally at lower prices. Household income decreases as a result of both the harvest losses and the decreased sale value.
- In general, tenant farmers have very little bargaining power to influence competitive pricing of their products to the traders. There have been cases wherein traders control prices regardless of the prevailing market price, while the farmers are obliged to sell the bulk of their harvest to these traders in order to repay input loans to ensure ability to receive another loan to use as capital for the next cropping season. Debt service is therefore necessary to ensure ongoing creditworthiness.
- Traders sell 60% less milled rice after typhoon, with an average price increase of 10% depending on the demand and availability of supplies outside the municipality.
- There is limited to no competition between existing traders and millers, where trade is normally controlled by a limited number of actors from the same wealth group (i.e. landowners with kinship ties), which further aggravates farmer household economic resilience.
- The municipal rice market is well integrated between national and regional rice traders, who in normal times are supplied by municipal rice traders.
- From a supply perspective, the rice market system could respond to the sudden increase of demand caused by typhoon losses and increased consumption needs, regardless whether stimulated by household borrowing or cash transfer programming. From an income perspective, however, the rice market system will not respond to household gaps deepened by typhoon.

How are households affected by changes in the market system?

- Income derived from rice farming does not address the economic security needs of smallholder tenant households, who can only save harvested rice for the coming months' food consumption needs -- barely or not breaking even and therefore unable to produce a profitable surplus.
- Farmer income is not compensated by the market system when disrupted by typhoon. The impact further contributes to existing economic insecurity. Households are constantly battling cyclical indebtedness that is further exacerbated by typhoon. Farmers tend to take more loans on top of previous loans, despite higher interest rates. Our estimated gap analysis suggests that typhoon reduces household income to levels where costs appear impossible to recover.
- To increase household income, farmers tend to engage in other daily labor work, construction work, motorcycle driving, and other sources of income for both men and women that are beyond the scope of this assessment (see Annex 4).
- Landless laborers tend to seek other sources of income, especially after losing agricultural work opportunities when crops are lost. Migration to other regions (Cebu and Manila) increases especially for men, while women who remain at home tend to increase productive and reproductive roles. There were stories of girls and boys that left school and became house helpers or casual laborers to help meet household income needs, especially when they reach teenage years.
- Rice farmers currently face systemic constraints related to capital, land, and market access. Smallholder tenants in particular appear barely able to satisfy their survival needs but cannot meet or increase their

livelihood protection threshold. This results from existing norms and systems that enhance structural vulnerability, disaster risk, and chronic indebtedness. Even government subsidized risk transfer mechanisms pose high opportunity costs to obtain or claim, with low returns that discourage investment.

1.3 Conclusions: Coconut lumber market system

How does typhoon affect the market system?

- A signal 3 typhoon will moderately impact the coconut lumber market system, in that functionality will be partially disrupted and for a short period before the system normalizes through existing market norms, practices, dynamics, etc – particularly for larger market actors.
- There is an increase of traders and farmer-traders due to the heavy damage or fallen coconut trees. Farmers are easily approached and engaged in selling coconut timber or lumber since they tend to give a cheaper price to poor or very poor households.
- There is increased demand for coconut lumber due to construction activities related to shelter assistance from government and INGOs. On the other hand, supply tends to be of lower quality because farmers process immature fallen trees.
- Traders are affected due to possible damage to their warehouse facilities and machineries. Retailers have limited access to credit in order to increase their supply and rent additional vehicles for hauling.

Can the market system respond to typhoon?

- The market system can respond to an increase in demand, but may take 2-3 months to supply the needed volume based on the crisis scenario. It is expected that there will be a three month gap because most of the needed lumber will need to be felled, processed, dried, and transported to lumber dealers. This is also due to the requirement to obtain permits to cut, transport, process, and cure the lumber, along with transportation to wholesalers and retailers alike. The PCA reports that there is sufficient coconut lumber dealers and processors in Leyte to fulfill the anticipated increase in demand. As of 2019, there are 45 registered lumber dealers and 180 lumber processors and chainsaw operators.
- It is expected that traders would also procure coconut lumber from other Leyte municipalities if there is not enough volume from the four UPL municipalities. Currently there is a lumber surplus in Leyte from the high density of coconut trees planted within the province.
- The market system would be able to respond to the increased demand of coconut lumber once traders obtained additional permits from the PCA. The main challenge would be the processing time required to prepare the lumber according to established market standards.
- In terms of coconut lumber processors (chainsaw operators and sawmills), there are no expected changes in the number of actors. Prices tend to be stable at this level of the market chain. Most price increases would be at the trader level, where increases result from lax price regulation and opportunistic tendencies of some traders.

How are households affected by changes in the market system?

- Poorer households (i.e. landless laborers and smallholder tenants) would expect aid for shelter recovery and reconstruction, received as either cash or in-kind assistance. This is mainly caused by the scale of operations during the Yolanda response. If poorer households did not receive shelter assistance after typhoon, they would use inferior, salvaged materials that would expose them to ongoing disaster risk and compromised resilience. These households are dependent on government and humanitarian assistance to repair or rebuild their shelters.
- Comparatively better off households (i.e. larger tenant farmers), in comparison, can be expected use better lumber that they would be able to purchase themselves.
- Households are affected by the lower quality of supply that leads to substandard materials. Some processors tend to harvest immature trees in order to compensate to the increased demand. This can create less resilient houses when another typhoon comes. Consumers are still expected to be able to afford the price of lumber in small quantities since there are minor price increases, but totally damaged households would probably need assistance in reconstructing their shelter.
- Men typically participate in lumber purchase, sale, and reconstruction while women usually participate in meetings and consultations regarding beneficiary selection, validation, monitoring, and sometimes even selecting laborers. Women mostly receive shelter cash transfers and control them in the household, although women and men usually make joint decisions on shelter cash grant expenditure.

1.4 Response analysis

Recommendations	Gender informed (L, M, H)	Feasibility (L, M, H)	Market based programming framework (1, 2, 3, 4)	Intended outcomes on market system(s) and target group(s)
Preparedness (Cash, FBF, response, others)				
1. Map agencies working with farmer associations: Locations, activities, plans, opportunities	L	H	1, 3	Greater relevance and complementarity of programming
2. Further mapping of rice and lumber traders, especially at municipality level	L	H	2, 4	Further inform planning, preparedness, capacity building
3. Additional household profiling in VCA activities at barangay level, e.g. wealth groups, food and income sources, gendered access and control	H	M	2, 4	Better informed program targeting and outcomes
4. Early warning as forecast-based action to promote early harvesting	M	H	1, 3	Informed decisions and mitigated income loss
5. Advocate and support farmer association governance, preparedness, and capacity building at barangay level	M	H	1, 2, 4	Informs linkages, planning, coordination, and mitigation measures
6. PRC review of preparedness plans (Chapter and NHQ)	M	H	1	Informs disaster response program priorities
7. Shock-responsive pre-agreements/MOUs with traders and financial service providers	L	M	1, 4	More resilient market systems and faster emergency response in CTPs
8. Development of common data registry for PRC in coordination with LGUs	H	L	3	Better informed response mechanisms and priorities
Shelter				
9. Participatory approach on safer shelter awareness (PASSA) to intensify wood treatment and preservation	M	H	1	Informs program integration and promotes behavioral change to extend material lifespan
10. Calculate a 'minimum expenditure basket' for shelter repair in typhoon	L	H	2	Informed decision making and response value per HH
11. Shelter expenditure and construction plans with households in emergency response	H	H	1	Better, phased construction according to plans and specifications
12. Advocate the 'eight key messages' for shelter reconstruction	H	H	1	Behavioral change in construction practice
13. Explore alternative construction materials	L	M	4	Reduce the harvest burden on immature coconut trees
Livelihoods				
14. Information and analysis of crop insurance to determine risk transfer advocacy agenda	H	M	1, 3	Increase informed access to insurance and livelihood protection
15. Advocacy on using appropriate, high quality rice and coconut seed	L	M	1, 2	Increased, improved production
16. Support and promote seed banks for rice and seedling nurseries for coconut	L	M	2	Improved production, decreased input costs, income enhancement
17. Promote integrated rice field-based farming, systematic rice intensification, inter-cropping for coconut trees, organic farming	H	H	3, 4	Diversify income sources, improve production and mitigation, maximize land use
18. Support to post-harvest machinery and storage	M	H	1, 3	Improve rice quality and profitability, reduce losses
19. Explore income generating activities from coconut tree derivatives	L	H	2	Livelihood diversification and strengthened household resilience
20. Support existing livelihoods diversification	H	H	3, 4	Greater household resilience
Water, sanitation, hygiene				
21. PCMA for water supply, WASH items, latrine materials	M	L	3	Informs integration of programming for other critical market systems
DRR, resilience				
22. Integrate additional hazard analysis into VCA	H	M	2, 4	Inform programming, reduce risk, increase resilience

Recommendations	Gender informed (L, M, H)	Feasibility (L, M, H)	Market based programming (1, 2, 3, 4)	Intended outcomes on market system(s) and target group(s)
23. Integrate additional risk analysis into VCA for gendered impact on different food and income sources	H	M	2, 4	Inform programming, reduce risk, increase resilience
Coordination, advocacy				
24. Collaborate and support CWG for national, interagency PCMA with major earthquake scenario	L	H	1, 2, 3, 4	More integrated preparedness and response, harmonized across actors including government
25. Collaborate and support CWG for routine cash and market assessment capacity building	L	H	1, 2, 3, 4	Collaborative, harmonized standards and better support to government
26. Collaborate with the shelter and early recovery clusters to update PCMA findings in relation to their Yolanda lumber analyses	L	M	1, 2, 3, 4	Interagency learning and coordination
27. Advocate with shelter and early recovery clusters DTI to regulate lumber prices, especially in typhoon response	L	L	1, 2, 3, 4	Stable, competitive prices during emergencies, along with minimized graft and corruption
28. Raise grower awareness on laws and policies in the coconut lumber market system	L	H	1, 2	Behavioral change in ways and attitudes of production and trade
29. Advocate and support trader association governance, preparedness, and capacity building at municipal level.	L	M	1, 2, 4	Informs planning, coordination, and mitigation measures
30. Advocate for low interest credit	M	M	1, 2	Reduce input costs and credit dependency
Chapter development				
31. Continued engagement of volunteers in PCMA updating and program links	L	M	1, 2, 3, 4	Deeper barangay engagement with PCMA content and program linkages
32. Capacity building to support VCA linkages and continued integration with PCMA	L	M	1, 2, 3, 4	Deeper barangay engagement with PCMA content and program linkages
33. Revise the Chapter contingency plan to include PCMA findings	M	H	1, 2, 3, 4	More effective, efficient services to vulnerable and disaster affected households
Monitoring, evaluation, PCMA updates				
34. Identify linkages between PCMA findings and the UPL logical framework to enhance objectives, outputs, or indicators	H	M	1, 2, 3, 4	Potentially more nuanced targets or outcomes
35. Revisit market related information needs throughout the project cycle	H	M	1, 2, 3, 4	MAG consistency and potentially increased strategic relevance
36. Conduct comparative analysis of cash versus in-kind support to partially and totally damaged shelter	H	H	2, 4	Increased program relevance, effectiveness, and efficiency
37. Fill current PCMA data gaps in lumber trader capacity outside program areas	L	L	2, 4	Better estimates of lumber consumption
38. Validate current PCMA findings after crisis to inform whether additional assessment or additional information is required	H	M	1, 2, 3, 4	Faster assessment and response decision making
39. Expand PCMA to other market systems and other crisis scenarios (e.g. flood, earthquake, upcoming el niño, etc)	M	M	1, 2, 3, 4	Increased preparedness and response capacity

1.5 Recommendations

These strategic recommendations were articulated during debriefs in Tacloban with the assessment team and in Manila with PRC senior management and other PNS and IFRC representatives.

See Annex 7 for additional linkages between PCMA and the PRC strategic plan.

