

Distribution, mapping, sustainable harvesting and marketing of laurel leaves (*Cinnamomum mindanaense* Elmer) in Boljoon, Cebu, Philippines

Hemres M. Albuero^{1*}, Rosalyn P. Albuero¹, Mario F. Gabucan¹ and Cesilo Albiso²

ABSTRACT

Cinnamons are popularly known as spice and flavoring to many foods. In the Philippines, laurel leaves (*Cinnamomum mindanaense*) are commonly used as spice to many Filipino dishes. In Cebu, *C. mindanaense* abundantly grows in San Antonio, Boljoon, where the community harvests and trades leaves for decades. An inventory of *C. mindanaense* was made to establish baseline data on the number of trees per diameter classes. A survey on knowledge, harvesting and marketing of *C. mindanaense* was also conducted. Trees by diameter class were mapped using ArcMap 10.5. A total of 5332 trees were inventoried and grouped into five diameter classes namely 10cm and below, 11-20cm, 21-30cm, 31-40cm and above 40cm. Results show that trees are generally small and growing on limestone areas both within Alienable and Disposable lands and timberland areas. Ninety-two percent or 4918 trees have diameter of 20cm or less. Leaves are harvested mostly by cutting all branches especially during dry season. Harvesting is generally made once a year. Over mature leaves tend to reduce quality due to disease and insect damage. Cut branches are sundried for 3 days then leaves are removed and traded to middlemen in the village at P10-15 per kilo or in Cebu City at P20-25/kg. Average harvest of farmers is 8 sacks per year with 20-25kg/sack. Income derived from cinnamons is only secondary. Development of products from the branches left or from the dried laurel leaves may be explored to enhance community livelihood and increase economic potential of the species.

Keywords: spice trees, cinnamon, non-timber forest products, sustainable harvesting

INTRODUCTION

Cinnamons are group of trees belonging to family Lauraceae. Worldwide, there are about 250 species of cinnamons (Krishnamoorthy et al 1999, Rao & Gan 2014) while in the Philippines, there are 23 species (Pelser 2015, Soriano 2015). They are

¹ Cebu Technological University – Argao Campus, Cebu, Philippines

² Department of Environment and Natural Resources, Region 7, Cebu City, Philippines

*Corresponding Author. Address: Cebu Technological University – Argao Campus, Cebu, Philippines; e-mail: hemres.albuero@ctu.edu.ph
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hardy plants that grow even in areas with poor soil fertility from sea level to 1000masl (Anandaraj et al 2005). Cinnamons are found in Sri Lanka, India, China, Indonesia, Malaysia, Madagascar, Seychelles, Philippines and other countries. They are popularly used worldwide as spice (Jakhietia et al 2010, Pandit et al nd, Sampath & Atapattu 2013, Stuart Jr 2016), medicine (Hlebowicz et al 2007, Jakhietia et al 2010, Natalie H 2015, Rao & Gan 2014) or flavoring of many food and condiments (Heli 2014). Cinnamon oils are obtained by distilling dried bark and leaves (Anadaraj et al 2005, Azam-Ali 2007). Oils are used in many products like soaps, toothpaste, perfumes, face creams, and hair oils as well as in flavoring liquors (Anadaraj et al 2005). Cinnamon powder is more readily available in the market, although generally, processed cinnamons are more expensive as it entails 60% of the cost of production (Azam-Ali 2007). As medicine, Cinnamon has been popularly known to help reduce blood sugar (BfR 2006, Jakhietia et al 2010, Khaki et al 2014, Safdar et al 2004) although caution must also be taken into consideration as coumarin that is present especially in *C. cassia* can cause damage in the liver and cinnamaldehyde was also found to have negative effects to pregnant women (BfR 2006).

Laurel (*Cinnamomum mindanaense*) is one of the 23 species of cinnamons found in the Philippines (Soriano 2015 & Pelser 2015). It is probably the most aromatic cinnamon species in the Philippines, which is comparable to *Cinnamomum cassia* of China and *Cinnamomum zeylanicum* of Sri Lanka and India. Laurel is popularly used as spice in many Filipino dishes. Though bark is aromatically sweet, the leaves are the commonly harvested and used in cooking.

