FPRDI-ITTO PROJECT PD 15/96 Rev. 2(M,I)

Study No. 1

RESOURCE SURVEY AND INVENTORY OF IMPORTANT NON-WOOD FOREST PRODUCTS (RATTAN, ERECT PALMS, BAMBOO, PANDAN AND FOREST VINES) AND ASSESSMENT OF THEIR NATURAL REGENERATION

Terminal Report

Study Leader: E. G. Aragones, Jr.
Co-Researchers: F. C. Pitargue, Jr. and R. A. Oliveros

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FPRDI – ITTO Project PD 15/96 Rev. 2 (M,I)

UTILIZATION, COLLECTION AND TRADE OF TROPICAL NON-WOOD FOREST PRODUCTS IN THE PHILIPPINES

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STUDY COMPLETION REPORT

A. STUDY IDENTIFICATION

Project Title: **Utilization, Collection and Trade of Tropical Non-Wood Forest Products in the Philippines**

Serial Number: PD 15/96 Rev. 2 (M,I)

Study Title: Resource Survey and Inventory of Important Non-Wood Forest Products Species (Rattan, Bamboo, Erect Palms, Pandan, Forest Vines) and Assessment of Their Natural Regeneration

Study Leader: Eustaquio G. Aragones, Jr.

Co-Researchers: Fernando C. Pitargue, Jr. and Roberto A. Oliveros

PART I. SUMMARY

1. Background Information of the Study

Non-wood forest products (NWFP) species such as rattan (climbing palms), erect palms, bamboo, pandan and forest vines constitute a very significant resource material for furniture and handicraft industry. In the Philippines, products produced and developed from said materials like baskets, mats, chairs, bags, hats, etc. are able to reach foreign market in Japan, Europe and the United States. Hence, industries dependent on these non-wood forest product species have become one of the country's top dollar earners.

For perpetuity, however, of any economic product, material resource should always be available for utilization. Specific places and areas where the materials are obtaining and how much of them may be available are important to know and identify.

A. Specific Objectives

The economic significance of non-wood forest products species is undoubtedly tremendous such that determination of their current supply and volume for the information of people engaged in their utilization including specific localities/ areas NWFP may be obtained is very important. Since most industries rely on natural sources of these materials, it is equally important to make an assessment of NWFP species regeneration pattern and cycle. This could be achieved through actual field study and observation of species in nature. In the

end, conservation measures and sustained yield collection practices may be recommended based on current utilization trend and regenerative pattern of the species.

B. Strategy Adopted in Carrying Out the Project

In four (4) pre-determined project sites, viz., SUDECOR (Surigao del Sur, Mindanao), San Jose Timber Corp. (Samar, Visayas), Palawan, and IDC (Aurora) official communication and discussion with officials of the Department of Environment and Natural Resources (DENR), Department of Trade and Industry (DTI), Department of Science and Technology, (DOST) and private logging industries were made pertinent to the project's objectives and goals. In addition, field assistance had been, likewise, solicited from local barangay officials in the locality of survey and conduct of inventory.

Quezon province was added together with Nueva Ecija, both in Luzon, owing to reported abundant occurrence of erect palms and economically-important forest vines in these provinces aside from their accessibility from project's official station in Los Baños, Laguna.

2. Study Achievements

a. Outputs Achieved

Non-wood forest products species such as rattan, bamboo, pandan, erect palms and forest vines had been surveyed and inventoried using a 100 m x 100 m (1 ha) plot replicated depending on extent of occurrence of the subject plant species in the provinces of Palawan, Western Samar, Surigao del Sur, Aurora, Quezon and Nueva Ecija. Those in Luisiana, Laguna are pandan plantations and not natural-grown. Though the site served for ecological observation of the species inventory data are not appropriate.

b. Specific Objectives Achieved

The survey made of the project sites mentioned and subsequent inventory conducted of the subject non-wood forest products species therein enabled determination of their supply, distribution, relative density and volume in each of the project area. Similarly, field observations made of the species in nature pertinent to their regenerative potential led to valuable and helpful information on species ecology necessary for evaluating sustainability of material resource based on observed regeneration trend and pattern.

c. Contribution to the Attainment of Development Objective

The cooperation and all out support by the field personnel of various government agencies, the DENR in particular contributed greatly in the successful implementation of the project's field activities.

3. Target Beneficiaries Involvement

The private industries and individuals engaged in the utilization and marketing of products derived from rattan, erect palms, pandan, bamboo and other forest vines are the direct beneficiaries of information and data on material resource availability. These entities represented in this particular study by non-timber forest products gatherers and users in various localities provided field assistance in conduct of survey and inventory of the subject material resource.

