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Socio-economic Impacts of Smallholder Tree Farming in the Caraga Administrative Region, Philippines

ABSTRACT

Tree farming is becoming infamous among smallholders in the Caraga Administrative Region, the acclaimed "timber corridor" of the Philippines. Despite the region's favorable bio-physical condition to tree farming, attractive cash benefits, and market availability compared to other regions of the country, tree farming has become less attractive to smallholders. The smallholders remained poor and marginalized even as the region's poverty incidence continually declined in the last three decades. This study seeks to determine the socioeconomic impacts of smallholder tree farming in the region. Using both qualitative and quantitative analyses, the study revealed that tree and non-tree farmers alike perceived positive and statistically significant changes on livelihood sources, income, equity, asset accumulation, education, level of trust, reciprocity and cohesiveness in the community as a result of tree farming. However, although income was improved with tree farming, benefits were considered inequitable among different stakeholders; those endowed with financial capital captured much of the economic benefits. Worse, the lack of financial resources has led some smallholder tree farmers to accommodate arrangements such as dependence on the purchase order (PO) holders who have control over the price of logs that put them into a disadvantaged situation, which consequently locked them in impoverished condition. The study recommends the institutionalization of an effective need-oriented extension program for smallholder tree farmers, investment in market diversification and vertical integration of tree products to make smallholder tree farming more sustainable and equitable.

Keywords: *social-ecological system, agroforestry, cattle farming, ecosystem services, resilience*

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INTRODUCTION

The Philippines' degraded forest landscapes have undergone rehabilitation since 1929 (*Chokkalingam et al. 2006*). Despite almost a century of forest rehabilitation, the Philippine forest cover gradually decreased from 70% in the beginning of the nineteenth century (*Chokkalingam et al. 2006*) to 26.8% in 2015 (*FAO 2015*). A greater part of the rehabilitation effort has been undertaken by the Philippine government. With the birth of participatory forest management in the 1980s, the local communities played a major role in the rehabilitation of forestlands in the country. In 1995, the Philippine government adopted the Community-Based Forest Management (CBFM) as the national strategy for promoting sustainable forest management and social justice in the Philippine uplands giving the local communities even greater role in the rehabilitation of the country's degraded land.

Meanwhile, at the height of logging in the 1960's, the private sector, through the Timber License Agreement (TLA), shared very little in rehabilitating the Philippine forestlands. This is attributed to limited or absence of incentive system for concessionaires to replant (*Emtage and Suh 2004*). Hence, forest cover continued to decline with an all-time high deforestation rate of 300,000 ha yr^{-1} between 1977 and 1980. Almost 11.5 M ha of the Philippine forestlands has been awarded to logging companies/concessionaires during the Martial Law years (*ESSC 1999; Chokkalingam et al. 2006*). Apart from logging, both legal and illegal kaingin-making (shifting cultivation) expansion and charcoal-making further led to forest degradation.

Forest rehabilitation is a continuing program of the government with the main goal of rehabilitating the entire country. CBFM communities' adherence to this goal is part of their sworn agreement with the Philippine government in exchange of their continued use of forest land/ public land for purposes of improving their socioeconomic and human well-being. Meanwhile, alienable and disposable lands, which constitute about

48% of the total 30M ha land area of the country is under private individual's property jurisdiction (*FMB 2012*). In many regions in the country, local communities utilize both the public and private lands for forest rehabilitation, including the establishment of tree plantations.

Raising public awareness to venture in smallholder tree farming is not unique to the Philippines but also holds in countries like Vietnam (*Putzel et al. 2012*), Brazil, Bolivia, Peru and Ecuador (*Hoch et al. 2009*), Indonesia (*Permadi et al. 2018*) and Bangladesh (*Rahman et al. 2017*). Even developed countries like United Kingdom is recently exploring the viability and profitability of investment in afforesting upland farms to reverse climate change (*Hardaker 2018*). However, the Philippines' company-community partnership in tree farming started as early as 1968 in the Caraga region.

This study seeks to determine the socio-economic impacts of smallholder tree farming in the region. This is one of the component studies of a big program that looks at the entirety of the Industrial Tree Plantations (ITP) in Caraga Administrative Region (CAR), Philippines in 2011. Like any other program implementation, social dimension is normally less regarded. This study came two years after the program started. While ITP is large scale, smallholder tree farming existence throughout the region continues. The economic challenge of ITP is well recognized through a number of studies conducted, but the impacts of smallholder's tree farming are still very limited. Therefore, this study aimed to capture the social dimensions of smallholder tree farming in CAR.

MATERIALS AND METHODS

Study Area

The study covered the four provinces of CAR or Region 13 (**Figure 1**): Agusan del Sur, Agusan del Norte, Surigao del Sur and Surigao del Norte, except Dinagat Island, located in the island of Mindanao.