In the Philippines, no commercial bark harvesting is yet being done. Along with this study, the Forest Product Research Development Institute of the Department of Science and Technology (FPRDI-DOST) is implementing a bark harvesting study on some Cinnamon species. Total import of cinnamon products in 2011 was at 29,000kg while export was at 6,000kg (Araral 2015).

While harvesting and selling of Cinnamons had been studied in other countries, harvesting and marketing coupled with inventory and providing distribution status of *C. mindanaense*, particularly in Cebu has not yet been documented, hence this study.

MATERIALS AND METHODS

The Study Area

The study was conducted in the town of Boljoon, Cebu, Central Philippines, specifically in the village (locally known as barangay) of San Antonio located at coordinates 9°40'26.97"N and 123°24'46.19"E. (Figure 1). Boljoon is a 5th Class town, which lies 103km southeast of the capital Cebu City. The town is generally mountainous with soils that are generally limestone type. Some of its forests form part of the Nug-as forest in Alcoy, although politically it is part of the town of Boljoon. San Antonio is one of the 10 villages of Boljoon. The village was selected for this study because it has natural stands of *C. mindanaense*, something that is unique to the village, as the species is not found in the adjacent village of Beceril although some trees are found in the other adjacent village of Nangka. Unlike the forest in Nug-as that is intact, vegetation in San Antonio is highly fragmented, with

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vast areas devoid with trees. In fact the village is a host to the government's National Greening Program (NGP), which began in 2010. San Antonio is approximately 15km from the town proper, however it has access roads, which open the place for motorcycle or four-wheeled vehicle as means of transportation. The village has both timberland areas and alienable and disposable lands. The former is a public land and cannot be titled although the Department of Environment and Natural Resources (DENR) issues tenurial instrument to qualified occupants under the Integrated Social Forestry Program (ISFP) while the latter are parcels of lands which can be titled and owned privately. The main livelihood of the village is farming. Generally, farmers grow corn, sweet potato and vegetables like tomatoes, pepper, eggplant, beans and many others.