4. Lessons Learned

a. Development Lessons

i Aspects of project design which most contributed to its success

Having determined in advance project sites/areas where non-wood forest products species occur in fair quantity or so made implementation of resource survey and inventory easier.

ii Changes in intersectoral links which affected the project's success

Originally, the project is tied up with agencies or organizations engaged in use and management of natural resources, viz., DENR, Industries Development Corporation (IDC in Aurora province), Surigao Development Corporation (SUDECOR in Surigao del Sur), San Jose Timber Corp. (SJTC, Samar) and Nagkakaisang Tribu ng Palawan (NATRIPAL). All of these companies, agency and organization gave their full cooperation for the successful conduct of the project's activities. Other agencies, however, turned a good deal of contribution to the project's success. Worthy of mention are the local government units, Department of Science and Technology (DOST) regional office and Department of Trade and Industry (DTI).

iii Additional arrangements that could improve cooperation between relevant parties involved

Appropriate agencies and organizations that could provide assistance in the conduct of the project's field activities should have been identified prior to project implementation. The objectives and goals of the project as a whole could have been discussed with concerned agency heads and organization leaders to solicit full cooperation and support through a signed Memorandum of Agreement.

iv Factors which will most likely affect project sustainability after completion

One is market demand for high quality raw materials of non-wood forest products species. Second is the availability of the raw material to sustain the market demand for products both domestic and international. Sustained-yield collection practices and appropriate conservation measures to regulate collection and utilization will have great influence on project sustainability after completion.

b. Operational Lessons

The project as whole has been well organized and managed. Project documentation has been well achieved with the project managers requirement for quarterly accomplishment and progress reports. The institutions involved in the project implementation cooperated very well and gave all out support in the conduct of project's field activities. At times, however, problems arise with non-issuance of logging operations permit to some private industries cooperators. This non-issuance of permit and failure to operate together with problem on the peace and order situation and inclement weather in some of the project sites caused delays in implementation of scheduled activities.

The study that dealt in particular with material resource survey and inventory focused on four pre-determined project sites, viz., Samar, Surigao del Sur, Palawan and Aurora. It was successful, however, in expanding to cover two additional provinces like Quezon and Nueva Ecija. Such study as it concerns material resources should have covered as many provinces and regions of the Philippines for a more extensive data and information on material resource availability.

5. Recommendations

In attempting to conduct and implement a similar project in the future, it would be best to identify exhaustively all possible agencies, sectors, organizations, individuals who could provide assistance and cooperation particularly in conduct of field activities. Allowance for delay in implementation of scheduled activities should always be considered in relation to weather, the peace and order situation and prevailing conditions in the field or forest. Although there may be pre-identified project sites/areas, flexibility should be exercised in locating similar areas that would equally yield the needed results or output. Material resource survey and inventory in particular should cover a wider scope or be conducted more extensively to provide a wider base of data and information on non-wood forest products species distribution, supply and volume.

PART II. MAIN TEXT

1. Introduction

Resource survey and inventory constitute a very important aspect of wise use and management of any renewable resource whether it be timber or non-timber. In attempting to utilize a particular plant species for specific end-uses, viz., bamboo for furniture and housewares or buri for handicraft products, any economic or commercial venture would dare to determine and have knowledge first and foremost of the species availability. When availability is guaranteed the next most probable question is where are they? Where can they be found and how much is extractible in a hectare of land where the species occurs? Will the supply and volume meet and sustain the demand for species product use? Since it is renewable, it means it is regenerating or reproducing and there is possibility to reproduce them through planting. What about information on this aspect?

Compared to a general floristic inventory done usually by plant systematists and ecologists that is geared toward determining species diversity in certain regions and places, search for resources and inventorying specified plant species for particular end-product and uses aim primarily at accomplishing and providing answers to the earlier cited questions. Said questions when taken together with their respective answers seriously spell successful and sustainable utilization of wood and non-wood forest products species for any industrial or commercial venture.

1. Non-Wood Forest Products Species Survey and Inventory

For the purpose of convenience, the results of the survey and inventory of NWFP species resource such as the erect palms (*Corypha, Livistona, Arenga*), pandan (*Pandanus* spp.) bamboo (*Bambusa, Dendrocalamus, Gigantochloa* and *Schizostachyum*), climbing palm (rattans) and other ecomomically important forest vines (*Freycinetia* spp., *Entada, Bauhinia, Ichnocarpus,* etc.) are here presented by project site. The results, however, admittedly cover a small segment of the entire province where project site is located as plots established to provide an estimate of available NWFP resources were situated in selected barangays (smallest socio-politico-geographic unit of a municipality) where the target species are obtaining.

Palawan Province

Altogether, 13 hectares (ha) of land vegetated mostly by bamboo, buri and pandan had been inventoried in the municipalities of Aborlan (5 ha), Narra (2 ha), Española (3 ha) and Brooke's Point (3 ha), all lying south of Puerto Princesa City. Individual species encountered and tallied using a 100 m x 100 m plot (1 ha) and inventory parameters measured and recorded for the species are shown in **Tables 1 through 4.**

Western Samar

A total of 18 hectares of second-growth forest and old coconut plantation on flat to slightly rolling topography were inventoried in the municipalities of Paranas and Hinabangan, Western Samar. The non-wood forest product species observed consisted of anahaw (*Livistona rotundifolia)*, tarau *(Livistona saribas)* and some 6 species of rattan mostly belonging to the genus C*alamus*.

The results are presented and shown in **Tables 5 through 9**.