1. Share the 2017-2021 strategic plan with Chapter staff.
2. Share PCMA findings externally with the Cash Working Group and relevant stakeholders.
3. Share PCMA findings, process, relevance, and learning internally with Participating National Societies.
4. Rank the response analysis (above) to determine which UPL activities are short, medium, or long term priorities in the UPL program.
5. Identify champions to inform and support continued deliberation on strategic questions of how best to proceed with market based programming.
6. Determine the relevance of market based programming as an overall approach, potentially mainstreaming across UPL sectors, not only livelihoods and shelter.
7. Invest in additional capacity building for greater market analysis inclusion of WASH, logistics, procurement, finance, administration, volunteer management, etc.
8. Existing UPL livelihoods budget allocations (for agriculture activities) need to be further refined to specific activities, per the response analysis, after which similar commitments will be needed for other sectoral interventions.
9. Consider the relevance and opportunities to institutionalize market based programming across PRC and PNS initiatives (e.g. Forecast Based Financing, Leyte Integrated Coastal Zone Management, Partners for Resilience, in addition to future emergency preparedness and response activities).
10. Staff currently trained in PCMA (and RAM and CTP) should be encouraged to conduct additional research and assessments whenever possible, without waiting for additional training, and to bring additional colleagues into the process (WASH, logistics, finance, et al).
11. Circulate the secondary resource file to all PCMA workshop participants (including free, online training opportunities) to encourage ongoing, individual learning and development.

2. Context analysis

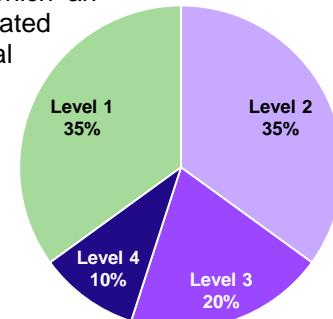
2.1 Demographics, vulnerability

The following table outlines demographic details of the UPL program area, which established the assessment context and informed the purposive sampling criteria discussed in the methodology, above.

Municipality	Municipal classification	Barangay	Number of Households	Zone		Primary income source				PRC-ARC shelter response post-Yolanda	
				Peri-Urban	Rural	Rice	Copra	Abaca	Fishing	# of shelters	% of HH
Alangalang	2	Aslum	188		✓	✓				152	81
		Astorga	394		✓	✓				288	73
		Hubang	420	✓						399	95
		Peñalosa	205		✓	✓				190	93
		Santiago	89		✓					76	85
Mayorga	3	Burgos	163		✓	✓				141	87
		San Roque	624	✓					✓	482	77
		Talisay	262		✓	✓				197	75
		Union	581	✓					✓	481	83
		Wilson	178		✓	✓				119	67
MacArthur	5	Burabod	89		✓		✓			80	90
		Danao	333		✓	✓				274	82
		Kiling	51		✓		✓			55	108
		Lanawan	93		✓		✓	✓		68	73
		Ogusian	37		✓		✓	✓		32	86
		San Antonio	117							127	109
		San Isidro	220	✓		✓				190	86
		Santa Isabel	168		✓		✓	✓		148	88
		Villa Imelda	137		✓	✓			✓	74	54
Total				4,349						3,573	82%

The total Leyte population was estimated at 1,925,033 people in 2015, of which an estimated 65% (1,252,000 people) were scored Level 2 or higher on the integrated food insecurity phase classification (IPC) chronic scale.¹ The proportion of total population at each chronic scale phase is illustrated in the chart at right.

Chronic IPC analysis also relates a range of limiting factors and underlying factors to overall food insecurity in Leyte: Availability, access, utilization, livelihood strategies, physical capital, financial capital, social capital, and recurrent risks.² This corresponds with poverty statistics on Leyte areas affected by Yolanda and primary analysis of the rice market system (in Section 3).



Poverty in Leyte regions affected by typhoon Yolanda

Poverty incidence among families (%)			Poverty incidence among population (%)			Magnitude of poor Families			Magnitude of poor population		
2006	2009	2012	2006	2009	2012	2006	2009	2012	2006	2009	2012
32.2	28.8	31.4	38.4	36.3	39.2	117,271	114,843	128,273	671,771	628,371	713,063

ACAPS 2014:11

¹ IPC 2015:10

² IPC 2015:15

2.2 Gender, food, income, and relative wealth

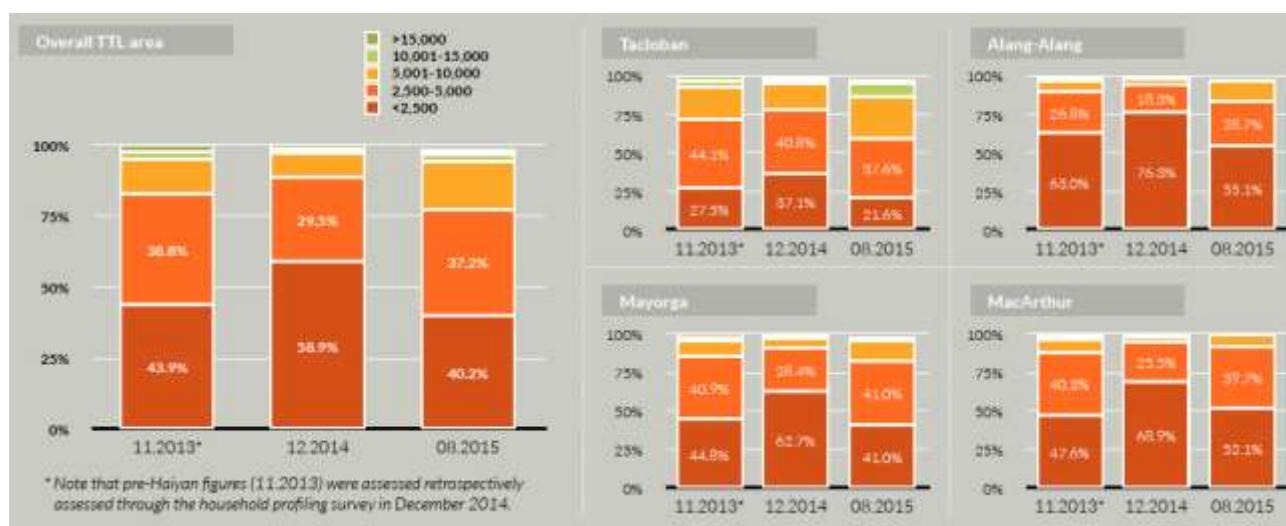
The PCMA workshop included a session on gender analysis in market systems and the household economy as part of the larger hazard analysis (see Annex 4). We queried the gendered impact of typhoon on household food and income sources from the perspective of a 'poor' household (before we began differentiating between landless laborers, tenants, and landowners), establishing that:

- A signal 3 typhoon will affect different food and income sources differently
- Women and men have different degrees of participation, access, and control over household food and income sources. Women and men would therefore be affected differently by typhoon impact on the household economy (in addition to other threats to health, assets, etc).
- Rice production involves women and men differently during the full production cycle (seed management or purchase, land preparation, planting, transplanting, weeding, fertilization, pest control, harvest, threshing, sale, storage, cooking). Men typically receive payment for rice sales, but women are often the ones canvassing where the best sale prices can be obtained. Women are also generally responsible for rice purchase as a food source.
- Men control fewer income sources, but generally control those earning the most household income.
- Typhoon impact is generally greater on larger income sources than smaller income sources, which corresponds with those controlled more by men. This profile is more indicative of a smallholder tenant household than a landless laborer, for whom the outcomes would be different – for example through the loss of daily agricultural labor opportunities rather than the loss of rice production.

These observations correspond with TTL data on gender roles in program communities, illustrating that women have high access to barangay governance processes but diminishing control over decision making:



Relative wealth within the barangay has been challenging to assess, with different sources using different categorizations. The TTL baseline report, for example, divides household income into five quintiles:



Although these quintiles do not help structure household income gap analysis analyzed in the rice market system, below, they nonetheless illustrate a consistent trend across the lowest income group. Our PCMA assessment data suggest a more nuanced characterization of relative wealth in program barangay, introduced here but discussed in more detail in each of the market system analysis sections below.

- Landless laborers whose work includes agriculture but not their own rice production. We estimate these are roughly half of all barangay households.

- Tenant farmers renting from landowners. For analysis we subdivided tenants further, according to the number of hectares cultivated (less than 1, up to 2, more than 2). Tenants are also believed to represent roughly half of barangay households.
- Landowners are a small minority (e.g. in Alangalang there is only one). Their land is generally rented to tenants, but some engage in their own rice production.

2.3 Crisis scenario

Hazard risk: Typhoon

Reference period: October 2018

Crisis period: October 2019

Seasonality: Rice crops could be standing or harvested, contingent on timing of typhoon impact

Preparedness: PRC Cash Preparedness Initiative anticipates a response for up to 10,000 households

The initial workshop group analyzed hazards to determine how to focus the PCMA (see Annex 4), determining that typhoon is the most likely hazard with the greatest potential impact. We also agreed, however, that super typhoon Yolanda was too exceptional a storm to be used as a point of comparison. Rather, the team needed to anticipate and estimate the impact of a more representative typhoon, a signal 3 event. A signal 3 typhoon is characterized in part by the following criteria (in addition to others):³

- Winds of greater than 100 km/hr up to 185 km/hr may be expected in at least 18 hours.
- Rice and corn crops may suffer heavy losses.
- Many coconut trees may be broken or destroyed.
- Majority of light material houses may be unroofed or destroyed. There may be considerable damage to structures of light to medium construction.
- In general, moderate to heavy damage may be experienced, particularly in the agricultural and industrial sectors.
- People are advised to seek shelter in strong buildings, evacuate low-lying areas, and stay away from the coasts and riverbanks.
- Disaster preparedness and response agencies/organizations are in action with appropriate response to emergency.

Our PCMA crisis scenario builds on the current PRC 2018-2019 Cash Preparedness Initiative (CPI), which is part of the larger Asia Cash Preparedness Program, whose goal is that participating National Societies have the capacities and the abilities to use cash transfer programming in emergencies, recovery, and resilience activities in a faster and more scalable way. This complements the broader cash preparedness objective of the Red Cross Movement, that National Societies are operationally ready to deliver quality, timely, and scalable cash-based interventions through ongoing institutional and cash preparedness.

The PRC has its own goal for cash transfer programming: To continue implementing scaled-up cash transfer programs in timely and efficient manner across the disaster cycle, while maintaining its auxiliary role to the Government. The PRC Cash Preparedness Initiative also considers the size and scale of PRC cash response capacity, including partner support for significant increase of scale for exceptional responses like Yolanda. The CPI identifies a current cash based capacity of up to 10,000 households in one intervention. Considering the Philippine risk profile, however, it is possible that ongoing operations throughout a year could reach up to 15-20,000 households.

Although Yolanda is not a representative typhoon, its intensity and recent memory informed PCMA primary and secondary analysis by respondents and the assessment team alike as a convenient reference point. Respondents and the assessment team then forecast how a future signal 3 typhoon could affect households and markets. The remainder of this section reflects on Yolanda's impact related to the critical markets assessed herein.

Of the percent of poor population in Leyte 2012, 39% were affected by typhoon Yolanda, i.e. an estimated 699,404 above the national poverty threshold and 451,739 below the poverty threshold.⁴

³ GOVPH (no date)

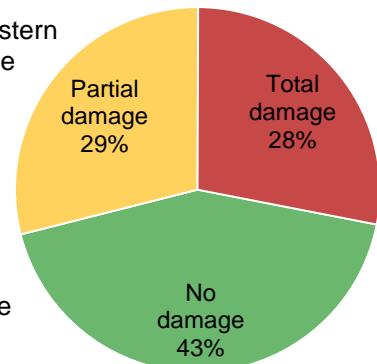
⁴ ACAPS 2014:13

On average, typhoon Yolanda halved incomes across all employment sectors,⁵ of which an estimated 23% of affected were vulnerable workers in agriculture (1,263,893 overall).⁶

Damage to livelihoods was significant, resulting not only in limited income sources becoming further diminished, but also in households losing one or more food sources. It was expected to take four to eight months for farmers to recover their livelihoods, after the next harvest cycle. To meet their critical needs, some families resorted to a number of coping mechanisms that could have deleterious effects such as chronic indebtedness,⁷ which our fieldwork suggests is already a key feature of rural poverty among landless laborers and small tenant farmers.

Damage to shelters was also significant, with 57 percent of households in the Eastern Visayas region experiencing full (N=244,550) or partial (N=248,306) damage (illustrated in the chart at right),⁸ more than all other regions affected by Yolanda.