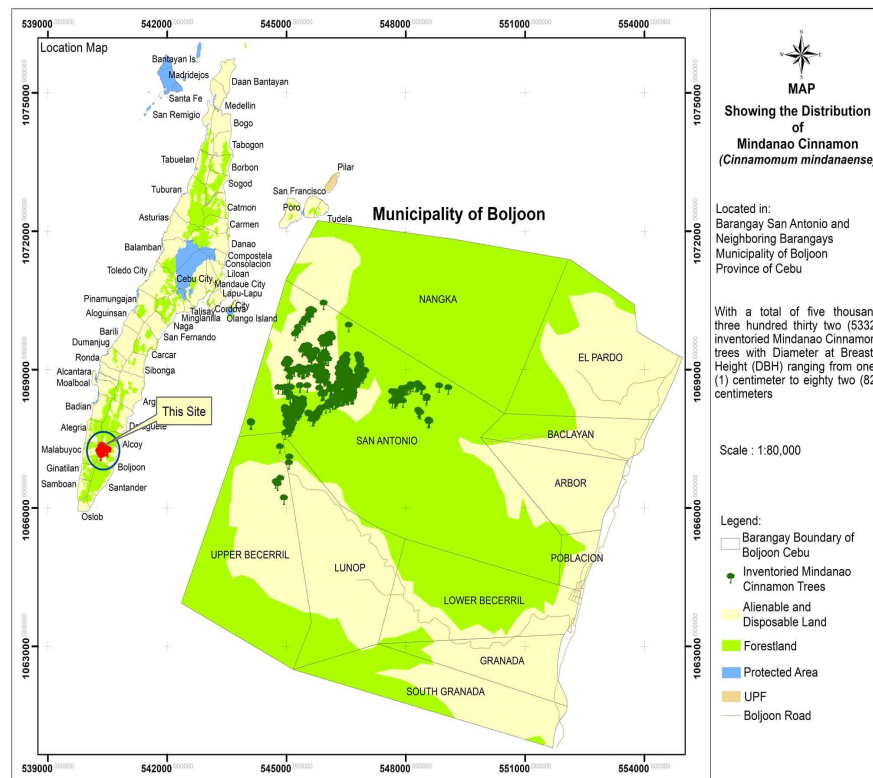


Figure 1. The study area

Inventory of Cinnamomum mindanaense

We used purposive random sampling in the inventory of *C. mindanaense* to record as many individual trees as possible. Inventory was made in June and from October to November 2016. Each *C. mindanaense* was tied with a ribbon to avoid double counting. To verify information on sustainable harvesting techniques, trees harvested were also observed how cutting or harvesting was done. For every *C. mindanaense* inventoried, the following data or measurements were taken namely diameter at breast height (dbh), total height, crown diameter and other relevant

information whether or not cinnamon trees were fruiting, flowering, harvested, etc. Ground coordinates were also recorded for each cinnamon tree to be used in mapping out spatial distribution. ArcMap 10.5 was used in mapping the distribution of cinnamons. Separate maps were made for all cinnamons trees and for every diameter class for better comparison. Ground coordinates of *C. mindanaense* with diameters of over 20cm are geo-referenced after Ramos et al (2012) for future use.

Survey on Knowledge, Harvesting Techniques and Marketing of *C. mindanaense*

A survey on the knowledge, harvesting techniques and marketing of *C. mindanaense* was made using Snowball Sampling or Respondent-Driven Sampling (RDS) (Heckathorn 2011) from June 13-18, 2016. Twenty-one respondents with 13 males and 8 females were interviewed using an interview schedule. Each respondent was harvesting and selling cinnamon leaves. Frequencies and percentage were used to analyze the data.

RESULTS AND DISCUSSION

Distribution and Mapping of Cinnamomum mindanaense

Cinnamomum mindanaense were found growing abundantly in the village of San Antonio. Most of them are growing naturally although some respondents claim that in sitio (portion of the village) Lapaw, some trees were planted. Some farmers allow cinnamons to grow in their farms while others cut them due to their shallow and extensive taproot system, which makes it difficult for farmers to plow the field.

A total of 5332 individual trees were inventoried from June to November 2016. Trees were observed growing both on timber land areas and alienable and disposable (A and D) lands, in spite the soil is generally limestone and have poor fertility. Anandaraj et al (2005) however reported that cinnamons grow even in sites with poor fertility. Soil fertility and periodic harvesting of cinnamons in San Antonio could be two influencing factors why cinnamons have not grown big. In terms of diameter class 2646 or roughly 50% of the 5332 cinnamons inventoried have diameters of 10cm or less, 2272 or 42% have diameters ranging from 11-20cm, while just a little over 400 trees (barely 8%) have diameters of over 20cm.

Spatial distribution of *C. mindanaense* is more or less random especially with larger trees (above 20cm diameter) however smaller ones tend to show clumping or aggregated (Figure 2). Clumping of regenerations generally results when species have limited seed dispersal ability (Zhang et al 2015). Similarly, species like cinnamons, which bear berry fruits and is commonly dispersed by animals, also exhibits clumping (Clark et al 1998). It was known from our interviews that *C. mindanaense* is commonly eaten and dispersed by birds particularly the Philippine bulbul (*Ixus pilipinus*) and Asian glossy starling (*Aplonys panayensis*). Moreover, the absence of wings or other superficial structure in the seeds or fruits of cinnamon makes it difficult to be well dispersed at far distance from the mother tree (Clark et al 1998).

Mean heights of *C. mindanaense* across diameter classes (>10cm dia.) range from 10 to about 13 meters. These measurements seem to be similar to heights that cinnamons attain base on the report of Anandaraj (2005).