Surigao del Sur

In the logging concession of Surigao del Sur, Mindanao, 2 plots, each measuring 100 m x 100 m were established covering barangays Suba and Pakwan in the municipality of Lanuza. Species encountered and tallied are shown in **Tables 10 and 11**. The limited area covered by the survey was due to long delay in the implementation of field activities in Surigao del Sur. First, field operations of SUDECOR had been temporarily stopped by the DENR. Operations resumed only in early 2000. Extensive survey was, likewise, inhibited by the hazards posed by lawless elements in the Mindanao region.

Table 1. Inventory data on 5 bamboo species in a 100 m x 100 m plot in Aborlan, Palawan

LOCAL NAME/ SPECIES	Ave. Clump Per Hectare	Ave. Stem Per Clump Per Hectare	Ave. Ht./ Length (Meter)	Ave. Diameter (Cm)	Density Per Hectare	Area Covered Hectare
Buho (*Schizostachyum lumampao*)	**270**	**120**	**4**	**2.5**	**32,400.00**	**3**
Patong *(Gigantochloa atter)*	**55**	**30**	**9**	**8.8**	**1,980.00**	**2**
Awod boho *(Schizostachyum brachycladum)*	**1**	**18**	**5**	**4.5**	**18.00**	**1**
Bayog *(Bambusa merrillianus)*	**15**	**22**	**5**	**8.3**	**330.00**	**2**
Kauayan-kiling *(Bambusa vulgaris)*	**20**	**33**	**8.5**	**9.2**	**660.00**	**2**

Table 2. Inventory data on buri (*Corypha elata*) obtained in a 100 m x 100 m plot in Aborlan, Palawan

Area covered	:	3 ha
Number of mature individuals/ha	:	73
Average height	:	23 m
Average diameter	:	45 cm
Average number of leaves per tree	:	23
Average number of saplings/ha	:	130
Number of seedlings (based on three (3) 5 m x 5 m subplots)	:	607
Average number of leaves (seedling)	:	5

Table 3. Inventory parameters for bamboo, pandan, buri and anahaw in Narra and Española, Palawan

LOCAL NAME/ Scientific Name	Ave. Ht./Length (m)	Ave. Diameter (cm)	Density	Density /ha	Ave. Clump/ha	Ave. culm/ Clump/ha	Area Covered (ha)	Location
Buho *(Schizostachyum lumampao)*	5.0	2.5	75,000	37,500	250	150	2	Española
Patong *(Gigantochloa atter)*	7.5	8.0	4,648	1,216	31	32	3	Narra
Kauayan-kiling *(Bambusa vulgaris)*	8.0	8.5	2,850	950	25	38	3	Narra
Bayog *(Bambusa merrillianus)*	5.0	7.8	840	280	10	28	3	Narra
Pandan *(Pandanus sp.)*	2.5	11.75	69	23.0	-	-	3	Española
Buri *(Corypha elata)*	15.0	3.8	70	35.0	-	-	2	Española
Anahaw *(Livistona rotundifolia)*	4.50	12.5	77	25.60	-	-	3	Española

Table 4. **Inventory data for bamboo, buri and pandan obtained in a 100 m x 100 m plot in Brookes Point, Palawan**

LOCAL NAME/ SCIENTIFIC NAME	Ave.Ht/ Length (m)	Ave. diameter (cm)	Density Total	Per Hectare	Ave. No. Clump/ha	Ave. No. Culm/clump/ha	Area Covered (ha)
Buho *(S. lumampao)*	5.0	2.5	23,994	7,998	86	93	3
Pandan *(Pandanus sp)*	2.5	10.50	120	40	-	-	3
Kauayan kiling *(B. vulgaris)*	9.5	7.75	1,305	435	15	29	3
Bolo *(G. laevis)*	10.5	9.5	975	325	12.5	26	3
Buri *(C. elata)*	18.0	50	87	29	-	-	3
Anahaw *(L. rotundifolia)*	5.0	12.0	48	16	-	-	3

Table 5. Resource inventory data on anahau (*Livistona rotundifolia*) at Barangay Casandig, Paranas, Western Samar.

Parameters	Measurements
Size of plot	100 m x 100 m (1 ha)
No. of plot	4
Area covered	4 ha
Density of individuals 10 cm. and greater	610
Density per hectare	152.5
Average height (m)	8
Average diameter (cm)	12.0
Average no. of leaves per tree	33
Density of saplings/seedlings (total)	2600 *
sity of saplings per hectare	650

- Total sapling/seedling density is combined for anahau and tarau as young individuals for the two species look very identical.

Table 6. **Resource inventory data on anahau (*Livistona rotundifolia*) at Barangay Lauan, Paranas, Western Samar.**

Parameters	Measurements
Size of plot	100 m x 100 m (1 ha)
No. of plot	3
Total density of individuals 10 cm. and greater in diameter	105
Density per hectare	35
Average height (m)	7.5
Average diameter (cm)	12.0
Average no. of leaves per tree	29.0
Total density of saplings/ seedlings	196.0

Table 7. **Resource inventory data on tarau (*Livistona saribas*) at Barangay Casandig, Paranas, Western Samar.**

Parameters	Measurements
Size of plot	100 m x 100 m
No. of plot	4
Area Covered	4 ha
Density of individuals 10 cm.	320
Density per hectare	80
Average height (m)	6.5
Average diameter (cm)	14.5
Ave. no. leaver per tree	28.0
Density of saplings/seedlings (total)	2600 *
Density of saplings per hectare	650

* Total sapling/seedling density is combined for anahau and tarau since young regenerants for the two species look very identical.