The PRC shelter response in its Leyte program area included 3,573 households, 82 percent of the population in those barangay (see Section 2.1 above). Overall, the shelter response coverage target was 17 percent of shelter affected households overall in each of its program municipalities (i.e. across all barangay, not only those reached in PRC's response). This was conducted in coordination with government and other humanitarian actors, all of whom were part of a coordinated shelter response.



Damage to infrastructure, marketplaces, shops, and warehouses was similarly disruptive. A World Food Program (WFP) rapid trade capacity assessment of Leyte supply chains reported that nearly one month after Yolanda (5 December 2013):⁹

- Very few stores were open in MacArthur, Mayorga, and other municipalities. Municipalities did not have a steady flow of supply.
- Few supplies were arriving from Tacloban, few distributors were delivering supplies, and retailers were receiving goods from alternate sources like Sogod, Maasin, and Matnog.
- Fuel costs and transportation lead times were increasing prices. Distributors reported that less than 50% of their supply chain was active.
- Main roads were cleared, but the logistics infrastructure was overloaded. Prices were roughly 10% higher because of transportation costs.
- Tacloban port was congested and causing delays for commercial (non-humanitarian) goods. For example items that previously took 72 hours to arrive from Cebu then required up to 10 days. Port limitations forced suppliers to divert deliveries through Ormoc and Sogod, which similarly had congestion, higher delivery costs, and extended lead times. There is also congestion in ports of origin, Manila and Cebu.
- Retailers had limited storage capacity and security was a major concern.

2.4 Critical market systems

The PCMA guidelines define critical market systems as those that are most urgently relevant to the target population's needs, the market systems that have or could have a major role in meeting the essential supply or income needs of affected populations.¹⁰ Like hazard analysis, the PCMA critical market selection was conducted during the initial workshop, resulting in the following table:

⁵ MCNA 2013 in ACAPS 2014:29

⁶ ILO 2013 in ACAPS 2014:30

⁷ MCNA 2013 in ACAPS 2014:29-30

⁸ NDRRMC 2013 & NSO 2010 in ACAPS 2014:83-84

⁹ WFP 2013a:4-5

¹⁰ PCMA 2016:8

	Rice	Skilled construction labor	Daily unskilled farm labor	Coco lumber	Water	Copra	CGI	Canned goods	Kerosene
Most significant	3	3	3	3	3	2	2	1	3
Most urgent	3	3	2	3	3	1	2	2	2
Most affected	3	3	3	1	2	3	2	1	2
Seasonality and timing	3	2	2	2	0	2	0	0	0
Response feasibility	3	3	3	3	3	2	3	1	0
PRC mandate & capacity	3	3	3	3	3	3	3	3	0
Government & partner plans	3	3	3	3	3	3	2	3	1
Market opportunity	3	3	3	3	3	3	1	0	0
Total	24	23	22	21	20	19	15	11	8

1 = low, 2 = medium, 3 = high

Beyond the clear importance of rice, skilled and unskilled labor had higher scores than coconut lumber. But in considering the PCMA pilot objectives and the importance of linking its results to the UPL program and PRC strategic plan, the team decided to focus on lumber instead of labor, without compromising the critical market selection process. This adjustment is consistent with the PCMA guidelines, which suggest that critical market system selection should also consider information utility and complementarity in addition to interconnectedness.¹¹ For example, most PRC shelter recipients in the Yolanda response were landless laborers and small tenant farmers, both of whom are integral to the rice market system. Beyond the sectoral balance, the two selected critical markets offer additional complementarity of analyzing income (rice) and supply (lumber) market systems within a single, integrated assessment.

2.5 Key analytical questions

The emergency market mapping and analysis (EMMA) toolkit interprets key analytical questions as the tangible reasons for assessing critical market systems, vitally important for articulating the assessment objectives and focusing primary data collection.¹²

Three key analytical questions guide this assessment, and will be used to structure the conclusions for each market system:

1. How does typhoon affect each of these market systems?
2. Can these market systems respond to typhoon?
3. How are households affected by changes in the market system?

2.6 Seasonality

See Annex 5 for a calendar of principal hazards, livelihood activities, and household priorities including health, education, and more. In relation to the rice and coconut lumber market systems:

- Hazard risks are relative to climatic conditions. They are more likely to occur with greater impact towards last quarter. Typhoon season begins in the third quarter, with stronger intensity towards the end of the year. Similarly, rainfall normally is heavier later in the year through January of the following year.
- There are two rice cropping seasons. The first planting season starts in December (when rain is heavier), with harvest in the summer season of March – May the following year. Second planting begins with the monsoon rains in June, with harvest by September – October. This corresponds with typhoon, which can strike before or after harvest – with different impacts on standing versus stored crops.
- June is a lean month, with greater expenses for education and fewer income opportunities before rice planting starts. Remittances are higher in June, along with increased migration.
- Festivities related to religious activities are in December, January, and after rice harvests (April/May, September/October). Based on initial interviews, coconut lumber consumption tends to be higher during fiesta months.

¹¹ PCMA 2016:33

¹² EMMA 2010:54-55

3. Rice market system analysis

3.1 Introduction

Leyte is an agricultural province and one of its principal crops is *palay* (unmilled rice), with a total production area of 76,803 hectares and production output of 314,892 metric tons in 2017 (source: Leyte Provincial profile, 2017). Rice is equally a major staple food of Leyteños, with a total consumption of 9,385,450 metric tons in 2016. Apart from being a staple food source, many households depend on rice cultivation for income, either through their own production or as paid agricultural laborers. By applying proper rice production technologies, farmers may earn a net income of between PHP 21,000 - 41,000, depending on the quality of seeds planted, cost of fertilizers, other production inputs, and investment in risk transfer.¹³ This comes alongside the employment opportunities generated by rice farming operations. However, in the past 7 years rice production has been greatly affected by natural calamities such as typhoons, pest infestation, and drought, which have resulted in decreased income of subsistence rice farmers.

The rice market system is consolidated analysis from consultations with national, provincial, and municipal government; agencies; and identified market actors in relation to our signal 3 typhoon scenario. The number of rice farmers represents the registered rice farmers of the Municipal Agriculture Office from each municipality. To determine an approximate volume of rice production, the number of rice farmers was assumed to cultivate an average of one hectare of rice paddy. The percentage of tenant farmers was determined from an approximation from the results of barangay focus group discussions (FGDs). One hectare of rice paddy farm yields an average of 100 sacks of unmilled rice, which is equivalent to 4.5 metric tons (4500 kg) of unmilled rice.

In this analysis, there are estimated 2,975 rice farmers in UPL program areas that are rice producers, primarily tenant farmers. Landowner cultivators were not considered in the analysis, partly because their number is unknown and partly because they represent a small minority of households that would probably not be included in PRC emergency response. FGD results on percentage of household consumption versus percentage as sales income was used to determine an approximate total volume of production that is supplied to the market chain. The analysis considers rice producers' derived income from production rather than the overall supply or availability of rice in Leyte markets, although traders and other market actors were nonetheless consulted to estimate the potential volume of demand.

Municipality	# registered farmers	Estimated % of tenant farmers	# of tenant farmers	Production volume			70% sales (MT) = total volume	30% HH consumption (MT)
				Caban*	Kg	MT**		
Alangalang	3,504	60%	2,103	210,300	9,463,500	6,624	6,624	2,839
Mayorga	1,297	30%	389	38,910	1,750,950	1,751	1,226	525
MacArthur	1,207	40%	483	48,280	2,172,600	2,172	1,521	652
Total			2,975	297,490	13,387,050	10,546	9,371	4,016

* 1 caban (sack) = 45 kg

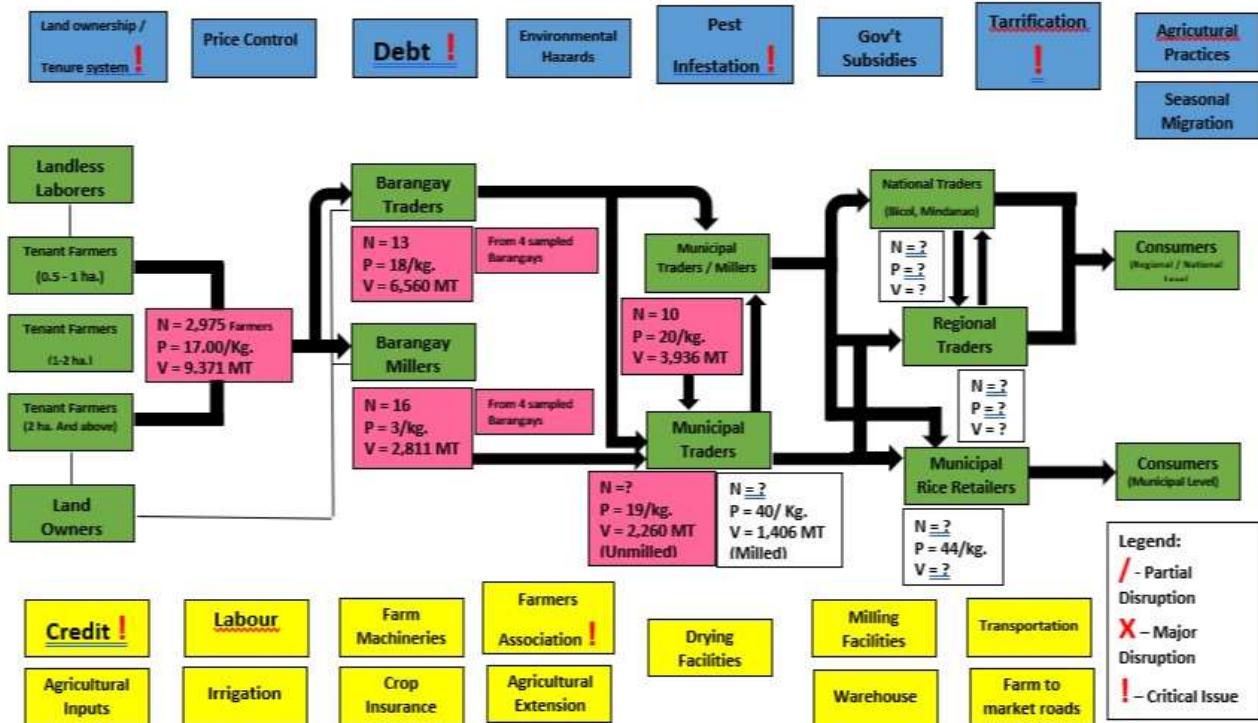
** 1 MT = 1,000 kg

Market actor	Key characteristics
Landless laborer	Landless agricultural laborers are primarily dependent on daily labor as a primary source of income, and do not have tenancy for cultivation. They also derive income from vegetable gardening and livestock rearing.
Tenant farmer	Farmers with 1 up to 2 hectares (average) of rice cultivation, their primary income source. Tenancy agreement is usually informal, where terms of payments are met after harvest. In this case, 25% of harvested rice is paid to landowners.
Land owner	Government registered owner of cultivated rice fields. Owners are either cultivators or have ongoing agreements with tenants. Landowners also provide financial loans to tenants for agricultural inputs.
Rice miller (barangay level)	Rice milling services at the community level.