Data Collection and Analysis

A combination of qualitative and quantitative data collection methods was employed. To have a better

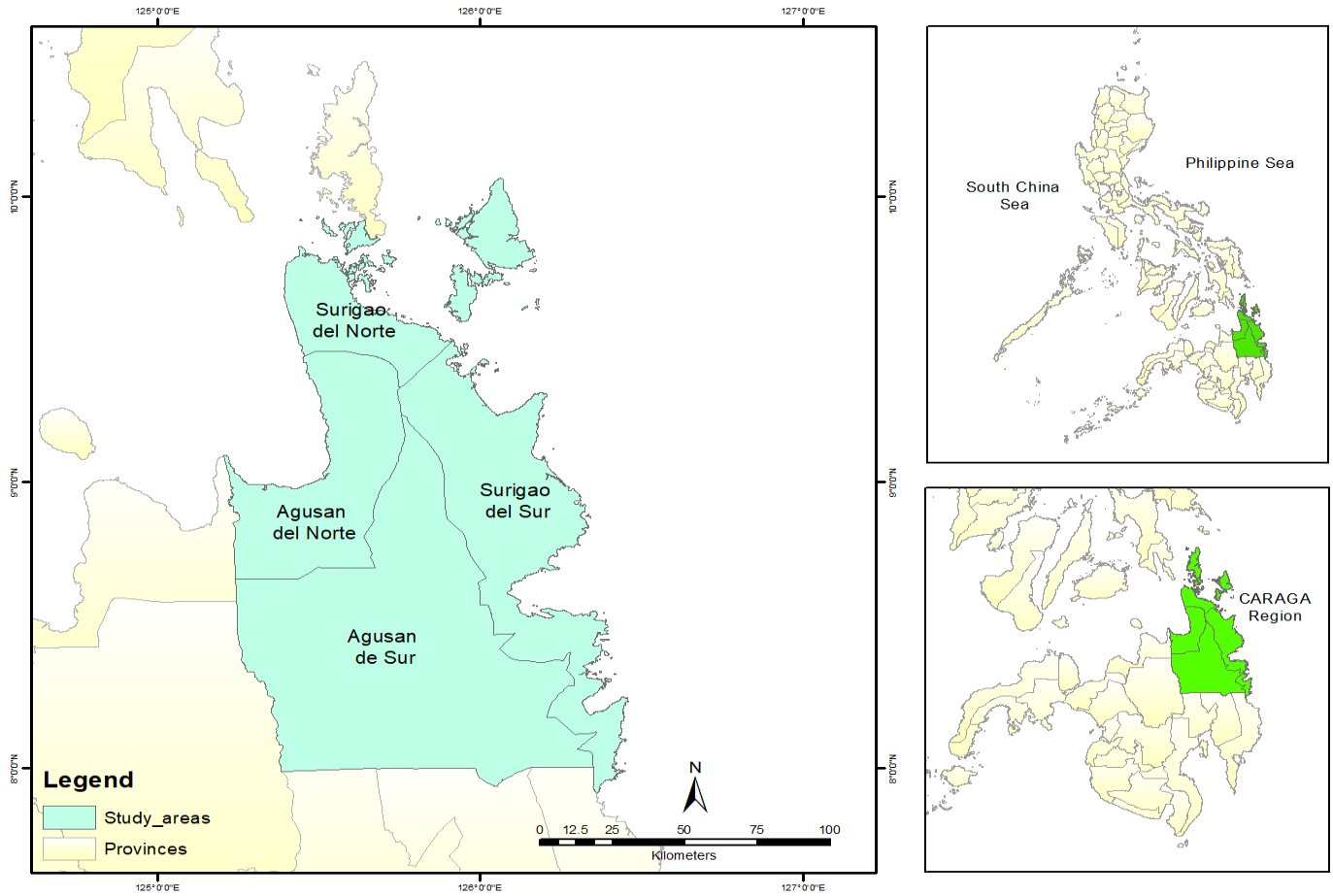


Figure 1. Map of the Philippines showing Caraga Administrative Region and provinces.

perspective of smallholder tree farming in the region, focus group discussions (FGDs) were set in each of the provinces. Two FGDs were conducted per province, one with tree farmers bin private lands and the other with tree farmers who are members of Community Based Forest Management (CBFM) projects in public forest lands. A total of eight FGDs were completed with 10-15 participants per FGD. FGD participants were selected on the basis of gender, age, and knowledge of tree farming development by the concerned Provincial Environment and Natural Resources Office (PENRO) and Community Environment and Natural Resources Office (CENRO). Age and knowledge are also considered, while older tree farmers are more experienced, the young blood in tree farming offered new innovations and are highly motivated.

A household survey instrument was developed after the conduct of FGDs, taking into consideration the issues raised during the FGDs. Majority of the data presented in this paper came from the household survey while FGD results provided further insights to deepen the analysis.

To supplement the household survey and FGDs, key informant interviews (KIIs) were also conducted among eight tree farmers with varying degree of capital investment, area of plantation, plantation development, and years of engagement in tree farming. Selected personnel from the Department of Environment and Natural Resources (DENR) Regional Office, Provincial Environment and Natural Resources Office (PENRO) and Community Environment and Natural Resources Office (CENRO) also served as informants of the study, providing additional insights into tree farming operations and its socioeconomic impacts.