Table 8. **Resource inventory data on tarau (*Livistona saribas*) at Barangay Lauan, Paranas, Western Samar.**

Parameters	Measurements
Size of plot	100 m x 100 m (1 ha)
No. of plot	3
Total density of individuals 10 cm. and greater	219
Density per hectare	73
Average height (m)	6.8
Average diameter (cm)	14.5
Average no. of leaves per tree	26.7
Total density of saplings/ seedlings	625.0
Density of saplings/seedlings per hectare	201.66

Table 9. Resource inventory data on rattan species at Barangay Concorde, Hinabangan, Western Samar in 4,100 m x 100 m plot

SPECIES	Density	Density/ha	Vol. (lineal meter	Vol/ha.	Average Length (m)	Ave. Dia (cm)
Palasan (*Calamus maximus*)	74	18.5	462.3	115.57	6.25	1.87
Limuran (*Calamus ornatus*)	49	12.25	195.56	49.14	4.01	1.28
Ditaan (*Daemonorops mollis*)	28	7.0	109.75	27.43	3.92	1.06
Panlis (*Calamus sp.*)	21	5.25	77.60	19.40	3.70	1.11
Tandulang-gubat (*Calamus blancoi*)	33	8.25	81.85	20.46	2.48	0.93
Tumalim (*Calamus mindorensis*)	24	6.0	68.90	19.22	2.87	0.98

Table 10. Resource survey of non-wood forest products in Lanuza, Surigao del Sur covering Brgys. Pakwan and Suba.

Plant Local Name	Habit	Tentative Determination
Olasi	climbing palm, rattan	Calamus aidae Fernando
Dalingdingan	climbing palm, rattan	-
Pandan	pandan	Pandanus sp.
Sarawag	palm	-
Uhay-babae	rattan	-
Pangamo	rattan	-
Hagnaya	climber, woody	Polygala venenosa
Pandan baging 1	climber, woody	Freycinetia sp.
Pandan baging2	climber, woody	Freycinetia sp.
Kalapi	rattan	Calamus ornatus Blume
Balanog	rattan	Calamus symphisiphus Mart.
Anibong	palm	Oncosperma tigillaria (Jacq.) Ridl.
Armog	rattan	Calamus javensis Blume
Bagbag	rattan	Daemonorops affinis Becc.
Saludingan	rattan	Daemonorops ochrolepis Becc.

Table 11. **Inventory data on rattan, other climbers and erect palms at Lanuza, Surigao del Sur covering 2 ha plot.**

LOCAL NAME/ SCIENTIFIC NAME	Average Diameter (cm)	Average Length (m)	Total Density	Volume (lineal meter)	Area Covered (ha)
Olasi *(Calamus aidae)*	1.6	12.7	9	114.3	2
Dalingdingan *(rattan undetermined)*	1.2	4.2	7	29.4	2
Pandan *(Pandanus sp.)*	8.0	4.0	12	48.0	2
Sarawag *(Pinanga insignis)*	4.5	3.5	8		2
Uhay-babae	1.5	4.2	7	29.4	2
(rattan undetermined)	1.6	4.5	6	27.0	2
Hagnaya *(Polygala venenosa)*	0.2	9.0	17	153.0	2
Pandan baging 1 *(Freycinetia sp.)*	1.2	6.5	19	123.5	2
Pandan baging 2 *(Freycinetia sp.)*	1.4	6.5	15	97.0	2
Kadapi *(Calamus ornatus)*	2.5	13.5	38	513.0	2
Balanog *(Calamus symphisiphus)*	2.0	10.0	27	270.0	2
Anibong *(Oncosperma figillaria)*	6.8	6.5	18		2
Armog *(Calamus javensis)*	1.7	5.5	12	66.0	2
Bagbag *(Daemonorops affinis)*	1.3	4.2	11	46.2	2
Saludingan *(Daemonorops ochrolepis)*	1.2	5.8	9	52.2	2

Aurora Province

Only 3 hectares of second-growth dipterocarp forest had been surveyed and inventoried in Aurora province **(Table 12)**. Again, there was extreme difficulty in accessing the province owing to frequency of typhoon and occurrence of inclement weather in the area. The place is accessible only through land transportation which often is rendered very difficult by impassable road conditions. Visits were made only during dry, hot summer months while IDC, the company that hosted research visits to the concession had its own moment of temporary closure pending compliance of some DENR requirements.

Quezon Province

Some 20 hectares of second-growth forest and old coconut plantation had been inventoried in various municipalities of Quezon province, viz., Lucban, Tayabas, Pagbilao, Gumaca and Catanauan. The more prominent non-wood forest products species encountered in 20 plots, each measuring 100 m x 100 m were anahaw (*Livistona*), tarau (*Livistona*), kaong (*Arenga*), pandan (*Pandanus*), bamboo (*Bambusa, Gigantochloa),* nito (*Lygodium),* baling-uai (*Flagellaria*), rattan (*Calamus spp.*), lukmoy (*Raphidophora*) and other forest vines with economic potential. Inventory data are shown in **Table 13** through **Table 19**.