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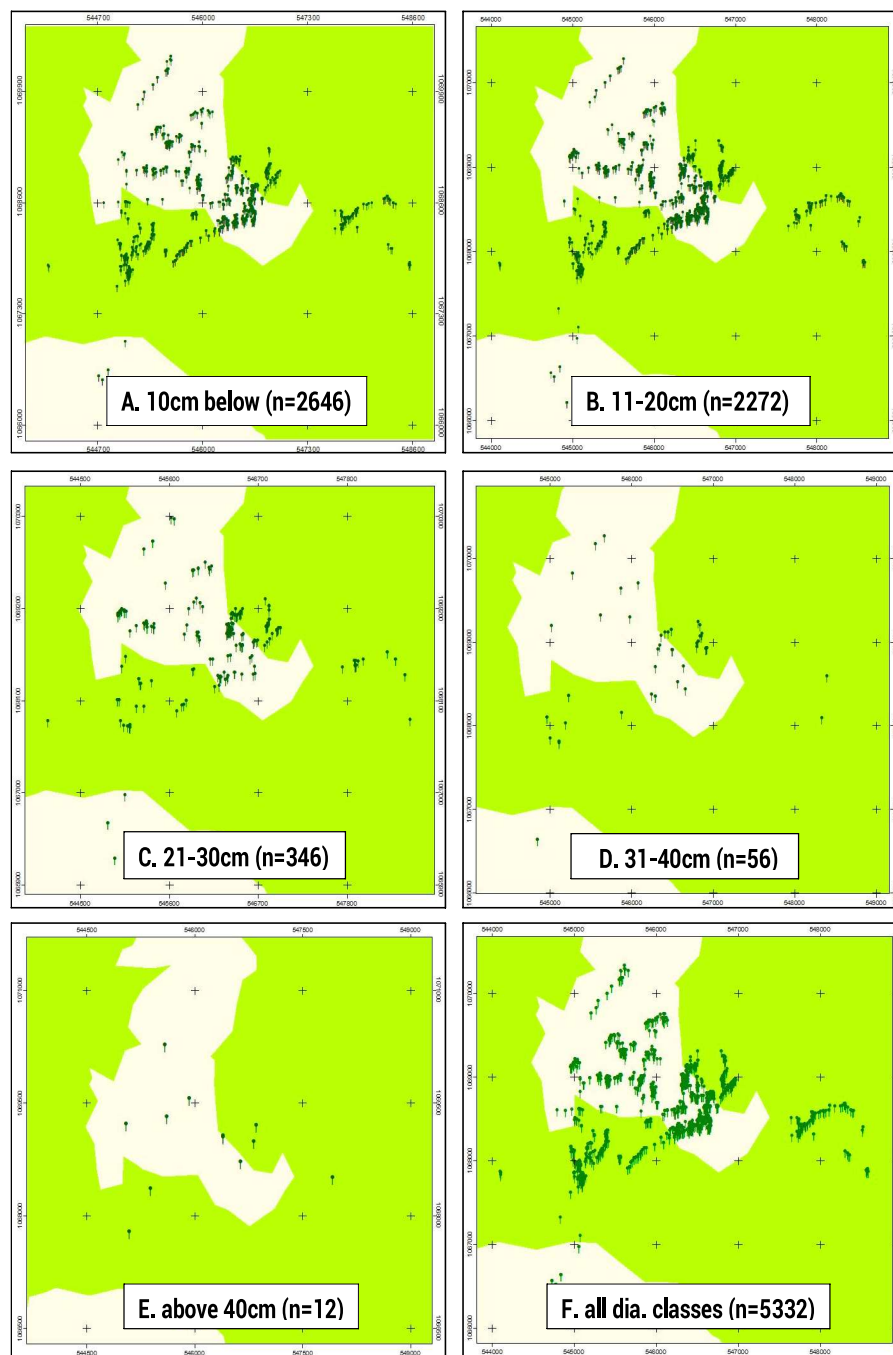


Figure 2. Distribution of *C. mindanaense* in San Antonio, Boljoon by diameter class (green shade = timberland area; light shade = alienable and disposable land); and green spots = *C. mindanaense* trees