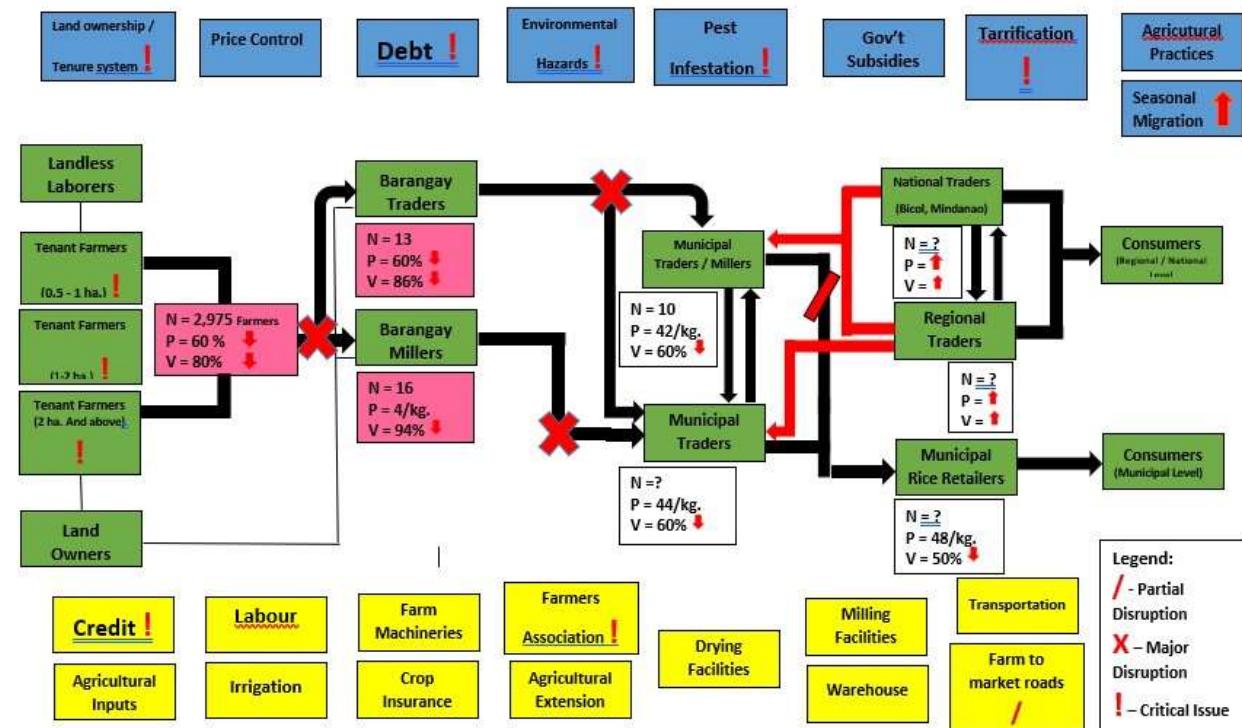
¹³ Dargantes et al 2016

Market actor	Key characteristics
Rice traders (barangay level)	Traders at the community level that act as consolidators of harvested rice. Traders are links between municipal traders and millers. Barangay traders usually are the loan providers (mostly for agricultural inputs) to tenant farmers, for which payments are settled with harvested rice. Barangay traders are often land owners. Traders sell rice to municipal traders/millers, or to regional traders.
Rice millers and traders (municipal level)	These actors are owners of rice milling facilities that cater to municipal rice milling needs. Facilities include solar and mechanical dryers. They also sell milled rice to regional and sometimes national traders.
Rice trader (municipal level)	Traders that buy unmilled rice and sell milled rice to municipal consumers and neighboring municipalities.
Regional trader	Traders who buy milled rice and sell it within Region 8. They provide transportation to collect rice from municipal millers/traders.
National trader	Traders who buy milled rice and then sell it outside the region (Mindanao and Bicol regions). They have larger credit capacity and are able to transport rice at larger volumes.
Department of Agriculture	Executive department of the Philippine government responsible for the promotion of agricultural and fisheries development and growth. The Department is a national agency with regional offices that supports and assists provincial and municipal government.
National Food Authority	Agency of the Philippine government under the Department of Agriculture, responsible for ensuring the food security and stability of rice price and supply.
Philippine Crop Insurance Corporation	Government owned and controlled corporation under the Department of Agriculture that is mandated to provide insurance protection to farmers against losses from natural disasters, plant diseases, and pest infestations. This was initially for rice crops but now covers other agricultural crops, livestock, farm machinery, and equipment in addition to accident and life insurance.
Provincial Local Government Unit	Local government at the provincial level, independent from the national government that coordinates and supports municipal government operations.
Municipal Local Government Unit	Local government at municipal level, administratively independent to national and provincial, that coordinates delivery of programs and services to barangays.
Barangay Local Government Unit	Local government at smallest political unit of government, governed by a Barangay council of elected officials.
Farmer Association	Rice farmer collective within barangay that are formally instituted with government accreditation (at least with the Barangay Council) and led by association officers where roles, functions, and objectives of association are embodied in their constitution and bylaws.

Rice Market System, Baseline Map of UPL Program Target Areas in Leyte, October 2018



Rice Market System, Emergency Map of UPL Program Target Areas in Leyte, October 2019



3.2 Market chain changes

- Households can be categorized into 3 groups of relative wealth: Landless laborers (50%), tenant farmers (40%), and landowners (10%). Tenant farmers can be further grouped into those that cultivate land from 0.5 to 1 hectare, those that cultivate 1-2 hectares, and those farming 2 hectares or more. Tenants pay 25% of their harvest to landowners, regardless their harvest outcomes. The majority of tenant farmers are smallholders cultivating up to 1 hectare, and are the basis of our modeling in the gap analysis below.
- Men and women have shared responsibilities in rice cultivation, where men are tasked with heavy physical work (land preparation, application of fertilizers and pesticides, and harvest management), while women are involved in sowing, planting, weeding, and labor management. Women normally perform sales and financial transactions. These gender roles are unchanged by typhoon.
- The average rice production cost for 1 hectare of land is PHP 54,155 across 3 municipalities (Alangalang, MacArthur, Mayorga) with an average harvest of 100 sacks at PHP 17.00 per kilogram that is valued at PHP 74,800. Thus, the total gross income is roughly PHP 20,645, excluding the 25% share paid to the landowner.
- Normally, households save 30% of their rice harvest for their own consumption, while 70% is sold to traders and/or lenders (often the same households from whom land is rented), either as income or loan payments. While the intention of the 70% sale is for household income, the expected income derived from sales will only suffice to service their loans (usually from landowners). Hence, there is no actual net cash income and whatever remains is only for their own family consumption. An example can be cited from Barangay Peñalosa, where for every 100 sacks of harvested unmilled rice, only 30 sacks remain with the household, of which 15 are sold and 15 (375 kg of milled rice) are for household consumption for the next six months (until the next harvest season) or until supply is exhausted and additional rice is purchased in markets.
- The Municipal Agriculture Officer (MAO) estimates that 70-90% of standing rice crops can be lost in a signal 3 typhoon. The rice remaining after typhoon is typically damaged and not purchased by barangay or municipal traders. Whatever is saved might still be sold or milled at barangay level, but is normally only for household consumption.
- The average household rice consumption is 2 kg per day for a family of five members. While household rice stocks in the baseline period were sufficient until the next harvest. This is different after typhoon, when rice production can decrease by 80%. This negatively affects household rice stocks and consumption, resulting in increased loans to repay creditors and purchase deficit staple food.
- Most farmers prefer to sell their unmilled rice to traders and middlemen instead of the National Food Authority (NFA) because of fewer documentation requirements and faster payment.
- The normal farm gate price for regular, dried, unmilled rice is PHP 17/ kg. Prices are higher off season, before harvest. After typhoon, rice farm gate prices typically decrease because of low quality, despite reduced local availability in the immediate aftermath.
- Due to decreased household production, supply is totally disrupted. This negatively affects the volume of rice supplied to municipal millers and traders by an estimated 86%.
- After typhoon, price decreases can be associated to highly moist rice quality, which results in traders buying rice at lower prices. In many cases, traders will not even purchase this rice.
- The majority of whatever remains at household level is usually consumed, resulting in an estimated 94% decrease in demand for milling services at barangay level.
- During normal times, municipal traders and millers supply milled rice to regional and national markets. After typhoon, however, due to limited local supplies, national and regional traders fulfill shortages in local supply within 1-2 weeks due to limited local supplies. The price of milled rice would be expected to increase from the effect of insufficient local supply.

3.3 Market environment changes

- A tenure system of tenancy agreements between landowners and tenant farmers affects income source outcomes of farmer producers, which is a critical issue affecting credit and debt systems between each actor and household food and income sources in general.
- Typhoon can occur before harvest while there are standing crops, meaning that households can lose all or part of their harvest and related food income. Environmental impact due to typhoon aggravates further subsistence farming, where a large portion of the anticipated rice harvest will be (re)paid to landowners, who are also the money lenders.
- Tenant farmers incur more debt after typhoon. This is on top of their past loans from the previous cropping season, hindering recovery and livelihoods protection.
- Environmental impact from pests is reportedly problematic (stem borer, snails), even in normal times. A greater variety of pests are observed after the occurrence of typhoon.
- Trader associations decrease in unmilled rice prices to a recently signed law on rice tariffs, although the law is not yet fully implemented.

- Government subsidies normally include providing farm inputs (seedlings, fertilizers, machinery) and technical training to farmers. After typhoon, the government tends to intensify these services as a recovery response to farmers.
- Seasonal migration is a normal livelihood strategy of farmer households during the off-season. Migration increases after typhoon, where mostly men apply for construction work and whatever other labor income opportunities are available.

3.4 Service and infrastructure changes

- Credit is a normal part of rice cultivation, particularly for tenants. This is to pay for inputs including seeds, labor, fertilizer, pesticides, equipment, etc. Landowners and traders are normally the money lenders, the same actors to whom producers will sell their harvested rice.
- Tenant indebtedness increases with respect to the fewer sacks harvested after typhoon, compared with total expected rice harvested under normal circumstances. This deficit increases demand for credit and tenant household indebtedness.
- Demand to avail more loans from formal (banks, microfinance institutions) and informal (landowners, neighbors, traders) money lenders increases after typhoon to meet immediate household needs and capital requirements, including inputs for the next cropping season. Informal credit services have higher interest rates (maximum of 85% - paid after harvest - either in cash or kind), as compared to formal credit services (maximum of 30% - paid in cash on varied payment schedules). Loans taken after typhoon are additional to those obtained earlier in the year, before the typhoon.
- Rice crop insurance is available to all farmers for free, regardless of land ownership status, but comparatively few households are reportedly using this subsidized government service offered by the Philippine Crop Insurance Corporation (PCIC). A one hectare paddy field is insured up to PHP 4,000 which some farmers are hesitant to enroll due to less benefit and the costs associated with traveling and processing claims, along with lengthy processing time subject to the damage assessment by PCIC inspectors (some of whom reportedly request bribes to prioritize claims). Rice farmers have to file a notice of loss within 20 days after crops have been damaged. The processing of insurance claims usually takes 20-60 calendar days and is commensurate with the proportion of loss, with a maximum payment of PHP 4,000 per 1 hectare of damaged crop.
- Provincial and municipal governments implement programs and services for rice farmers, e.g. exchange of rice seeds, wherein each farmer trades different varieties of rice in order to diversify their seed stock. Services also include agricultural inputs and implements. However, growers can only avail these services through membership in a farmer association.
- There are three main government programs to support rice farming: More Income in the Countryside (MIC) rice program for microcredit loans, seed exchange program (for access to certified cultivars), and the Provincial Agricultural Office (PAO) granting equipment (e.g. landmasters) to farmer associations. This means that membership is important and relevant to questions of income level, access to services, inputs, and social and political capital.
- There is a partial disruption on farm to market roads, mainly due to flooding affecting physical access to markets and barangay.

3.5 Gap analysis

Without secondary data on household food sources, income sources, and expenditure – and without time to collect our own representative figures – the team used provincial estimates from the Philippine Statistics Authority.¹⁴

Leyte per capita poverty threshold and poverty incidence among families							
Per capita poverty threshold (PHP)				Poverty incidence among families (estimated %)			
2006	2009	2012	2015	2006	2009	2012	2015
6,350	8,276	8,593	10,981	33	33	32	39
PSA 2015:2							

Government data for Leyte illustrates a consistent, negative trend in poverty and food thresholds (see tables, above and below). In 2015, the poverty incidence per population was 39%, meaning that households require PHP 10,981 of income to stay out of poverty and to meet basic food and non-food requirements. We attribute this trend to the long term effects of typhoon Yolanda that worsened poverty between 2012-2015 more significantly than changes across other periods. Leyte provincial poverty incidence is worryingly higher than the national poverty incidence of 21% (2015).

Leyte per capita food threshold and subsistence incidence among families							
Per capita food threshold (PHP)				Subsistence incidence among families (estimated %)			
2006	2009	2012	2015	2006	2009	2012	2015
4,434	5,780	5,999	7,663	17	13	14	20
PSA 2015:8							

This same trend to the food threshold (above), where 20% of the population does not meet the minimum income of PHP 7,663 to meet basic food needs or satisfy the nutritional requirements for economically necessary and socially desirable physical activities. Here too we see that the 2012-2015 increase is greater than changes between any of the other periods, similarly indicative of the longer term food economy impact of typhoon Yolanda. Overall trends in poverty and food thresholds (above) are also consistent with deteriorating income gaps, poverty gaps, and poverty severity in Leyte 2012-2015, below.