Nueva Ecija

Resource survey and inventory of non-wood forest products species were conducted in the hill forests of Gabaldon, Nueva Ecija. The survey and inventory site was a second-growth forest composed of small diameter trees. There was no sight of palms in the area while bamboos (buho and kauayan-tinik) are widely distributed in patches or clumps particularly along river and stream. Forest climbers were conspicuous rather in the site of survey. **Table 20** presents the inventory data obtained.

1. Non-Wood Forest Products Species Natural Regeneration Pattern and Trend

Bamboo

In all of the project sites where bamboos are found, they seem to be most adapted to relatively open habitats. In several cases, most of them form a dense, long stretch of grove near rivers or waterways while they are seen in widely dispersed patches or clumps farther from watercourses.

Table 12. **Resource inventory data for rattan and other economically-important forest climbers at Brgy. Dimaseset, Dilasag, Aurora.**

COMMON NAME/ SPECIES	FAMILY	HABIT	DENSITY	LENGTH/ HEIGHT (m)	DIAMETER (cm)	VOLUME (lineal meter)	Area Covered (ha)
Tumalim *(Calamus mindorensis)*	Palmae	climbing	9	4	2	36	3
Palasan *(Calamus maximus)*	Palmae	climbing	12	6	2.5	72	3
Limuran *(Calamus ornatus)*	Palmae	climbing	18	5	2	90	3
Ditaan *(Daemonorops mollis)*	Palmae	climbing	8	3	1.3	24	
Anahaw *(L. rotundifolia)*	Palmae	Erect, tree-like	3	seedlings	-	-	-
Pandan baging 1 *(Freycinetia sp.)*	Pandanaceae	Climbing	14	12	3	168	3
Pandan baging 2 *(Freycinetia sp.)*	Pandanaceae	Climbing	8	10	5	80	3

COMMON NAME/ SPECIES	FAMILY	HABIT	DENSITY	LENGTH/ HEIGHT (m)	DIAMETER (cm)	VOLUME (lineal meter)	Area Covered (ha)
Lukmoi *(Raphidophora merrillii)*	Araceae	climbing herbaceous	26	15	4	390	3
Amlong *(Raphidophora pinnata)*	Araceae	climbing herbaceous	22	12	4	264	3
Bikal *(Schizosostacyum diffusum)*	Graminae	Climbing bamboo	15	6	2	90	3
Pandanus sp.	Pandanaceae	Erect, tree-like	4	4	7	-	3
Piper sp.	Piperaceae	Climbing herbaceous	28	6	1.2	168	3
Hagnaya *(Polygala venenosa)*	Polygalaceae	Climbing, small,woody diameter	19	7	0.7	133	3
Giant fern *(Cyathea sp.)*	Cyatheaceae	Erect, tree-like	13	4	6	-	3

Table 13 . Inventory data on selected non-wood forest products in a 100 m x 100 m plot in Lucban, Quezon.

LOCAL NAME/ SPECIES	No. Individuals or Clump	No. culm Per clump	Average Length/ Ht. Culm or Stem (Meter)	Average Diameter Culm or Stem (Cm)	Density or Number Individuals or Clump Per Hectare	Area Covered (ha)
Anahaw *(Livistona rotundifolia var. luzonensis)*	167		4.47	14.00	41.75	4
Kaong *(Arenga pinnata)*	40		5.56	24.83	10.00	4
Pandan *(Pandanus sp.)*	77		2.70	12.88	19.25	4
Bolo *(Gigantochloa laevis)*	55	23.33	8.62	7.25	18.33	3
Kauayan-kiling *(Bambusa vulgaris)*	8	16.62	7.46	4.76	2.66	3

Table 14. Inventory data on buri (Corypha elata) obtained from three (3), 100 m x 100 m plot in Tayabas, Quezon

Area covered (hectare)	:	3
Number of mature individuals	:	282
Density per hectare	:	94
Average height (meter)	:	5.75
Average diameter (centimeter)	:	48.50
Average number of leaves per tree	:	26.10
Number of seedlings	:	818.00
Number of seedlings/ha	:	272.66

Table 15. Inventory data on selected non-wood forest products in a 100 m x 100 m plot in Pagbilao, Quezon.

LOCAL NAME/ SPECIES	Area Covered(ha)	Total Density	Density/ Hectare	Mean length/ Height (meter)	Mean Diameter (centimeter)
Kauayan-kiling *(Bambusa vulgaris)*	1	36	36	7.00	5.00
Buri *(Corypha elata)*	2	727	364.50	4.42	74.32
Nito *(Lygodium circinatum)*	1	30	30	10.00	
Baling-uai *(Flagellaria indica)*	1	29	29	10.17	
Lukmoy *(Raphidophora merrillii)*	1	6	6	20.33	

Table 16. Density and volume (lineal meter) of forest vines in 100 m x 100 m plot at Quezon National Park (QNP), Pagbilao, Quezon.