Table 1. Number of Laurel trees (*C. mindanaense*) by diameter classes

Diameter class (cm)	No. of trees	With signs of harvesting	Without signs of harvesting	W/lianas/ climbing bamboo	Presence of scar	Flowering	Fruiting	Average Height (m)	Ave. Crown Dia. (m)
10 below	2646	969	1677	939	1012	606	743	7.91	2.57
11-20	2272	1049	1223	988	1128	561	940	10.22	3.62
21-30	346	146	200	165	155	81	170	11.68	4.65
31-40	56	26	30	24	24	14	23	12.36	5.34
above 40	12	6	6	5	5	2	2	12.82	4.44
Total	5332	2196	3136	2121	2324	1264	1878		

Note: Some trees bear both fruits and flowers at the same time while crown diameters of some trees remain small due to periodic harvesting.

Knowledge, Sustainable Harvesting and Marketing *C. mindanaense*

All respondents knew only *C. mindanaense* locally called as "mana" except for one who also knew about Cebu cinnamon (*Cinnamomum cebuense*). This appears to be interesting because not too far San Antonio is the Nug-as forest where the highest remaining population of the threatened cinnamon remains. The absence of Cebu cinnamon in our inventory sites across San Antonio probably justifies why the respondents are generally not familiar about it. All respondents knew that *C. mindanaense* is used as spice in fact all of them have used it in cooking some food for the household. With long experience of harvesting *C. mindanaense*, 9 respondents shared that trees generally flower and bear fruit after summer or during the rainy season while 6 others gave specific months between June and October. Our observations in field however showed that mother trees are very prolific with numerous flowers still developing while fruits have already developed unlike the Cebu cinnamon where seed off year is very pronounced.

In terms of harvesting, 81% of respondents harvest cinnamons once a year (Figure 3). Specifically, only leaves are harvested unlike in other countries where bark harvesting is practiced like in Sri Lanka and India (Anandaraj et al 2005), and Nepal (Pandit et al nd). The frequency of harvesting gives enough time for cinnamon trees to recover. Moreover, respondents said that older leaves are better and more aromatic than younger ones. Contrastingly however, respondents noticed that allowing the leaves to mature for more than two years would reduce its quality because of insect and disease damage. Leaf spots usually appear on shaded older leaves similar to observations made by Rajapakse and Wasantha Kumara (2007).