Leyte income gap, poverty gap, and severity of poverty																				
Income gap				Poverty gap				Severity of poverty												
06	09	12	15	Increase / decrease		06	09	12	15	Increase / decrease		06	09	12	15	Increase / decrease				
32	27	28	31	(4.6)	0.6	3.5	11	9	9	12	(1.5)	(0.2)	3.3	5	4	4	5	(1.0)	(0.0)	1.7
PSA 2015:28																				

To assess household rice income gaps more closely, we collected primary data for all income and expenditure related to rice production, from borrowing seeds and inputs to hiring labor and repaying loans to household sale, storage, and consumption. See table, below. Our data are appropriately imprecise but nonetheless illustrate issues consistent with the provincial data above and what focus groups respondents discussed during fieldwork.

¹⁴ All data are first semester figures. It would have been ideal to use second semester figures for consistency with timing of the baseline and crisis scenarios, however these data are not yet publically available. PSA technical terminology is defined below (PSA 2015:37), but our gap analysis can be understood without this specialist vocabulary:

Food threshold: Minimum income required for a family/individual to meet basic food needs, which satisfying nutritional requirements for economically necessary and socially desirable physical activities.

Income gap: Average income shortfall, expressed in proportion to the poverty threshold, of families/individuals with income below the poverty threshold.

Poverty gap: Total income shortfall (expressed in proportion to the poverty threshold) of families/individuals with income below the poverty threshold, divided by the total number of families/individuals.

Poverty incidence: Proportion of families/individuals with per capita income less than the per capita poverty threshold to the total number of families/individuals.

Poverty threshold: Minimum income required for a family/individual to meet basic food and non-food requirements.

Severity of poverty: Total of the squared income shortfall (expressed in proportion to the poverty threshold) of families/individuals with income below the poverty threshold, divided by the total number of families/individuals.

Subsistence incidence: Proportion of families/individuals with per capita income less than the per capita food threshold to the total number of families/individuals.

Rice consumption budget: 1 hectare, smallholder, irrigated second season crop, PHP equivalent/unmilled 44 kg sack

	Baseline: Oct 2018 100% harvest (PHP)	Emergency: Oct 2019 20% harvest (PHP)
A. Inputs	70,380	70,380
B. Typhoon impact	0	-61,200
C. Yield	76,500	15,300
D. Saved for consumption (C-B-A)	6,120	-55,080
E. Additional purchase for consumption	-11,000	-17,000
F. Annual balance (E-D)	-4,880	-72,080

The table shows the income and expenditure cash flow for one hectare of irrigated, second season rice cultivation in the assessed municipalities. The total estimated amount of inputs required to cultivate one hectare of paddy is PHP 70,380. This normally yields an average of 100 sacks of unmilled rice, worth an estimated PHP 76,500. After repaying input loans, farmers remain with a net rice income equivalent of PHP 6,120. Farmers explain that this profit margin is insufficient for them to meet even food income needs before the next harvest season in the next 5-6 months. Indeed, the national average for the poorest 30% of households is that roughly 60% of all expenditure goes to food purchases.¹⁵ Even producers need to purchase additional rice in normal years.

Additional rice purchases are therefore required, usually at higher cost, later in the season when household stocks are exhausted. In the baseline period, a smallholder tenant would need to purchase approximately PHP 11,000 of additional rice for household consumption. This means that an additional +/- 5 more rice sacks will be purchased, usually at a higher cost than what farmers received at harvest when repaying loans and selling a portion of their yield. In practice, the apparent yield for income and savings after harvest does not allow any profit, but is instead largely utilized for debt service (to ensure creditworthiness for the next cropping season) and household consumption.

Typhoon impact exacerbates these tendencies, following an estimated income (harvest) loss of 80%. The compound loss from crop failure and the additional rice purchases required for household consumption leave farmers with a net annual loss of PHP -72,080 and without any reserves until the next cropping season. These deficits are met through additional borrowing, usually from the same landowners and barangay traders that they borrowed from previously and to whom future harvest is effectively mortgaged.

Beyond additional debt, focus group participants discussed how men tend to seek income opportunities outside the municipality for daily construction work or as helpers, while women increases productive roles such as farm labor or laundry services to augment family income in addition to their reproductive roles with children and homestead management. As discussed previously, there were related reports of children leaving school and seeking wage opportunities as well. Combined with the inelasticity of rice production, wherein tenant households typically cannot increase cultivated land area (or wherein landless laborers cannot realistically aspire to diversify into paddy cultivation), typhoon undermines household livelihoods that are already vulnerable to food and economic insecurity.

¹⁵ PSA 2017:26

4. Coconut lumber market system analysis

4.1 Introduction

Coconut lumber is one of the primary wood types typically used for construction in the Philippines. There is abundant supply, and it has become a vital housing material. It is mainly cultivated for its fruit, which is a source of oil. The coconut tree has a lifespan of roughly 70 years, after which it is considered a senile tree. Coconut lumber was selected as commodity in this market study due to its strategic importance for households and the wider response of government and humanitarian actors. Based on the policies of the Philippine Authority, only senile and non-bearing/unproductive trees should be cut. Permission to cut and transport is issued by the Philippine Coconut Authority (PCA) upon formal request.

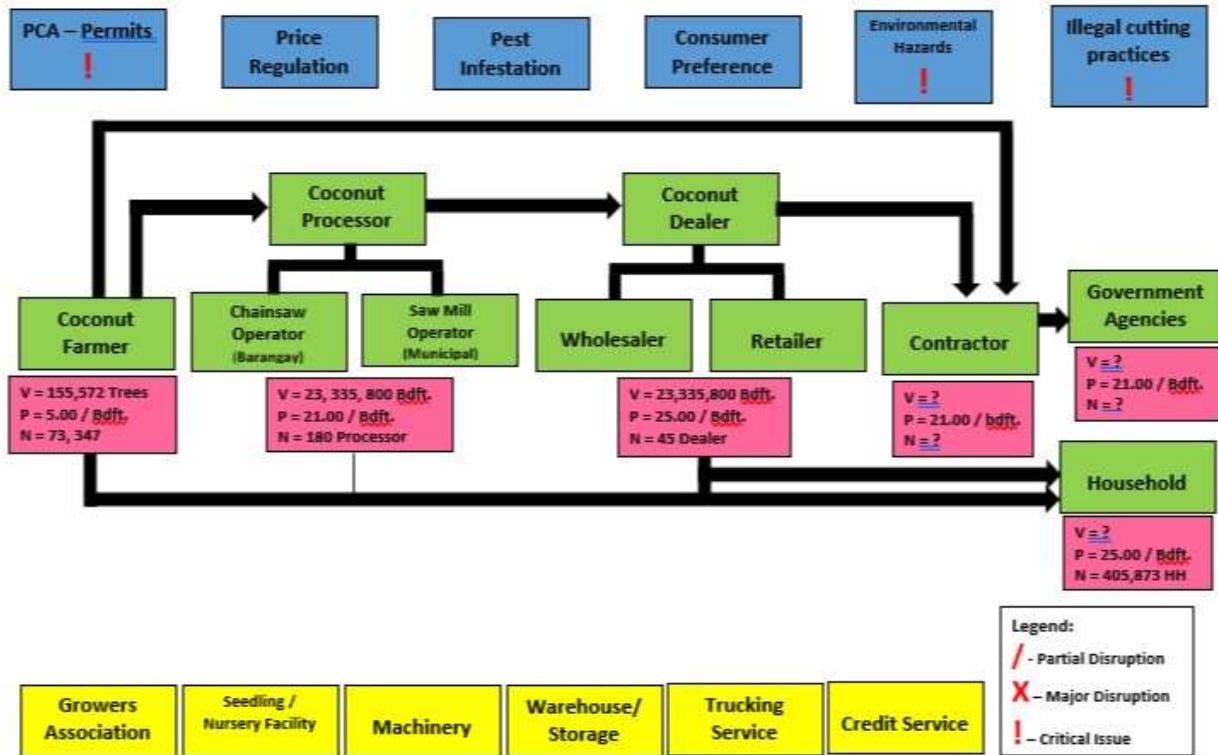
Poorer households tend to use coconut lumber more than comparatively wealthier households, as it is an inexpensive alternative to hardwood timber. The main tree is normally felled by single operated chainsaw, but traditional methods like manual handsaw is also used. It is then cut to desired proportions either by chainsaw or mechanized chainsaw/band saw. Trading is conducted through dealers that can be categorized based on their supply stock: wholesalers and retailers.

There are currently a total 7,175,891 coconut trees registered in Leyte, of which 2,663,766 are non-bearing and 739,538 are senile and suitable for construction. There are 73,347 registered producers with a total cultivated area of 71,909 hectares. In 2018 Leyte harvested a total of 155,572 trees, which translates to 23,335,800 board feet of lumber. After typhoon Yolanda devastated much of the coconut trees, PCA has replanted 12,000,000 seedlings.

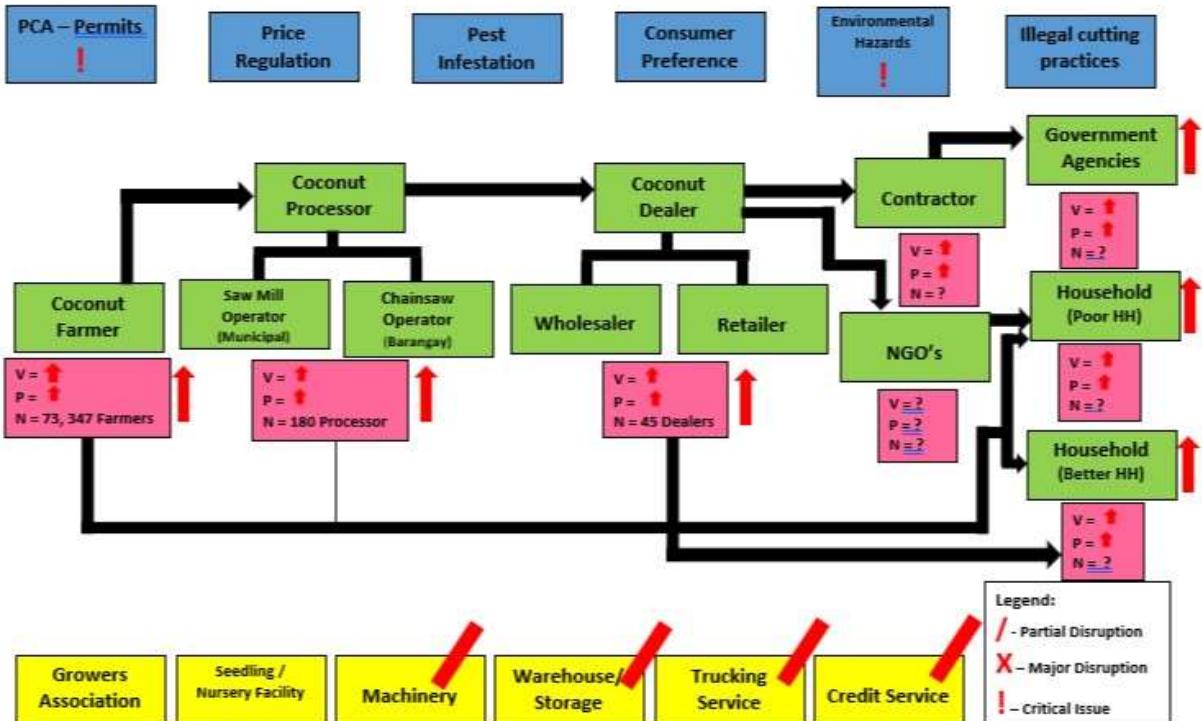
PRC utilized coconut lumber during its Yolanda operations. It was used in shelter repairs and the construction of full shelters. The lumber was also utilized in some of the WASH construction activities, mainly for latrines. PRC decided to assess the coconut lumber market system because of its significance in domestic use and humanitarian response in Leyte province. The market assessment focused on the supply chain of coconut lumber so most of the respondents are processors and dealers.