LOCAL NAME/ SPECIES	Family	Area Covered (ha)	Density	Volume (l. m.)	No. of Seedling
Albotra *(Arcangelisia flava)*	**Menispermaceae**	**1**	**2**	**4**	
Agpoi *(Bauhinia cumingiana)*	**Caesalpiniaceae**	**2**	**16**	**102**	
Palasan *(Calamus merrillii)*	**Palmae**	**2**	**10**	**32**	**45**
Dinochloa sp.	**Gramineae**	**2**	**24**	**235**	
Balingayo *(Erythrophalum scandens)*	**Olacaceae**	**2**	**6**	**88**	
Nito 1 *(Lygodium merrillii)*	**Schizaeceae**	**1**	**9**	**81**	
Nito 2 *(Lygodium japonicum)*	**Schizaeaceae**	**1**	**5**	**68**	
Phytocrene sp.	**Icacinaceae**	**1**	**6**	**59**	
Piper retrofractum	**Piperaceae**	**2**	**13**	**230**	

LOCAL NAME/ SPECIES	Family	Area Covered	Density/	Volume (l.m.)	No. of Seedling
Patai-butu *(Piper sarmentosum)*	**Piperaceae**	**2**	**6**	**38**	
Baralta *(Pothoidium lobbianum)*	**Araceae**	**1**	**10**	**102**	
Lukmoy *(Raphidophora merrillii)*	**Araceae**	**2**	**18**	**330**	
Amlong *Raphidophora pinnata*	**Araceae**	**1**	**7**	**28**	
Adadinko *(Sageretia theezans)*	**Rhamnaceae**	**2**	**8**	**182**	
Thylophora sp.	**Asclepiadaceae**	**1**	**16**	**128**	
Saga-saga *(Abrus precatorius)*	**Papilionaceae**	**1**	**10**	**180**	
Alagag *(Artabotrys cumingiana)*	**Annonaceae**	**1**	**5**	**44**	
Lambutan *(Calamus halconensis)*	**Palmae**	**1**	**3**	**17**	

Table 17. Density and volume (lineal meter) of rattan and other forest vines in a 100 m x m plot in Mt. Banahaw, Lucban, Quezon at 550 m elevation.

LOCAL NAME/ SPECIES	Family	Density	Volume (l.m.)	No. of Seedling
Ampelocissus sp. 1	Vitaceae	3	55	
Ampelocissus sp. 2	Vitaceae	2	50	
Aristolochia tagala	Aristolochiaceae	2	16	
Calamus dimorphacanthus	Palmae	4	265	5
Limuran *(C. ornatus var. philippinensis)*	Palmae	22	277	61
Connarus trifoliatus	Connaraceae	11	197	
Dinochloa sp.	Gramineae	12	157	
Dioscorea sp.	Dioscoreaceae	15	217	
Nami *(D. hispida)*	Dioscoreaceae	2	32	
Dregea volubilis	Ascleapiadaceae	4	62	
Baling-uai *(Flagellaria indica)*	Flagellariaceae	2	18	
Mezoneuron cucullatum	Caesalpiniaceae	1	10	
Micrehites micrantha	Apocynaceae	5	54	
Piper sp.	Piperaceae	2	50	
Raphidophora merrillii	Araceae	2	50	
Raphidophora pinnata	Araceae	2	50	
Bana *(Rubus pectinellus)*	Rosaceae	8	64	
Hampas-tikbalang *(Smilax bracteata)*	Smileaceae	1	20	
Kamot-kabag *(Smilax leucophylla)*	Smileaceae	2	18	
Kalit-kalit *(Tetrastigma harmandii)*	Vitaceae	1	12	

Table 18. Resource inventory data on selected non-wood forest products in Catanauan, Quezon.

COMMON/ SCIENTIFIC NAME	No. Individuals or Clump*	No. Culm Or stem Per Clump**	Average Length/ Ht. of Culm or Stem (Meter)	Average Diameter (Cm)	Area Covered (ha.)	Density Per (ha.)
Buri *(Corypha ulan)*	373	-	13.5	40	4	93.25
Anahaw (*Livistona rotundifolia*)	294	-	10.5	11.6	4	75.50
Pandan *(Pandanus sp.)*	270	-	4.0	8.0	2	135.00
Kauayan-tinik *(Bambusa blumeana)*	76	54.25	12.0	8.6	4	1030.75
Bolo *(Gigantochloa laevis)*	15	41.00	10.5	8.0	2	307.50

*/** Clump refers specifically to growth habit of bamboo where culm or stem form a congested or crowded group of individuals.

Table 19. Inventory data on important forest vines in 2-ha second-growth forest in Gumaca, Quezon.