There is a wide range of smallholder tree plantations in the region, however, information on the exact total number of smallholder tree farmers is lacking. Estimate is based mostly on tree farmer's registration through Private Tree Plantations Ownership Certificate (PTPOC), a more popular term used in Caraga than the CTPO or Certificate of Tree Plantation Ownership, which refers to the same ownership certificate issued by the CENRO. However, in reality, most tree farmers registered their farms before harvest time to avoid paying annual taxes (property and development tax) and penalties for late payment. Hence, the PTPOC registration data was used in determining the number of sample size for the household survey. Computed sample size of 731 was derived using Yamane's formula to determine the representative proportion at 5% margin of error (**Table 1**) (*Osahon and Kingsley 2016*). Of the total respondents, 498 were tree farmers (TF) and 233 were non-tree farmers (NTF).

The household survey instrument includes the respondent's socio-economic and demographic information, farm characteristics, and impacts of tree farming. Degree of impacts of tree farming on livelihood capital assets, such as livelihood sources and income in three periods, i.e., before tree farming (T1), right after harvest of tree farms (T2) and five years after harvest (T3), was determined using the ladder diagram. A photo of a ladder was shown to the respondents highlighting the situation between stages/level from 0-10 (**Figure 2**). This shows the basis of determining the degree of smallholder industrial tree plantation socio-economic impacts. A two-tailed t-test was used to determine the differential impacts of tree farming for the tree farmers (TF) and non-tree farmers (NTF) during the three periods, i.e., before tree

Table 1. Distribution of survey respondents in the four provinces of Caraga Administrative Region.

Provinces	Tree Farmer		Non-Tree Farmer	
	Count	Percent	Count	Percent
Agusan del Norte	79	15.86	43	18.45
Agusan del Sur	262	52.61	149	63.95
Surigao del Norte	19	3.82	14	6.01
Surigao del Sur	138	27.71	27	11.59
Total	498	100	233	100
Overall Total Count	731			

Figure 2. Indicators and stages/steps of the ladder diagram used in determining the impacts of tree farming in Caraga region, Philippines.

farming, during harvest and five years after harvesting.

A dissemination cum validation workshop was also conducted per province to ascertain the findings of the study. Hence, impacts of tree farming to households of tree farmers (TF) and non-tree farmers (NTF) were validated as well. The workshop was attended by more than 50 participants with representatives coming from the LGUs- both provincial and municipal, national agencies and people's organizations.

RESULTS AND DISCUSSION

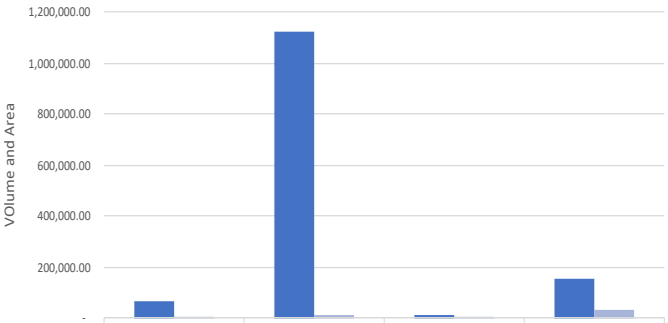
Caraga: The timber corridor of the Philippines

Caraga Administrative Region is popularly known for the private sectors' (individuals and company/ corporations) involvement in tree farming. At the household level, majority invested in tree farming of Falcata (*Paraserianthes falcataria*), Mangium (*Acacia mangium*) and Gmelina (*Gmelina arborea*) species. Smallholder tree farming in the region was influenced by the Paper Industry Corporation of the Philippines' (PICOP) introduction of smallholder tree plantations within the 50-km radius of its pulp and paper plant in Bislig, Surigao del Sur (*Pulhin and Ramirez 2016*) . Farmers are bound by the contract with PICOP where planted trees, once harvested, will be solely bought by PICOP. The agreement produced positive and negative impacts on farmers. Positive impacts pertain to the continuous flow of income derived from tree harvesting on rotation basis. However, timber price is being monopolized by PICOP; it gave the cheapest price for farmer's timber (*Hyman 1983; Arnold 1990*). After PICOP's operation terminated in the 1990s, tree farming continued to exist not only in the province of Surigao del Sur but spread like wildfire in other provinces, particularly in Agusan del Sur where almost 90% of its households is into tree farming.

The government, through the issuance of Department of Environment and Natural Resources (DENR) Memorandum Circular 1999-20, requires private individuals to register their planted tree crops in private lands/ A&D lands at the start of planting. However, it is believed that only a minority of tree farmers registered their tree plantations through the PTPOC (**Figure 3**). Of the total number of PTPOC registrations, Agusan del Sur recorded the highest number, volume and area, with 3,715 registrations, 1.12M m^3 and 15,880.58 ha, respectively.

Regional contribution of tree farming

Caraga Administrative Region is considered a major player in national timber production. About 69% of the national log production came from Caraga, where 90% of the region's log production is sourced from private tree plantations (*NEDA-Caraga 2017*). In 2011, 148.11% (or 260,786.49 m^3) increase in the forestry subsector production was recorded in the region, with 91.35% of log production originating from PTPOC areas. Manufactured forest products (veneer, plywood, lumber) also contributed, with an increase of 11% (60,266.77 m^3) (*NEDA-Caraga 2011*). But further increase in timber production was not sustained. In 2012, log production started to decrease. In 2013, there was a 3.10% decline, as influenced by decrease of PTPOC by 0.77% (PTPOC's annual contribution was 96%; (*NEDA-Caraga 2013*). In 2014, there was a slight turnaround with the 16.17% increase in log production mainly coming from private tree plantations (*NEDA-Caraga 2014*). In succeeding years, supply was largely problematic. This foreseen decline was attributed to the issuance of Executive Order 23 (total logging ban in natural forests) affecting supply of raw materials for major processing plants. Deficit was addressed through importation and the flourishing local level smallholder tree plantations (*NEDA-Caraga 2011*). In 2017, log production slightly increased by 0.14% from 2016 level. Minor increase was attributed mainly to the harvested Falcata planted in 2011 under the National Greening Program (*NEDA-Caraga 2017*).