Market actor	Key characteristics
Coconut farmers	Land owners or tenant farmers that own and cultivate coconut trees. They produce coconut related products like copra (dried coconut kernels), timber, and other derivatives. They are normally registered and monitored by the Philippine Coconut Authority.
Coconut Grower Association	A collection of individual coconut farmers registered under the Philippine Coconut Authority. They serve as the conduit for the majority of PCA extension services, especially for copra producers. In some cases they produce and trade commodities as a group.
Coconut processors	Entities that own registered machines that are used in harvesting and processing coconut timber. They normally own a chainsaw, circular saw or electric band saw. In Leyte there are two categories of process: chainsaw operators and saw mills. Processors are registered according to the cutting machine that they own.
Coconut dealers: Wholesalers	Engage in trading cut or pre-fabricated coconut lumber to various size specifications. Normally they own large shops and lumberyards at municipal level. Wholesalers deal with bulk orders and mostly cater to large construction companies or tenders from government and other organizations.
Coconut dealers: Retailers	Dealers that have smaller supply stock, which is usually below 500 boards at any given time. They own significantly smaller shops and smaller storage facilities. They have limited access to capital and mostly rely on MFIs to obtain credit. Their main clients are household consumers that normally buy around 8-10 pieces of lumber.
Philippine Coconut Authority	An agency under the wider Department of Agriculture that is responsible for developing the coconut industry to its full potential. They are the sole agency mandated to issue permits to cut, transport, register coconut processors, exporters, and traders. Their offices are based at the provincial and regional levels, aside from their main office.
Contractors (construction)	Privately owned businesses engaged in construction activities. They are one of the main consumers of coconut lumber. Although coconut lumber is not commonly used in permanent construction, especially larger buildings, they mostly use coconut lumber for temporary scaffolding at large construction projects. They normally procure their supplies from wholesalers or directly from coconut farmers. They are able to acquire permits to cut and transport if necessary.
Household consumer	Poorer households tend to construct using coconut lumber due to their lower purchasing power and the wood's abundant supply and low price. Coconut is typically used for roofing truss, wall panels, posts, and livestock pens. It is significant to note that permanent houses tend to use better (hardwood) lumber.

Coconut Lumber Market System, Baseline Map of UPL Program Target Areas in Leyte, October 2018



Coconut Lumber Market System, Emergency Map of UPL Program Target Areas in Leyte, October 2019



4.2 Market chain changes

- Post recovery, some poorer households tend to buy lower quality lumber due to their lower purchasing power. Households in Leyte prefer good lumber (hardwood) for permanent structures, but since coconut lumber is cheaper and highly available it becomes an alternative to good lumber. INGOs also tend to use coconut lumber in their shelter construction support due to its abundance and affordability.
- There is high risk for small traders to stop business operations due to low coconut lumber supply in normal times. This will be aggravated after a typhoon. Smaller businesses are prone to disruption in supply from the lack of trucking services and lower capital to increase their supply after disaster.
- Small to medium traders tend to compete for supply of coconut lumber due to limited production, causing lower sale prices from coconut farmers (normal times, seasonal variations). On the other hand, larger traders are still able to procure lumber as they have more capital and trucking to transport.
- Post-disaster it is expected that there will be increased presence of INGOs and interventions of government agencies for shelter reconstruction, commensurate with the scale of impact. INGOs tend to compete with traders as they buy directly from coconut farmers in order to hasten their procurement process. Local traders cannot supply the required volume within the first four weeks (because of the preparation process) and cannot lower their sale price to enable greater household purchasing power.
- It is expected that there will be increased number of first hand actors (chainsaw operators, distributors) at the community level due to increased supply of fallen trees. PCA accommodates additional chainsaw registration after a disaster to compensate with the increased availability of trees. In previous experiences, even some INGOs distributed chainsaws to facilitate the cutting and processing of lumber (and income generation) at community level.
- Post disaster, the standard PRC shelter response uses coconut lumber in shelter repair and latrine construction (WASH). This is commonly sourced from wholesale dealers and coconut farmers. It is expected that the response of PRC will affect the supply in local markets and may increase competition in the supply of coconut lumber. PRC normally uses cash grants to deliver assistance for shelter repair (as opposed to shelter construction, which is generally in-kind). One implication of this is the presence of substandard coconut lumber in the local area, which may compromise house integrity.
- In terms of coconut trees, there is minimal expected damage except for younger coconut trees. Older, senile trees (60 years old and above) have a harder and sturdier core, while younger trees tend to be softer and thereby more prone to wind damage.
- In normal times the price of one coconut tree is PHP 800 per tree, while 1 board feet is around PHP 5 (for coconut farmers), with normal increases along the market chain. After typhoon it is expected that there will be minor price increases of around PHP 2-5 per board foot. This means an average PHP 4,500 increase in price assuming an average requirement of 1,500 board feet per house.
- In 2018 PCA issued permission to cut 155,592 coconut trees. This is expected to increase after typhoon due to construction activities by households and the greater availability of fallen trees.
- There are 7,175,891 coconut trees currently registered in Leyte, of which 2,663,766 are non-bearing and 739,538 are senile. These are possible sources of coconut lumber post-typoohno, in which case chainsaw operators and sawmills would need permits to cut them. PCA allows the cutting of non-bearing and senile trees since this will not affect copra production. Tree density in Leyte is around 100-150 trees per hectare, which is higher compared to national levels. Burauen, Abuyog, and Jaro municipalities have the highest number of coconut trees in the province.
- PCA is expected to supply coconut seedlings to affected farmers post-disaster to recuperate the coconut stock in Leyte. Assistance can be channeled through existing coconut grower associations in barangay.
- An increase in household and commercial use of coconut lumber is expected post-disaster based on feedback from traders and barangay respondents. It is important to note that there are no existing data from government on lumber consumption per household.
- Men are generally more involved in construction activities, hence they are commonly involved in trading (buying/selling) of lumber. There is less involvement of women in construction related activities in general, although after typhoon women participate more in meetings and are typically targeted to receive shelter program cash grants.

4.3 Market environment changes

- In terms of specification, the most commonly sought lumber are 2 inch x 2 inch x 12 feet, 2 inch x 3 inch x 12 feet, and 2 inch x 2 inch x 10 feet. Lumber is graded based on density, wherein the core is considered as soft 'low density', the middle part is considered 'medium density', and the outer ring is considered as hard 'high density'. Good quality coconut lumber is made of planks from the outer ring that is sawed, graded, dried, treated, and preserved. Cut lumber is also bought based on its surface finish: S4S for smooth on four sides and S2S for smooth on two sides. In general better off households prefers S4S while poorer households buy S2S.

- Lumber processing follows a sequence of activities that involves tree felling, grading, sawing, sorting, curing, stacking drying, seasoning, and surface finishing. Coconut lumber processors normally do these before selling to lumber dealers. It may take 3 to 4 weeks to fully process lumber in order to meet market standards.
- A lack of price regulation allows market actors (i.e. traders or consumers) to control coconut lumber prices, leading to price distortion. Prices are generally dictated by supply and demand in consideration with the amount consumers are willing to pay. After a typhoon there might be localized increases in lumber prices. Price regulation is not strictly implemented post-disaster.
- Post-disaster there is also lower quality of lumber sold in the market, especially with smaller traders. Normally there are quality standards for coconut lumber in the construction industry, but after a typhoon even younger, immature timber is processed and sold.
- There is a higher mortality rate for newly planted coconut trees due to pest increases after typhoon. Fallen trees tend to host pests and diseases. It is expected that the PCA will approve permission to cut deceased and non-bearing coconut trees for economic utilization after typhoon, both to facilitate clearing and to stimulate household income.
- Most of the coconut lumber supply in Leyte is still in recovery stage after Yolanda, with the majority below 10 years old. Considering the age, maturity, and quality of coconut lumbers, there is currently a prevalence of low quality supply of coconut lumber. This will further compromise available wood quality if there is another typhoon.
- It is expected that after a disaster there will be an increase in the number of permits to cut and transport. After Yolanda, the PCA waived the need for permits in order to hasten the processing of coconut lumber.
- The upcoming election period poses higher risks of decreased supply, especially from small traders due to higher presence of checkpoints and stricter implementation of a moratorium on coconut tree felling as traders/distributors normally do not have permits to transport coconut lumber.

4.4 Service and infrastructure changes

- After typhoon there will be increased number of financial loans and credit services by retailers and traders for capital investments due to high demand for coconut lumber. Smaller traders need to borrow from MFIs or individuals in order to scale up their capacity to supply.
- It is expected that there will be partial disruptions to some of the road network due to debris and landslides. This will cause delays in delivery and increase prices due to longer transportation times.
- There will be increased use of and demand for machinery to cut trees (band saw, chainsaw, circular saw). There is also the possibility of damaged machinery and impaired production capacity.
- Small and medium traders tend to improvise makeshift warehouses or poor quality storage facilities (mostly with light materials that are not typhoon resistant), affecting the quality of coconut lumber supplies. This results into poorer quality of lumber available in local markets.
- We expect minor increases in fuel consumption due to increased demand for trucking and transportation services, despite fuel price hikes; hence an increase in transportation costs.
- The PCA has a seed dispersal program wherein they distribute good quality coconut seedlings to individual farmers, associations or local government units (LGUs). Their aim is to subsidize the input costs of cultivation and promote increased propagation. PCA has also established seedling nurseries as a long term strategy to ensure adequate supply of seeds.

4.5 Gap analysis

Municipality	Total # HH	# HH total damage (5%)	Total available senile trees	Total trees required	Total board feet available	Total board feet required	Total gap	Likely duration of gap	Response modality
Alangalang	11,047	552	36,545	2,760	5,481,750	414,000	+5,067,750	12 weeks	In-kind
MacArthur	4,242	212	27,761	2,120	4,164,150	318,000	+3,846,150	12 weeks	In-kind
Mayorga	3,432	171	27,387	855	4,108,050	128,250	+3,979,800	12 weeks	In-kind
Tacloban	48,417	2,421	26,189	12,105	3,928,350	1,815,750	+2,112,600	12 weeks	In-kind
Total	67,138	3,356	117,882	17, 840	17,682,300	2,676,000	+15,006,300	-	-

- Availability of coconut lumber is defined here as total number of senile coconut trees per municipality. These trees are above 60 years old, non-bearing, with no more economic value, and therefore appropriate for harvest. Dealers do not commonly stock lumber for more than 6 months due to its susceptibility to degradation the longer it is stocked. Treated coconut lumber has an average lifespan of 5 years before it begins degrading. The main limitation of our gap analysis is the lack of data on current trader stocks within

their storage facilities, as this is not monitored by any agency. It is also important to note that according to the PCA there is no set maximum number of cutting permits that can be issued.

- The crisis scenario estimates that 3,356 shelters will suffer total damage in UPL municipalities, assuming 5% of a total 67,138 households. The study expects that there will be an increased need for coconut lumber in affected areas due to INGO and government interventions.
- PRC is expected to cover 30% of affected households for Type A core shelters (half-concrete) in Alangalang, Mayorga, and Tacloban, in addition to Type B core shelters (wooden type) in MacArthur. Type A shelters need 750 board feet (equivalent to 5 trees) while Type B shelters need 1,500 board feet (equivalent to 10 trees).
- The gap analysis table summarizes the total number of necessary coconut trees (17,840) and lumber board feet (2,676,000), based on 150 board feet per tree. It is significant to note that 17,682,300 board feet of lumber is already available in the target areas. Therefore there should be no gap in market response capacity. Rather there would be an anticipated surplus of 15,006,300 board feet, which more than covers all of the expected need based on the crisis scenario.
- There is a surplus of trees within the four areas, but it does not necessarily equate to lumber stock but rather the potential timber supply that could be felled and processed to meet sudden increases in demand. This is significant, as processors would need 2-4 weeks to fully process lumber, which would influence the timing of humanitarian response.
- Traders are also able to procure trees from other Leyte municipalities, where the total available senile coconut tree stock is around 739,538 (or 110,930,700 board feet). Based on the expected 3 month gap, there would be a need to cut and process 212 trees (31,800 board feet) per day. (See Annex 11 for regional statistics).
- There is no defined seasonality in the coconut lumber supply, although demand tends to be higher after rice harvests due to increased purchasing power of households.
- Issues related to low access to credit and damaged warehouses and machinery exacerbate the situation, as dealers (especially retailers) have limited capacity and resources to increase stock volume.