LOCAL NAME/ SPECIES	Family	Ave. Length (m)	Density	Volume (l. m.)	Average Diameter
Lukmoy *(Raphidaphora merrillii)*	**Araceae**	**11.5**	**29**	**333.5**	**2.04**
Gogo *(Entada phaseoloides)*	**Leguminosae**	**9.0**	**9**	**81.0**	**3.91**
Piña-piñahan *(Boerlagiedendron sp.)*	**Araliaciae**	**7.0**	**16**	**112.0**	**2.58**
Tawag-ama *(Aspidoptera ovata)*	**Malphigiacee**	**8.8**	**9**	**79.2**	**1.94**
Baleteng-baging *(Ficus indica)*	**Moraceae**	**6.2**	**3**	**18.6**	**3.27**
Kalit-kalit *(Cissus repens)*	**Vitaceae**	**9.0**	**18**	**162.0**	**2.28**
Bayati *(Anamirta cocculus)*	**Menispermaceae**	**7.6**	**16**	**121.6**	**2.59**
Paminta-pamintahan *(Piper loheri)*	**Piperaceae**	**5.0**	**21**	**105.0**	**1.23**
Hanope *(Conocephalus suaveoleus)*	**Moraceae**	**8.3**	**26**	**215.8**	**2.83**

LOCAL NAME/ SPECIES	Family	Ave. Length (m)	Density	Volume (l. m.)	Average Diameter
Galamai-amo *(Schefflera odorata)*	**Araliaceae**	**5.7**	**7**	**39.9**	**2.59**
Bulakan *(Merrenria peltata)*	**Menispermaceae**	**7.9**	**6**	**47.4**	**1.75**
Katmon-baging *(Tetracera scandens)*	**Dilleniaceae**	**6.8**	**5**	**34.0**	**2.16**
Kamaksa *(Rourea volubilis)*	**Connaraceae**	**8.4**	**12.0**	**100.8**	**2.33**
Nito *(Lygodium circinatum)*	**Schizaeaceae**	**4.3**	**4.0**	**17.2**	**1.0**
Banot *(Bauhinia aherniana)*	**Leguminosae**	**6.7**	**9.0**	**60.3**	**2.76**

Table 20. **Inventory data on important forest climbers in three (3) 100 m x 100 m plots in the hill forest of Gabaldon, Nueva Ecija.**

LOCAL NAME/ SPECIES	Family	Ave. Length (m)	Average Diameter (cm)	Density	Volume (l. m.)
Albotra *(Arcangelisia flava)*	**Menispermaceae**	**8.4**	**3.5**	**12**	**100.8**
Hinggiu *(Ichnocarpus volubilis)*	**Apocynaceae**	**7.6**	**2.5**	**9**	**68.4**
Lukmoy *(Raphidophora merrillii)*	**Araceae**	**5.2**	**1.7**	**11**	**57.2**
Liktang *(Anamirta cocculus)*	**Menispermaceae**	**7.8**	**2.30**	**13**	**101.4**
Gogo *(Entada phaseoloides)*	**Leguminosae**	**9.5**	**2.7**	**14**	**133.0**
Makabuhai *(Tinosphora rumphii)*	**Menispermaceae**	**9.8**	**2.12**	**7**	**68.6**
Nito *(Lygodium circinatum)*	**Schizaeaceae**	**4.2**	**0.75**	**10**	**42.0**
Baling-uai *(Flagelleria indica)*	**Flagellariaceae**	**6.3**	**1.20**	**15**	**94.5**
Hagnaya *(Polygala venenosa)*	**Polygalaceae**	**7.5**	**1.90**	**8**	**60.0**

LOCAL NAME/ SPECIES	Family	Ave. Length (m)	Ave. Diameter (cm)	Density	Volume (l.m.)
Palasan *(Calamus maximus)*	**Palmae**	**7.5**	**2.6**	**11**	**82.5**
Limuran *(Calamus ornatus)*	**Palmae**	**6.8**	**2.4**	**9**	**61.2**
Tumalim *(Calamus mindorensis)*	**Palmae**	**5.2**	**2.0**	**6**	**31.2**
Kamaksa *(Rourea volubilis)*	**Connaraceae**	**8.8**	**1.9**	**13**	**114.4**
Kurotan-baging *(Linociera sp.)*	**Oleaceae**	**9.5**	**1.0**	**7**	**66.5**
Agpoi *(Bauhinia aherniana)*	**Leguminesae**	**6.3**	**3.0**	**5**	**31.5**
Saga *(Abrus precatorius)*	**Leguminosae**	**5.6**	**5.6**	**12**	**67.2**
Pandan baging *(Freycinetia sp)*	**Pandanaceae**	**8.7**	**3.2**	**16**	**139.2**
Nito *(Lygodium circnatum)*	**Schizaeaceae**	**4.0**	**0.6**	**14**	**56.0**

The largest and tallest of the grass family (Gramineae), bamboos easily regenerate by production of young shoots or by sucker. Such is brought about by its characteristic rhizomatous growth which often leads to formation of clump or individual stem grouped and set closely by a common rhizome or root system. These unique growth characteristics of bamboos like its close relatives, the herbaceous grasses provide mechanism for its perpetuity.

Pandan *(Pandanaceae)*

In this particular study, two genera of the family Pandanaceae (screw pine) have been covered, viz., *Pandanus* and *Freycinetia.* The former is an erect, woody, palm-like tree whose leaves are the popular source of woven product like mats, hats, bags and the like. The latter is represented by climbing species economically useful as material for weaving or handicraft.