	Agusan del Norte	Agusan del Sur	Surigao del Norte	Surigao del Sur
Volume (m3)	68,630.95	1,124,348.45	15,146.82	151,963.81
Area (ha)	1,190.94	15,880.58	130.33	35,867.18

Figure 3. Profile of Private Tree Plantation Ownership Certificate (PTPOC), 2005-2012.

Out of the 5,029 registered PTPOC, only 2,504 have a complete information on year of plantation establishment. Based on records, about 1,998 tree plantations were established in the 1990s (**Figure 4**). The termination of PICOP's operation in the 1990s did not deter tree farmers to develop tree plantations on their own in the region.

Increasing interest in tree plantation benefitted families in the region. The region's annual per capita poverty incidence among families significantly improved

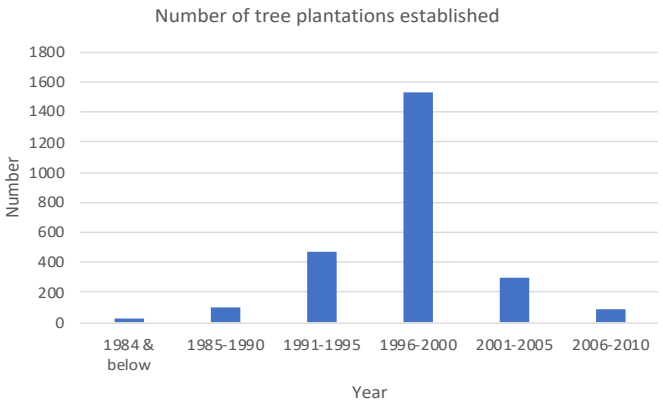


Figure 4. Number of tree plantations established in Caraga Region, Philippines (Source: *DENR-Caraga-FMS 2005-2012*).

from 48.5% in 1991 down to 37.6 % in 2003 (**Table 2**).Although the annual per capita poverty incidence increased by about 5% from 2006 to 2009, it has continuously declined until 2018, at an annual per capita poverty incidence of 24%. This is however, two times higher than the nation's average of 12% for the same year. Amongst the four provinces, Agusan del Norte and Surigao del Sur recorded the lowest poverty incidence of about 10% in 2018.

Household and farm characteristics of respondents

Survey respondents were mostly male, married, completed elementary education, belonged to age class 42-53 years and their households comprised of 1-5 members. While most TF were native to the area of residence, most NTF were migrants. Income was derived mostly from agricultural farming, augmented substantially by income from tree farming by those who own tree farms and supplemented by engaging in trading or vending. Most NTF interviewed derived wages from activities in tree farming. NTF also earn from tree farming through the "patubo" system. Patubo system is an arrangement made between two farmers, where the TF (tree and landowner) sells the trees at stumpage price to another farmer for a maximum of 12 years, the expected maturity period of Falcata. Nursery growing/operation is another income source becoming popular among tree farmers in the Caraga region.

Almost one-third of the TF and NTF-respondents had total annual income at < PhP 5,000.00 (US$ 108.69 at PhP 46.00=US$1.00) (**Table 3**). Income generated by households was below PhP10,000.00 (US$ 217.39). This is lower than the 2015 national and regional annual per capita poverty threshold level at PhP 22,747.00 and PhP 22,788.00, respectively (*PSA 2018*). This means that annual income is not sufficient for a family with five household members. Only a few (12.84 % and 8.45 % of TF and NTF, respectively) had a total annual household income greater than PhP110,000.00.

Tree farming is beneficial to both TF and NTF, directly and indirectly. Direct contribution of tree farming includes income generated from sale of lumber (harvest), while indirect contribution refers to income generated from services/ activities related to tree farming such as hiring of carabaos and/or horses for hauling of logs, rent of chainsaw, hiring of chainsaw operator, trading/ vending lumber, labor services, etc. There were 34 NTF that received income from Falcata farming. These NTF earned income through the patubo system.

Based on the FGDs, TF directly benefitted from income derived from harvesting trees. NTF also benefitted from tree farming through their involvement in local economic activities generated by tree farming, such as providing labor in cutting and hauling the harvested timber, timber trading, establishment of small businesses (i.e., sari-sari or convenience store), etc. Thus, the survey incorporates both TF and NTF respondents to have a more comprehensive understanding of the socioeconomic impacts of smallholder tree farming in the region.

Majority of the households engaged in tree farming in Caraga are indeed smallholders. Smallholder tree

Table 2. Annual per capita poverty incidence among families (%).