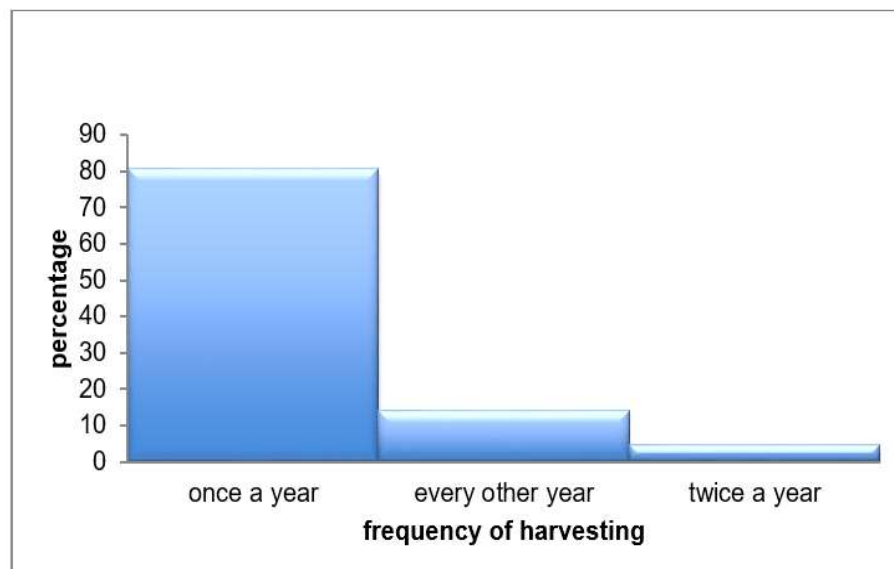


Figure 3. Frequency of harvesting *C. mindanaense*

Farmers harvest cinnamons by cutting up to arm-sized branches from the mother tree. All respondents practiced pollarding or cutting of all branches at the top every time they harvest, with a height of cut ranging from 1.5 to 5m depending on tree size. Two of them however, sometimes alternately harvest the top branches and side branches each year to ensure that the tree will not die (Figure 4). While the latter appears to be more sustainable, our field observations showed that either method is sustainable because trees are surviving for many years of periodic harvesting. Interview of respondents revealed that harvesting of cinnamons in their village begun in the 1960s and until today they never run out of cinnamon trees. Considering both methods, 41% of the trees inventoried exhibited signs of harvesting, which shows that it is still possible to increase their production.

During harvesting, larger branches are removed while leaves on the twigs are sun dried for 3-5 days. Harvesting is done year round though farmers prefer it on dry periods especially when it is not ideal period to work in their farm. Harvesting during the dry periods makes it convenient for farmers to sundry and prevents molds from developing on the leaves (Pandit et al nd). After drying, leaves are removed and placed in sacks ready for marketing. In some cases, dried leaves and twigs are placed and temporarily stocked inside a hut before selling.

One-third (33%) of the respondents solely harvest cinnamons naturally growing in the forest areas while about 62% or 13 harvest both naturally growing and planted trees. They plant cinnamons near their houses or at the edge of their farms using wildlings. For planted cinnamons, farmers start harvesting five years after planting and then succeeding harvests are made yearly or every other year. For cinnamons that are naturally growing in timberland areas, anybody who wishes to harvest can cut. A group of respondents during the interview shared that since the government owns timberland areas, anyone can harvest the cinnamons.

While there is no control set by the government on the harvesting of cinnamons in timberland areas like that in Nepal (Pandit et al nd), no conflict has ever happened between those who harvest cinnamons in San Antonio. It has been observed that farmers who are harvesting cinnamons respect each other to avoid conflicts to happen.

Since San Antonio farmers had been into harvesting and trading of dried cinnamon leaves for decades (since 1960's), marketing styles have also evolved over time. Many years back (ca 1985), when no farm-to-market roads were constructed yet, farmers had to walk on trails for 5-6 hours carrying sacks of dried cinnamon leaves to sell in the adjacent town of Alegria at P8 per kilo. Later developments in the mountain villages resulted to the creation of a landing area for vegetables in the nearby village of Nug-as where farmers, middlemen and sellers of vegetables and other goods converged. It was also learned that some farmers in San Antonio sold their dried cinnamon leaves during market days (Wednesdays or Saturdays) in Nug-as to a middleman from Guihulngan town of the neighboring island of Negros.

Since 2005, dried cinnamon leaves were traded in Carbon market in Cebu City. Presently, there are three identified middlemen in the village to whom farmers sell their cinnamons. Majority (85.7%) of respondents sell their harvested cinnamons to the three identified middlemen in the village while the remaining respondents sell their cinnamons to two identified middlemen in Carbon market in Cebu City. These middlemen in Cebu City are also the buyers of the middlemen in the barangay, who distribute to other resellers and consumers. Farmers either manually transports their cinnamons to local buyers in the barangay or sometimes through single motorcycle (habal-habal). Cost of transportation varies from P1.00 to P1.50 per kilo depending on the distance. On the other hand, those who sell cinnamons to Cebu City transport their commodities on trucks that periodically deliver vegetables. Transportation cost is usually P2.00 per kilo. Buying price of cinnamon leaves in San Antonio range from P10-15 while in Cebu City it range from P20-25. Average harvest of the respondents each year is 8 sacks (L=1; H=30) with estimated weight per sack of 20-25kg.