Annex 1: Methodology and limitations

This assessment builds on an initial training with 25 participants from the Red Cross Movement and a representative of the Philippine cash working group. The five day workshop was intensely participatory and involved the group in a series of practical exercises using global and local examples. Days 2-5 concentrated almost entirely on Leyte province and building the analytical foundation of this assessment report, including:

- Context analysis
- Hazard analysis and crisis scenario identification
- Gender, food, and income analysis
- Seasonal analysis
- Critical market selection
- Initial baseline and emergency mapping
- Information needs and tool development

The PCMA workshop also included half a day of actual fieldwork (in Alangalang and Tacloban City), during which participants collected primary data using tools they developed gradually over Days 1-3. Building on their data collection, participants then completed:

- Data analysis
- Final mapping (then revised a third time during the full assessment)
- Initial gap analysis
- Initial conclusions (responding to the key analytical questions)
- Initial response analysis

A smaller team then revised the assessment tools and conducted another 6 days of primary data collection plus another 4 days of data analysis and report writing. This report is therefore an outcome of the full process above, an iterative and collaborative effort.

Fieldwork locations are all in the UPL program catchment. Barangay were sampled purposively using criteria captured in Section 2.1 below. We concentrated solely on rural areas, without diversifying to coastal or peri-urban areas. We also decided to assess barangay where both rice and coconut tree production are prevalent, and where a high proportion of households received shelter support in the post-Yolanda response. These decisions helped focus the analysis and enhance the learning objectives of the PCMA pilot. This entire report was written in concert with all workshop and assessment participants. We used:

- Primary and secondary data collection and analysis
- Tailored semi-structured discussion guides for each market system
- Focus group discussions, separating rice and coconut producers and separating women and men
- Key informant interviews with traders and government
- Transect walks and direct observation
- Daily data entry and interpretation sessions; plenary analysis and report writing with two projectors

There nonetheless remain limitations to the process and the final product:

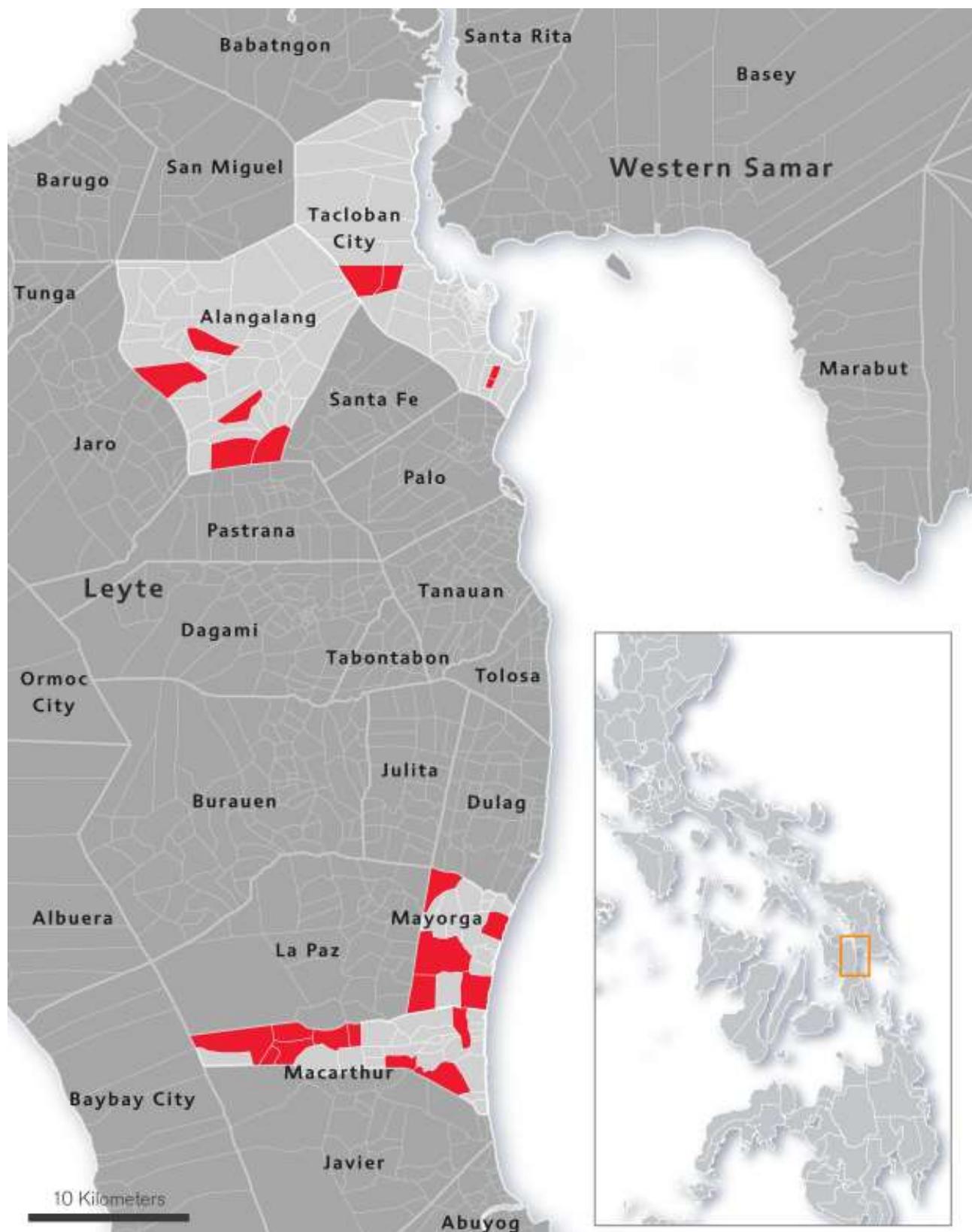
- The PRC team was already experienced in cash, markets, and assessments but had never conducted a PCMA before. More importantly, the limited time available to conduct and complete the assessment meant longer days and working weekends, thereby taxing momentum from the initiative.
- Several senior PRC staff and the OCHA cash working group representative that were supposed to participate in the full assessment did not, joining only for the initial workshop. Greater multisectoral and interagency impact could have been achieved in both process and product.
- Not all assessment team members conducting fieldwork participated in all analysis and reporting sessions. Insight and interpretation were lost.
- A literature review was conducted in preparation for the workshop and assessment, however there was insufficient time overall to capitalize on a wealth of secondary sources. Only some documents could contribute directly to our analysis, but many more could have been mined for relevant data and insight. The secondary resources were nonetheless included in PRC handover to encourage ongoing research and further contribution to PCMA revision.
- The assessment was rapid and there are gaps in quantitative data and qualitative understanding, all of which are documented herein.

Annex 2: Leyte provincial map



Source: https://commons.wikimedia.org/wiki/File:Ph_fil_leyte.png

Annex 3: UPL program map



Source: Philippines Red Cross

Annex 4: Hazard analysis

Risk analysis

	5	Storm surge				
	4					Typhoon, Flood
Impact	3		Disease outbreak	Landslide, Earthquake		
	2		Urban fire			
	1	Armed conflict				
		1	2	3	4	5
		Likelihood				

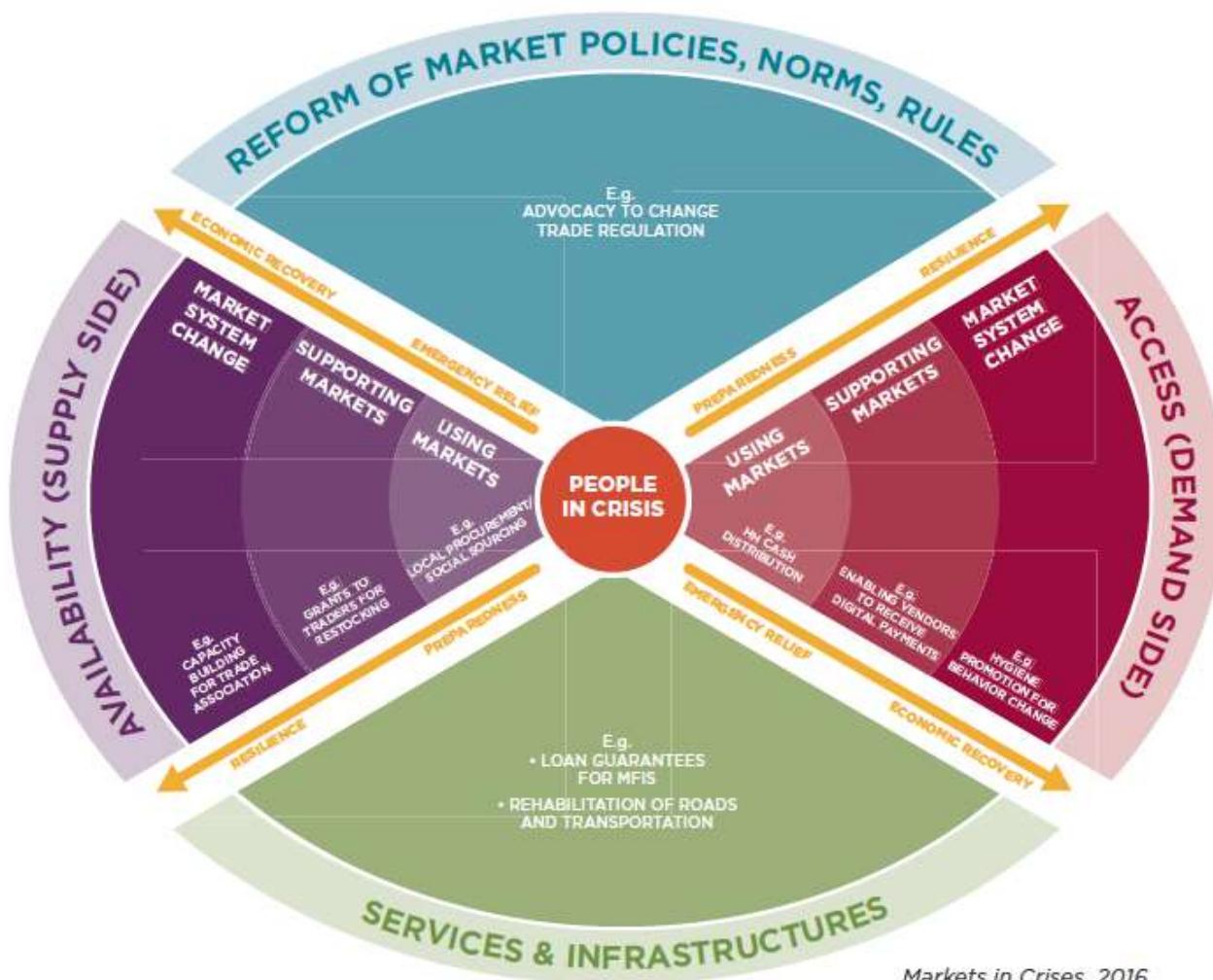
Hazards, gender roles, and the household economy

Household economy	Gendered access and control			Typhoon impact
	Mostly women	Mostly men	Women and men	
Food sources				
Rice cultivation			✓	High
Backyard vegetables	✓			High
Market purchase	✓			Medium
Donations	✓			High
Income sources				
Copra production		✓		High
Swine production			✓	Medium
Duck production			✓	Low
Fishing		✓		High
Rice farming			✓	High
Daily wage labor			✓	Medium
Taking loans	✓			High
Food vending	✓			High
Self employment	✓			Medium
Wage employment			✓	Low
Remittances	✓			Low

Annex 5: Leyte seasonality

Month	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
Hazards												
Rainfall												
Typhoon Season												
Floods												
Drought												
Labor and Income generating activities												
Construction labor			High				High					
Fishing labor				High	High		Low	Low				
Sari-sari/vending, transport services	High	High					High	High				
Remittances		High						High				
Migration		High	High			High	High	High	High			
Agriculture/Livestock												
Rice	H	P	P		H	H		P	P			H
Root crops	H							H				H
Vegetable gardening	H				P	P	H	H		P		
Livestock sales												
Fishing												
Hook and line	Low	Low	Low									
Gill net		High	High	High		Low	Low	Low				
Crab		High	High									
Squid			High	High								
Education												
Enrolment								Fees				
Food related												
Lean season												
Non-food prices		High					High	High				
Rice price trends		High				Low		High				Low
Health risks												
Dengue												
Diarrhea												
Other												
Festivities												
Poor water availability												

Annex 6: Market based programming framework



Markets in Crises, 2016

Annex 8: Secondary resources

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Annex 9: Fieldwork schedule and respondents

Date	Municipality	Barangay	Respondents	Number		Total
				Women	Men	
28.02*	Alangalang	Hubang	Market actors			
			FGD lumber			
			Households			
			Council			
			Market actors			
04.03	Tacloban City	Tacloban City	Government KII	1	2	3
05.03	Alangalang	Astorga	FGD rice	10	8	18
			FGD lumber	9	5	14
			Households	0	1	1
			Council	2	2	4
			Market actors	1	1	2
06.03	Alangalang	Peñalosa	FGD rice	9	10	19
			FGD lumber	11	5	16
			Households	2	0	2
			Council	2	6	8
			Market actors	4	2	6
07.03	MacArthur	Danao	FGD rice	11	8	19
			FGD lumber	10	11	21
			Households	1	1	2
			Council	1	5	6
			Market actors	2	2	4
08.03	Mayorga	Wilson	FGD rice	9	10	19
			FGD lumber	3	7	10
			Households	0	1	1
			Council	0	1	1
			Market actors	0	5	5
09.03	Tacloban City	Tacloban City	Market actors	2	3	5
11.03	Tacloban City	Tacloban City	Market actors	1	2	3
Total				91	98	189

- 28 February fieldwork was 2-3 hours as part of the PCMA workshop. Respondent data were not captured.