Region/ Province	Annual per capita poverty incidence among families (%)						
	1991a	2003b	2006a	2009a	2012a	2015c	2018c
Philippines	29.7	20	21	20.50	19.70	18.00	12.10
Caraga	48.5	37.6	41.7	46.00	31.90	31.10	24.10
Agusan del Norte		23.8	38.7	37.30	27.70	25.80	18.90
Agusan del Sur		48.5	46.1	53.80	37.30	37.50	30.60
Surigao Del Norte		42.3	43.7	48.90	33.80	28.80	27.70
Surigao Del Sur		35.8	38	44.10	28.30	32.20	19.20

Note: Annual per capita poverty incidence is the proportion of families with per capita income/expenditure less than the per ca pita poverty threshold to the total number of families (Sources: a) *NSCB 2013*; b)*NSCB 2011*; c) *PSA 2020*)

Table Total annual income of respondents and their households, Caraga Administrative Region, Philippines, 2014.

Total Annual Income (PhP)	Tree Farmer		Non-Tree Farmer	
	Count	Percent	Count	Percent
Respondent (n=686)				
less than or equal to 5,000	156	33.12	71	33.02
6,000 - 10,000	75	15.92	37	17.21
11,000 - 20,000	59	12.53	35	16.28
21,000 - 50,000	64	13.59	29	13.49
51,000 - 100,000	58	12.31	25	11.63
110,000 - 150,000	22	4.67	8	3.72
greater than or equal to 160,000	37	7.86	10	4.65
Average	436	PhP 27,051.87	211	PhP27,730.66
Household (n=708)				
less than or equal to 5,000	115	23.81	48	21.33
6,000 - 10,000	98	20.29	40	17.78
11,000 - 20,000	68	14.08	39	17.33
21,000 - 50,000	76	15.73	46	20.44
51,000 - 100,000	64	13.25	33	14.67
110,000 - 150,000	21	4.35	8	3.56
greater than and equal to 160,000	41	8.49	11	4.89
Average	436	PhP29,457.09	209	PhP31,938.44

farming pertains to household level tree plantation development, including backyard planting, covering an area of less than 5 ha. Data showed that about 61.35% of the PTPOC holders who registered from 2005-2012 had an area of less than 5 ha, followed by those PTPOC-covered tree farms of 5.01-10 ha (28.50%). Registered PTPOC farms covering more than 10 ha accounted for the remaining 10%.

By province, more than one-third of the PTPOC holders with an area below 5 ha came from Agusan del Sur (**Figure 5**). While Surigao del Sur popularized tree plantation, the province ranks second only to Agusan del Sur in terms of households engaged in tree farming and registered as PTPOC holders. This could be due to the number of wood processing plants in Butuan City that sparked up market interest among tree growers in neighboring Agusan del Sur.

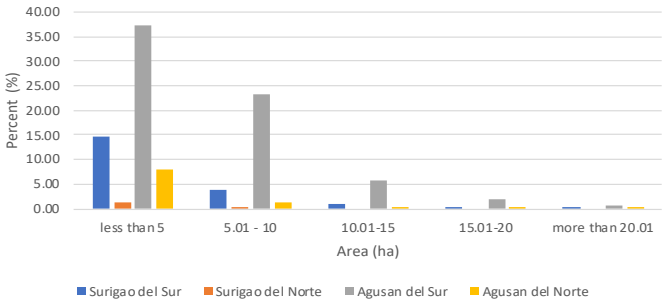


Figure 5. Area coverage (in percent) of plantations registered as PTPOC in 2005-2012.

Impacts of Tree Farming

The rating given by respondents on impacts of tree farming on TF and NTF used the following parameters: livelihood sources, income, forest condition, equity, asset accumulation, education, level of trust, level of reciprocity and level of cohesiveness (**Figures 6 and 7**). Generally, there was an increasing trend on the amount of change on the condition of the different parameters used for the period before tree farming (T1) and right after harvest of tree farms (T2), for both TF and NTF. However, the amount of change in observed parameters between the period of harvesting the tree farms (T2) and 5 years after harvesting (T3) has been uneven - some declined while other did not change.

More specifically, the livelihood sources, income, equity, assets accumulation, level of trust, level of reciprocity and level of cohesiveness of TF have increased between period T1 (before tree farming) and T2 (during harvest of tree farms). There was a variety of livelihood sources a tree farmer can venture during harvest period, not necessarily earned from own farm. Economic spin-offs include rental of carabaos, booming small local businesses such as sari-sari store (convenience store) as people have cash income to buy goods and services, labor service to other farms in hauling and cutting of logs, and others. Consequently, income also increased with the increase in livelihood sources.

Conversely, there is a perceived decline in forest condition due to cutting of tree farm, rendering the area

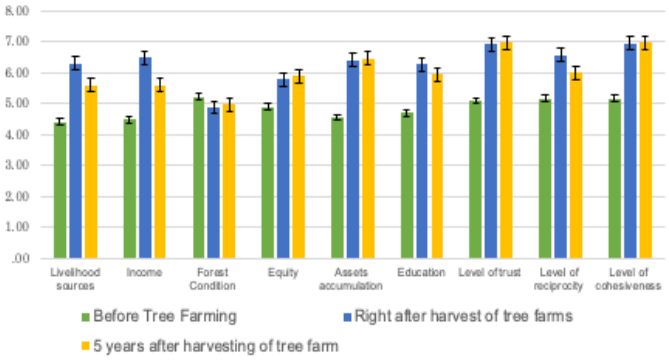


Figure 6. Impacts of tree farming on tree farmers in Caraga Administrative Region, Philippines based on selected indicators of change, 2014.