Trading of cinnamon leaves in San Antonio is not really a substantial economic activity of the village unlike that reported by Pandit et al (nd) in Nepal where income generated from collecting or harvesting cinnamon provides better earnings than those who work as part time laborers. Trading cinnamon in San Antonio is only a secondary source of livelihood to some farmers especially during off-season in the farm. Although it is not a significant income provider to many households, somehow the business is providing benefit to a few households, meeting the demands of Filipinos in cooking various dishes. Moreover, one thing is clear in the scenario, which is similar to what has been found out by Pandit et al (nd), that middlemen earns more in the business rather than the farmers or the collectors of cinnamon. In the context of generating income from cinnamons, it is important to find a way to improve or develop certain products from the leaves or bark of cinnamon branches being harvested to help the community augment their income from cinnamon in the community. Extracting of barks from harvested branches maybe explored as they are possibly in similar sizes of 1.5-2cm in diameter as reported by Anandaraj (nd) where coppice are harvested for both leaves and bark. Anandaraj (nd) also reported that coppice can be harvested in about 4 years for leaves and bark extraction.

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Figure 4. Cutting of all branches during harvesting (left), partial cutting - only side branches are cut upon harvesting (middle), and dried Cinnamon leaves (right)

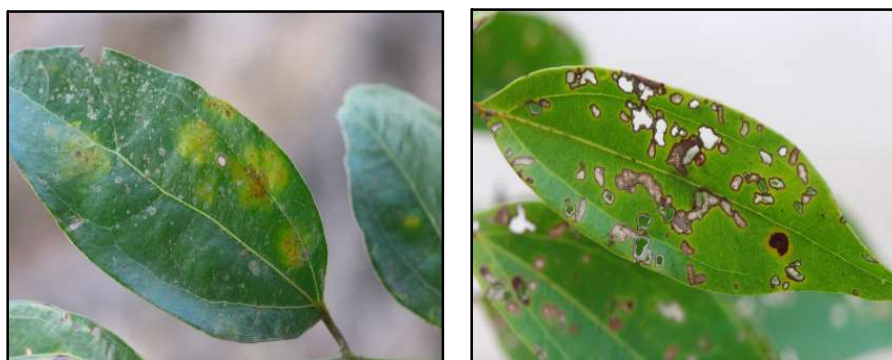


Figure 5. Leaf spot usually attacking older leaves (left) and holes left on younger leaves caused by insects (right)

CONCLUSION AND RECOMMENDATION

Cinnamomum mindanense abundantly grows in San Antonio, Boljoon, Cebu, Central Philippines to about 13m in height. A total of 5332 trees were inventoried and distributed in 6 diameter classes. Most trees have dbh of 20cm or less. Small trees tend to exhibit clumping while larger trees (>20cm dia.) are randomly distributed. Farmers harvest the species sustainably for decades since the 1960s. Inventory data shows that 41% of the trees exhibit signs of harvesting. Farmers are harvesting cinnamons once or every other year by cutting all branches or side branches. Leaves are sun dried for 3-5 days and sold to middlemen in the village or directly in Carbon market. Although the income generated by farmers from harvesting and selling cinnamons is not substantial, the supply coming from San

Antonio answers the consumers' demand for the commodity. This study opens a possibility of developing the market potential of *C. mindanaense* by developing certain product from its leaves or from the barks of larger branches cut during harvesting.