Annex 10: Coconut lumber properties

Properties of Coconut Palm Stem

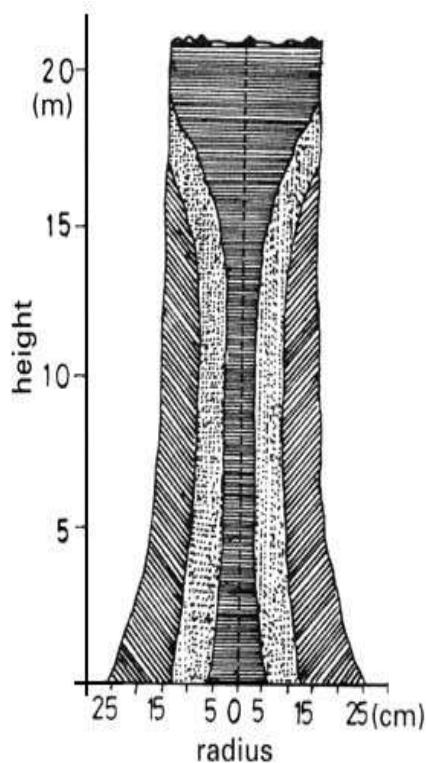
Only when palms are over 60 years of age (that is, when the copra yield declines, and they are of less interest to the farmer), is enough "wood" built up and therefore of use to the sawmilled. Depending on its oven-dry density, coconut wood can be segregated into three different groups:

High density timber (HD) - ($> 0.6 \text{ g/cm}^3$): Timber from lower periphery of stem. Can be used for load-bearing structural purposes, framing, flooring, staircases, tool handles and furniture.

Medium density timber (MD) - ($0.4 - 0.59 \text{ g/cm}^3$): Timber from upper stem periphery and lower middle section. Used for limited load-bearing structural purposes, furniture, wall-paneling, curios.

Low density timber (LD) - ($< 0.4 \text{ g/cm}^3$): Timber from core sections. Indoor use only, where no load is applied, e.g. wall-paneling.

Figure 1: Density distribution in mature coconut palm stem



Density

- high $> 600 \text{ kg/m}^3$
- medium $400-600 \text{ kg/m}^3$
- low $200-400 \text{ kg/m}^3$

Hs = Height in meter to first nut
LA = Actual length of usable log
Lm = Length of millable log

Figure 2: Use of the coconut palm

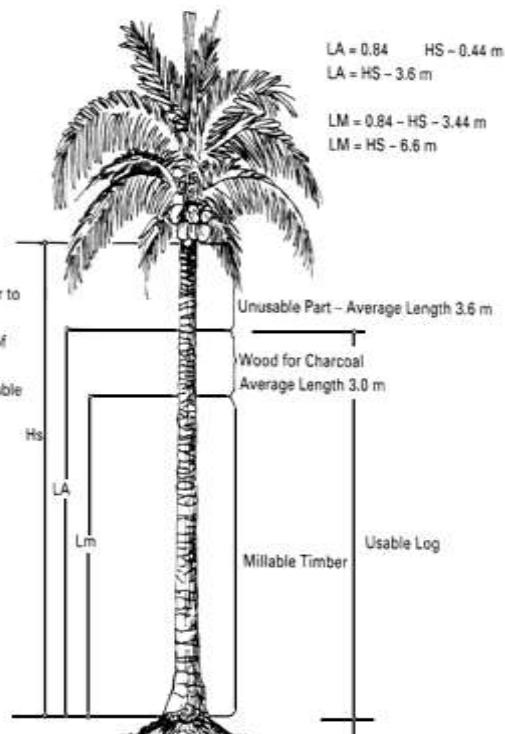
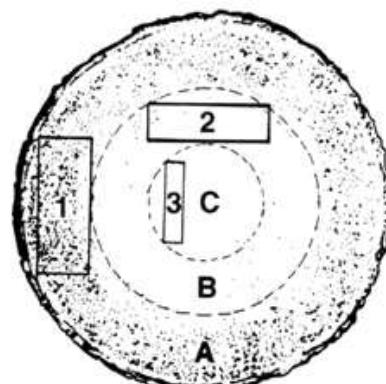


Figure 3: Cross section of coconut palm stem with density zones

A: High density group
B: Medium density group
C: Low density group



Steps in Coconut Lumber Processing

Logging

The technology required for harvesting or logging coconut stems is almost the same as in traditional forest trees. However, the conveniently straight and branchless stems, and their nearly uniform volume and dimension allow the use of comparatively light and simple tools and transportation equipment. Logging operation in a coconut plantation is therefore easier and cheaper than logging under forestry conditions especially in mountains with steep terrain.

Sawmilling

In sawing coconut logs, the most important factors in selecting the milling equipment are profitability and ability to be relocated if this is required; simplicity of design to avoid breakdowns which are difficult to repair in isolated situations; ease of operation as skills of operators will often be limited; an inexpensiveness as the industry is often situated in poorer and underdeveloped areas. Mills include the medium-size portable sawmill, a larger transportable sawmill, light/general purpose portable sawmill, a mini mill, a breast bench with light weight carriages and a chainsaw with guide attachments.

Grading

Quality control of coconut wood starts during the logging operation. Coconut wood should be graded hard, intermediate or soft, corresponding to high, medium and low density: high density is above 600 kg/m³; medium density between 400 and 600 kg/m³; and low density less than 400 kg/m³. Because of the widely varying density of material within each log, and the difficulty of differentiating these by superficial inspection after sawing, it is essential that a grading, sorting and identification system be established to track the wood from different parts of a log and from different logs along the length of a tree; this should start in the plantation at the time of felling. Systems of this sort have been designed and are implementable.

Machining

Another important phase in cocowood utilization is machining or the process of cutting and milling the cocowood into various shapes and patterns with the use of woodworking machines.

Seasoning and Drying

Coconut wood must also undergo seasoning process to minimize if not completely avoid problems in its utilization: the appropriate moisture content levels of coconut wood for various uses are as follows: furniture - 10 to 12%; flooring - 11 to 17%; framing timber - 15 to 18%; joinery - 12 to 16%; and weatherboards - 15 to 18%. The common drying methods include air drying wood under shed, forced-air, and kiln drying. Depending on existing conditions, 25mm and 50mm coconut boards take 4 to 11 weeks and 16 to 21 weeks to air dry, respectively to attain equilibrium moisture content of 17% to 19%. Drying schedules have been worked out (*Tables 8 and 9*) for kiln drying coconut wood to avoid drying defects such as collapse, twist, wrap and check.

Preservative Treatment

Coconut is not naturally durable when used in situations favorable to attack by decay fungi and wood boring insects particularly in ground contact and exposed to the weather. The low natural durability can be overcome by the application of suitable wood preservative treatment, for which appropriate prescriptions and dose rates have been developed. Choice of treatment depends on hazard level and cost that can be borne.

Finishing

Good quality finish for cocowood involves sanding the surface to remove the knife marks and produce a smooth surface. The use of mechanical sanders instead of manual sanding facilitates finishing the surface of the wood. Coating involves the sequence application of stain, filler, sealer and top coating materials such as lacquer, polyurethane, polyester and oil finish to enhance the natural beauty of the grain, color and figure of cocowood products. Usually two or more coats of finishes are applied to cocowood to improve the appearance and quality of the wood products.

(Source: Asia-Pacific Forestry Sector Outlook Study: Focus on Coconut Wood, UN FAO 2010)

Annex 11: Eastern Visayas coconut statistics

Province/ DISTRICT/Municipality/ Barangay	UPDATED NUMBER OF COCONUT TREES				UPDATED COCONUT AREA			Coconut Farmers	Coastal Area	2017 VOLUME OF PRODUCTION (nut w/ husk in MT from PSA)
	Number of Coconut Trees	Bearing Trees	Non-Bearing Trees	Senile Trees	TOTAL AREA (Ha)	AGRICULTURAL LAND (Ha)	COCONUT AREA (Ha)			
LEYTE	7,175,891	3,772,587	2,663,766	739,538	274,540	169,197	71,909.44	73,347	29,910	71,623
DISTRICT I	1,827,445	684,454	856,367	237,752	76,220	38,517	19,902.32	18,475	10,046	12,994
ALANGALANG	287,070	111,382	131,631	36,545	15,050	8,787	3,403.22	3,379		2,114.60
BABATNGON	339,603	185,708	115,303	32,011	11,520	4,047	3,386.92	1,282	2,739	3,525.68
PALO	167,991	18,646	111,894	31,065	6,760	3,555	2,094.49	3,559	1,676	353.99
SAN MIGUEL	308,429	160,221	111,042	30,829	14,510	8,443	3,165.39	1,756	1,361	3,041.82
STA. FE	187,277	81,819	79,013	21,936	8,190	2,348	2,216.69	2,296		1,553.35
TACLOBAN	197,454	71,550	94,332	26,189	10,100	3,400	2,346.34	2,210	1,877	1,358.39
TANAUAN	183,887	33,678	112,541	31,245	7,840	6,050	2,097.50	2,936	1,678	639.39
TOLOSA	155,734	21,450	100,610	27,932	2,250	1,887	1,191.77	1,057	715	407.23
DISTRICT II	4,152,239	2,037,122	1,584,717	439,963	149,720	112,805	45,795.42	41,543	16,442	38,675
BARUGO	238,616	100,642	103,374	28,700	7,850	5,693	2,376.95	2,274	998	1910.71
BURAUEN	601,448	247,242	265,383	73,678	26,490	23,040	11,807.67	10,430	5,904	4693.92
CAPOOCAN	473,417	371,846	76,100	21,127	18,540	11,096	3,797.41	1,377	2,658	7059.55
CARIGARA	393,853	250,966	107,056	29,722	11,400	8,487	3,405.52	2,702	2,384	4,764.61
DAGAMI	286,443	116,062	127,655	35,441	16,000	11,579	3,211.08	3,499	1,284	2,203.45
DULAG	222,235	101,192	90,689	25,178	8,100	5,070	3,066.96	1,910	2,147	1,921.14
JARO	516,646	250,949	199,069	55,267	20,720	16,222	4,057.28	3,242		4,764.30
JULITA	161,523	48,022	85,039	23,609	5,330	2,673	1,128.44	1,402		911.71
LA PAZ	293,787	117,578	132,022	36,653	10,020	9,251	5,203.77	7,768		2,232.24
MACARTHUR	224,153	90,694	99,992	27,761	4,860	4,458	1,613.98	1,165	646	1,721.84
MAYORGA	168,577	36,915	98,646	27,387	6,160	5,211	1,051.14	2,495	420	700.83
PASTRANA	340,596	238,891	76,201	21,155	7,930	4,687	3,243.97	1,856		4,535.38
TABON-TABON	108,242	15,020	69,845	19,391	2,500	2,091	874.82	626		285.15
TUNGA	122,704	51,102	53,647	14,894	3,820	3,247	956.44	797		970.17
DISTRICT V	1,196,207	898,995	222,681	61,823	48,600	17,875	6,211.71	13,329	3,422	19,954
JAVIER	539,949	393,945	109,391	30,370	14,180	5,076	1,542.96	2,684	154	7,479.10
ABUYOG	656,258	505,050	113,290	31,453	34,420	12,799	4,668.75	10,645	3,268	12,474.47

Source: Philippine Coconut Authority Regional Office