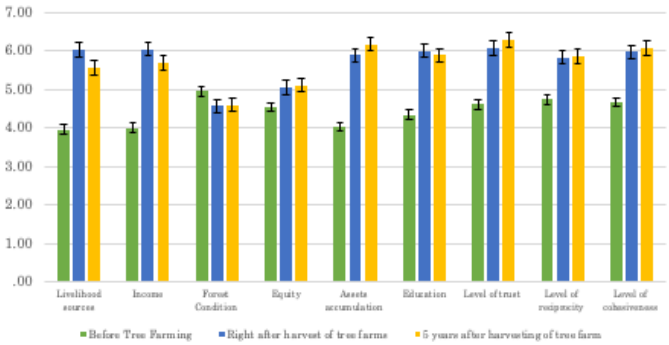


Figure 7. Impacts of tree farming on non-tree farmers in Caraga Administrative Region, Philippines based on selected indicators of change, 2014.

prone to soil erosion with few trees remaining after harvest. For Falcata (*Paraserianthes falcataria*) tree farmers, open spaces brought by harvesting can be regained after a while since Falcata exhibits regeneration ability. Falcata has coppicing ability also that enables re-growth after harvest. Good quality harvest of Falcata is up to three rotation of its coppice. Otherwise, the logs produced are no longer acceptable to the market.

Equity in tree farming is perceived to increase during and right after harvest time. Tree farmers believed that there is fairness in terms of income generated in tree farming. Others refuted this observation claiming that the richer and powerful middlemen received most of the benefits. Tree farmers are often lured by Purchase Order (PO) holders who can facilitate negotiation between the tree farmers and the Buyer. Oftentimes, PO holders have easy access to pricing information, thus, control the price of logs relayed to tree farmers. This arrangement also holds true in the Ecuadorian Amazon (*Mejia et al. 2015*). For a more organized timber extraction, smallholder colonists in Iturralde in Northern La Paz, Bolivia are highly dependent on traders (*Pacheco 2012*) for pricing and transport.

Tree farmers' assets accumulate through time after every harvest. Along with the bulk income derived from harvest is the opportunity to buy new appliances, vehicles, repair and building of houses; while others increased their assets through buying another tree farm (**Table 4**). Some have mentioned ease in sending children to school at the collegiate level, thus improving the educational status among children of tree farmers.

The level of trust, reciprocity and cohesiveness have also increased with tree farming. Assurance of income during harvest makes a great collateral for accessing credit facilities, even between and among neighbors, leading to increase in trust among members of the community. In the same manner, reciprocity in terms of disseminating or sharing knowledge and skills relevant to tree farming is already evident among tree farmers. This is in contrast to *Boulay's et al.* (*2013*) findings where inequalities in accessing new knowledge were kept unchallenged by tree farmers within the community to avoid conflicts and problems. The farmers have accepted the reality that access to new information favored the big landowners. Thus, tree farming for smallholders did not improve access to new knowledge.

There are differences (**Figure 7**) among the levels of change in selected indicators for the period 5 years after harvest (T3) reckoned from the time of harvesting (T2). Many believed that forest condition, equity and assets accumulation have slightly increased; livelihood sources, income, education and level of reciprocity declined; while level of trust and cohesiveness did not change. Improvement in forest condition is attributed to the growing time of tree farms and the expansion of tree farms as tree farmers invest into another parcel during last harvest. Livelihood sources and income decreased during this period mainly because of the bulk income and livelihood sources associated with harvest period.

Non-tree farmers benefitted from tree farming as well (**Figure 7**). The perception of NTF on the impacts of tree farming pertains to their own personal experience combined with their observation on the over-all community improvement. Condition of the different indicators of change has likewise increased from before tree farming (T1) to during or right after harvest of tree farms (T2). Among the conditions perceived to increase are livelihood sources, income, equity, assets, education, level of trust, reciprocity and cohesiveness. Only forest condition is perceived to have declined during harvest, mainly because of the process of harvesting where trees are felled and huge void is left. Livelihood diversification is common, from provision of labor services to tree harvesting activities like in hauling, cutting, etc., to small

Table 4. Key characteristics of the tree farming as experienced by selected key informants in Caraga Administrative Region, Philippines, 2014.