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REFERENCES

- Anandaraj M, Devasahayam S, Krishnamoorthy B, Mathew PA & Rema J. 2005. Cinnamon (Extension Pamphlet). In Rajeev P & Dinesh R (eds). VA Parthasarathy, Director, Indian Institute of Spices Research. Printers Castle, Kochi.
- Araral RK. 2015. DOST-FPRDI Helps in Cinnamon Conservation. www.dost.gov.ph accessed July 23, 2015.
- Azam-Ali S. 2007. Cinnamon processing: Practical action. The Schumacher Center, Bourton-on-Dunsmore, Rugby, Warwickshire, CV23 9QZ, United Kingdom.
- BFR. 2006. High daily intakes of cinnamon: Health risk cannot be ruled out. BfR Health Assessment No. 044/2006. 18 August 2006.
- Clark JS, Macklin E & WOOD L. 1998. Stages and spatial scales of recruitment limitation in Southern Appalachian Forest. *Ecological Monographs*, 68:213-325.
- Heckathorn DD. 2011. Comment: Snowball versus respondent-driven sampling. *Sociological Methodology*, Washington 41:355-XI.
- Heli JR. 2014. Cinnamon. Pennington Nutrition Series. Pub. No. 40. Pennington Biomedical Research Center. 6400 Perkins Rd., Baton Rouge, LA 70808.
- Hlebowicz J, Darwiche G, Bjorgell O & Almer LO. 2007. Effect of cinnamon on postprandial blood glucose, gastric emptying, and safety in healthy subjects. *American J of Clinical Nutrition*, 85(6):1552-1556.
- Jakheta V, Patel R, Khatri P, Pahuja N, Garg S, Pandey A & Sharma S. 2010. Cinnamon: A pharmacological review. *J of Advance Science Research*, 1(2):19-23.
- Khaki A, Khaki AA, Hajhiseini L, Golzar FS & Ainehchi N. 2014. The Anti-oxidant of ginger and cinnamon on spermatogenesis dysfunction of diabetes rats. *African J of Traditional Complementary Alternative Medicine*, 11(4):1-8. doi.org/10.4314/ajtcam.v11i4.1
- Krishnamoorthy B, Rema J & Mathew PA. 1999. Tree Spices. In Sasikumar B et al (eds), *Proceedings of the Golden Jubilee National Symposium on Spices, Medicinal, and Aromatic Plants: Biodiversity, Conservation and Utilization, Calicut, 10-12 Aug 1998* (pp121-130). Indian Institute of Spices.
- Natalie H. 2015. 20 Reasons why we should use cinnamon everyday. Available at https://www.naturalnews.com/041216_cinnamon_ginger_healthy_spices.ht

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- Pandit BH, Thapa GB & Zoerbisch M. nd. Promoting Marketing of Cinnamon Tree Products in Palpa District of Nepal. Available at <http://cares.vnu.edu.vn/webp lus/attachments/21f42b882354149a2a03f1230818c9e3-013.pdf>
- Pelser PB. 2015. *Cinnamomum Schaeff (Lauraceae)*. Co's Digital Flora of the Philippines. Available at philippineplants.org.
- Ramos LT, Torres AM, Pulhin FB and Lasco RD. 2012. Developing a Georeferenced of Selected Threatened Forest Tree Species in the Philippines. *Philippine J Science*, 141(2):165-177.
- Rajapakse RHS and Wasantha Kumara KL. 2007. A Review of Identification and Management of Pest and Diseases of Cinnamon (*Cinnamomum zeylanicum* Blume). *Tropical Agricultural Research & Extension*, 10.
- Rao PV and Gan SH. 2014. Cinnamon: A multifaceted medicinal plant. *Evidence-Based Complementary and Alternative Medicine*. doi: 10.1155/2014/642942
- Safdar M, Khan A, Khattak MMAK & Siddique M. 2004. Effect of Various Doses of Cinnamon on Blood Glucose in Diabetic Individuals. *Pakistan J Nutrition*, 3(5):268-272.
- Sampath HKR and Atapattu NSBM. 2013. Effects of Cinnamon (*Cinnamomum zeylanicum*) Bark Powder of Growth Performance, Carcass Fat and Serum Cholesterol Levels of Broiler Chicken. In *Proceedings of the Third International Symposium*, SEUSL: 6-7 July 2013, Oluvil, Sri Lanka.
- Sorian GC. 2014. A Review on the Ethnobotanical and Pharmacological Properties of Cinnamon. Special Problem, De La Salle University, Manila.
- Stuart JR, GU. 2016. Kaliñgag (*Cinnamomum mercadoi*, S. Vidal). *Philippine Medicinal Plants*. Available at <http://www.stuartxchange.org/Kalingag.html>
- Zhang M, Kang X, Meng J & Zhang L. 2015. Distribution Patterns and Associations of Dominant Tree Species in a Mixed Coniferous-Broadleaf Forest in the Changbai Mountains. *J Mountain Science*, 12(3):659-670.