Key Informant Code	Key Characteristics of Tree Farming Experience
Mr. A	He is a 33-year old forester and a government employee whose interest in tree farming started in his college years. He oversees the family's tree farm established in 2006-2009. Amazed at the PhP 319,000.00 net income generated by his parents from sale of 4 truckloads of Falcata during the first harvest, he was motivated to establish his own plantation. At present, the income he earned from the 8.5-ha tree plantation that he maintains is being used to acquire more farmlands. His success motivates neighbors to start their own tree farming venture.
Mr. B	He is a 58-year old tree farmer and former PICOP employee, operated a 15-ha Falcata plantation which generated a net income of P100,000.00 per truckload of harvest. He maintained a tree nursery and paid laborers to produce the planting stocks. The Falcata nursery generates an additional net income of PhP 25,200.00
Mr. C.	He is a smallholder tree farmer and a father of 9, planted his 2-ha farm with Falcata. In 2011, due to his wife's sickness and huge hospital bills, he was compelled to sell to a PO holder his 9-year old 300 Falcata trees for PhP 80,000.00 only, which at that time was just a fifth of the market value of the trees.
Spouses A	They are CBFM-PO members with 2.5-ha Falcata plantation intercropped with various fruit trees. Falcata enabled them to generate a net income of PhP 90,000.00 which they placed in "patubo" system in their community.

enterprise development such as sari-sari store. All these led to increased income level during harvest period. Meanwhile, the same condition experienced by TF is also observed by NTF for the period between T2 and T3. Livelihood sources and income declined, while equity, trust and cohesiveness increased.

Comparison on the indicators of change in tree farming

In general, almost one-third of the responses on the condition of the parameters between NTF and TF was not significant at 0.05 level of confidence (**Table 5**). Condition of livelihood sources, asset accumulation and education were not significant at 0.05 level between NTF and TF for periods T2 and T3. Income for both TF and NTF is significant at 0.05 level for periods T1 and T2, but not for T3. Meanwhile, the responses on forest condition for periods T1 and T2 was not significant at 0.05 level, mainly because there was no variation in the responses of NTF and TF. Conversely, there was a significant level of forest condition in period T3 among NTF and TF. There was no variation of responses on the condition of equity concerns for period T1. Level of trust, reciprocity and cohesiveness was consistently significant in three periods among NTF and TF.

Income change occurred but was not sustained; hence, it became insignificant at T3. Earlier economic benefits no longer wield a significant influence on tree and non-tree farmers' decision as years passed after the last harvest. Five years could mean that the positive effects have been blurred because income change was not very high or that the benefits like cash income has been used up five years after the trees have been harvested.

Generally, there was a significantly positive high level of change in the different indicators between period T1 (before tree farming) and T2 (during harvest of tree farms). Meanwhile, a decreasing trend in the level of change is evident between periods T2 (during harvest of tree farms) and T3 (5 years after harvest), particularly for livelihood sources, income and education (**Table 6**). Change in other indicators between these periods was also minimal as compared to periods T1 and T2. This is expected because the lump sum accrual of income is generated during harvest and hardly distributed across the years. Therefore, sustainability of income from tree farming after 5 years is crucial to enhancing livelihood assets.

According to the key informants, income can reach as high as PhP 1.2M for at least 200 trees at age 12. However, for smallholder tree farmers, this is barely attained due to early harvesting by some at the age of 3 or to engage in patubo system during contingency situations (pay for hospitalization bills, buy medicines, education of children in college, and the like). Early harvest of Falcata before the trees reach maturity (at age 7-12 years) renders tree farmers at the losing end. The farmers can hardly bargain for a good price of the trees which at age 3 remains at pulp level, implying very low price and demand.

Tree farms also served as "savings in a bank" for capital formation, which farmers can eventually withdraw every time they needed the money, usually by selling a couple of trees to resolve immediate cash needs. Others

Table 5. Result of two-tailed t-test comparing condition of selected parameters between tree farmers and non-tree farmers in Caraga Administrative Region, Philippines in different periods, 2014.

Indicators	T1		T2		T3	
	NTF	TF	NTF	TF	NTF	TF
Livelihood sources	3.95	4.41	*6.02*	*6.30*	*5.56*	*5.59*
Income	4.00	4.47	6.04	6.47	*5.69*	*5.60*
Forest Condition	*4.94*	*5.20*	*4.56*	*4.87*	4.59	4.96
Equity	*4.54*	*4.90*	5.04	5.78	5.10	5.88
Asset accumulation	4.02	4.55	*5.88*	*6.40*	*6.16*	*6.46*
Education	4.34	4.70	*5.99*	*6.27*	*5.88*	*5.93*
Level of trust	4.61	5.09	6.07	6.91	6.27	6.95
Level of reciprocity	4.73	5.16	5.82	6.56	5.85	6.00
Level of cohesiveness	4.66	5.15	5.96	6.94	6.07	6.95

Note: TF- tree farmer; NTF- non tree farmer; T1- before tree farming; T2- right after harvest of tree farms; T3- 5 years after harvest; not significant at p-value > 0.05

use the income derived from tree farming to expand their small businesses (**Table 4**). Asset accumulation was observed among TF, especially for the average income earners and the rich growers. In Agusan del Sur and Surigao del Sur, tree farming is encouraged by the local government units (LGUs) as this has become an important income source for the provinces through the collection of environmental tax and certification fee from the tree farmers undergoing harvesting and transport.

Tree farming's impact on forest condition centers on natural expansion of forests. Focus on maintaning Falcata farms generated less pressure on the natural forest nearby, leading to the expansion of the latter. Tree farming kept farmers busy with their enterprise resulting in less conversion of forestlands into agricultural production areas, avoiding the extraction of vegetative cover in steep areas. But as practiced by many tree farmers, the one-time harvesting (clear cut) of most plantations can render the forest area susceptible to soil erosion and landslide.

Sharing of costs and benefits among key stakeholders of tree farming is highly inequitable. Costs are said to be borne by tree farmers while the holders of POs earn much in transactions. Participants of the FGD were compelled to accept the existing norm in log trading where the middleman (PO holders) gains more than the wood producers because the former provides the market link between tree farmers and buyers. Buyers or industrialists find direct trading as cumbersome so they do not negotiate directly with tree farmers. Since PO holders becoming indispensable in log marketing, buyers have a wide elbow in manipulating the price and disposal of logs. Majority of the FGD participants believed that this relationship with PO holders is one-sided and highly disadvantageous to the tree farmers; yet nothing has been done about this norm (**Table 4**).

Sustainable livelihoods and viability of smallholder tree farming

Tree farming has positive impacts on the lives of both tree farmers and non-tree farmers. But the impacts vary in different periods, during harvest and five years right after harvest. Increased income is felt due to bulk income derived from tree harvesting. But this is not sustained through time especially years after the last harvest, where decline in income brings challenges to tree farmers. These challenges include the lack of capital investment needed by tree farmers and knowledge (technology) on improving tree farming practice.

Costs and benefits of tree farming is deemed inequitable. The greater benefits accrue to stakeholders

Table 6. Result of two-tailed t-test on the amount of change (level of impacts) of selected indicators in three periods (T1, T2, T3) of tree farmers and non-tree farmers in Caraga Administrative Region, Philippines, 2014.

Indicators	Non-Tree Farmers			Tree Farmers			Both		
	T2-T1	T3-T2	T3-T1	T2-T1	T3-T2	T3-T1	T2-T1	T3-T2	T3-T1
Livelihood sources	2.07**	-0.46*	1.61**	1.89**	-0.71**	1.18**	1.93**	-0.66**	1.27**
Income	2.04**	-0.35*	1.69**	2.00**	-0.87**	1.13**	2.01**	-0.76**	1.25**
Forest Condition	-0.38**	0.03*	-0.35**	-.33**	0.09**	-0.24**	-.34**	0.08**	-0.27**
Equity	.50**	0.06	0.56**	.88**	0.10*	0.98**	.79**	0.09**	0.88**
Assets accumulation	1.86**	0.28**	2.14**	1.85**	0.06	1.91**	1.85**	0.10	1.96**
Education	1.65**	-0.11	1.54**	1.57**	-0.34**	1.23**	1.58**	-0.28**	1.29**
Level of trust	1.46**	0.20*	1.66**	1.82**	0.04	1.86**	1.73**	0.08*	1.82**
Level of reciprocity	1.09**	0.03	1.12**	1.40**	-0.56*	0.84**	1.33**	0.03*	1.36**
Level of cohesiveness	1.30**	0.11	1.41**	1.79**	0.01	1.80**	1.67**	0.04*	1.71**

* Significant at $\alpha = 0.05$, ** Significant at $\alpha = 0.001$

with external economic interests such as the middlemen, holders of purchase orders (PO) and traders, while the smallholder tree farmers bear much of the costs. Although financial income is also enjoyed by tree farmers, this is minimal as compared to the income derived by other stakeholders who have entered into the marketing stage of the tree farm. All the economic benefits derived by tree farmers are not enough to lift them out of poverty. The poorer farmers, constantly dogged by immediate needs for cash to support the family, would normally enter into a disproportionate arrangement. In cases where the income derived has been used up to pay for medicines and hospitalization bills, the tree farmer becomes poor again and this cycle repeats over time (**Table 4**).

CONCLUSIONS AND RECOMMENDATIONS

The Philippines' degraded forest landscape has already been through massive reforestation, rehabilitation and spontaneous tree growing even at the farm level. The PICOP experience led to the spread of smallholder tree farming in CAR. It has proven its success in the 1980s but was not sustained due to many challenges. The smallholder tree farmers appear to remain poor and marginalized and many have remained within the poverty line despite sporadic slight increase in income during tree harvesting.

Socioeconomically, tree farming has benefited both tree farmers and non-tree farmers alike, directly and indirectly. Positive and statistically significant changes perceived by tree farmers are on livelihood sources, income, equity, asset accumulation, education, level of trust, level of reciprocity and level of cohesiveness in the community.

Poor tree farmers did not capture as much economic benefits as other stakeholders with economic interest, such as the middlemen, traders, purchase order (PO) holders and some non-tree farmers. Lack of capital investment in tree farming led smallholders to accommodate unfavorable arrangements. Despite the inequity that smallholders experienced, tree farming remains to be perceived as the most viable enterprise to get them out of the poverty trap.

Caraga Administrative Region's timber corridor distinction has to be improved, not only by producing the needed supply of planted timber but also by addressing the issues and challenges of the smallholder tree farmers to improve their total welfare. Inequity and social justice demand that the national and local government must revert back to the people the taxes and fees paid through various forms of support. Tree farming is people's initiative, and this has largely made significant improvement in the natural forest's condition. To sustain this practice, appropriate policies and programs must be put in place to alleviate poverty. Policies must streamline tree farm registration, support investment in market diversification and vertical integration of tree products and institutionalize a comprehensive extension program specifically directed to poor smallholder tree farmers. To be effective, this extension program should be need-oriented and provides appropriate and timely technical, financial and marketing assistance including critical information on prices of different products.

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