Field study and observation of palm-like *Pandanus* particularly in Quezon and Laguna provinces where the species is most abundant indicate its inability to reproduce by seed. Although flowering and fruiting had been observed to occur regularly each year, sight of young seedling growth near mother trees was not observed. Rather, the plant tends to perpetuate its species by sucker growth near the base of the tree stem. A small sucker had been frequently seen to protrude producing a young independent individual.

Freycinetia species on other extreme, were observed to regenerate by seeds in the forest. Young seedlings most probably from seeds that drop off were seen prominently in project sites where the species was encountered.

Erect Palms *(Livistona, Corypha, Arenga)*

Buri which belongs to the genus *Corypha* of the palm family is absolutely a monocarpic species. In all project sites particularly in Quezon province where several mature individuals had been observed, death of tree follows after flowering and fruiting. A mature individual normally sheds off its foliage in exchange for the flowers it bears. When fruits set, they become the more conspicuous sight. A single tree based on field observation could bear about a thousand or more fruit. Germination of seeds that drop off the ground seemingly is not a problem for the species as seeds readily germinate in moist soils. Profuse occurrence of seedling growth was observed when soil was wet and under shade although in open condition, seedlings were likewise present. Indications had it that moisture may be the limiting factor for seed germination.

Livistona species (anahaw and tarau) unlike *Corypha* are non-monocarpic. In other words, they continue to live even after flowering and fruiting. Field observation of the species indicated strong ability to

reproduce by seed. Young seedlings were prominent and conspicuous under dense stand of *Livistona* in all the project sites where the species occur. Reproduction and perpetuity, hence, depend on the individual's ability to produce flower and fruit. Abundant production of seeds under favorable environmental factors could ensure continuous growth and occurrence for the species.

Kaong (*Arenga pinnata)*, commonly referred to as "cabo negro" in the Philippines regenerates naturally by seed. A mature individual of the species bears abundant fruit and seed which field observation showed could germinate readily particularly under wet soil condition. In Quezon province, young growths are common near mother trees indicative of the species ability to reproduce by seeds. Since fruits are hard coated, birds and other animals are not reported to feed on the fruit. In several instances, flowers were seen visited by flying insects while fruits were frequented by black ants.

Rattan (Climbing Palms)

The *Lepidocaryoid* climbing palm collectively called "rattan" regenerate by seeds. There is no report yet of asexual reproduction in the rattans. In the field, rattan, seedlings were observed to be common particularly under the canopy of second-growth forest. As climbers, they understandably require presence of trees to cling on or for mechanical support. High frequency of observed seedlings seemingly point to high germination of seeds. As mature ones are cut and harvested, they are replaced by young regenerating wildlings.

Rattans reportedly bear flower and fruit irregularly. When flowering and fruiting, however, occur they are profuse that abundant fruit and seed are produced. Germination particularly under shaded and moist condition of the soil probably contributes to perpetuation of species supply.

Forest Vines

Forest vines are notably abundant in relatively disturbed forest areas in low to medium altitudes which described all of the project sites. Thus, they are seldom found under closed forest canopy that prevents penetration of sunlight through the middle layer down the forest floor.

Asexual reproduction is not popular among the climbers. Instead, they regenerate by seed just like the rattans. Of the environmental factors that influence germination and growth of forest vines, light and moisture seem to have the greatest effect.

2. Recommendations on Sustained-Yield Collection Practices and Conservation

Sustainable management and utilization of material resources will have to consider the collection practices and appropriate conservation measures. For one, collection should be based on age or size of the plant material. In doing so, it ensures perpetuity giving time for the young ones to grow and attain full maturity size. When cutting for *Livistona* stem, for instance, see to it that there are enough residuals for the next harvest. Care should, likewise, be taken to protect growth of young seedling or wildlings. Always give allowance for the next generations of crops as excessive cutting or harvesting will devastate the stand and will not leave material for future use.

CONCLUSIONS AND RECOMMENDATIONS

Resource survey and inventory of important non-wood forest products (NWFP) species in various municipalities of the provinces of Palawan, Aurora, Western Samar, Surigao del Sur, Quezon and Nueva Ecija provided very valuable and useful quantitative data on the species availability and supply. The results answer the common queries on where to find them, what could be found and how much may be obtained. The particular study, likewise, gave an ecological assessment of the different species regeneration pattern and potential for sustainability of supply. Sustained-yield collection practices and measures to conserve the species for continuous supply of material depend largely on the growth habit and regeneration characteristic of the species concerned. In general, cutting and harvesting should be regulated based on volume of mature individuals and population density of young regenerating wildlings.

The particular study admittedly covers a very small segment of the country. Similar study in the future is highly recommended to include as many forest provinces and regions as possible. Sourcing of materials for commerce and the industry will always play a very significant role in non-wood forest products utilization for the success of any economic venture depends greatly on availability of materials.

APPENDIX PHOTOS

Kauayan-tinik (*Bambusa blumeana*) growing in clump.

Regenerating shoot of kauayan-tinik (*B. blumeana*).

Bamboo house, a common sight along roads going to Lucena City, Quezon province.

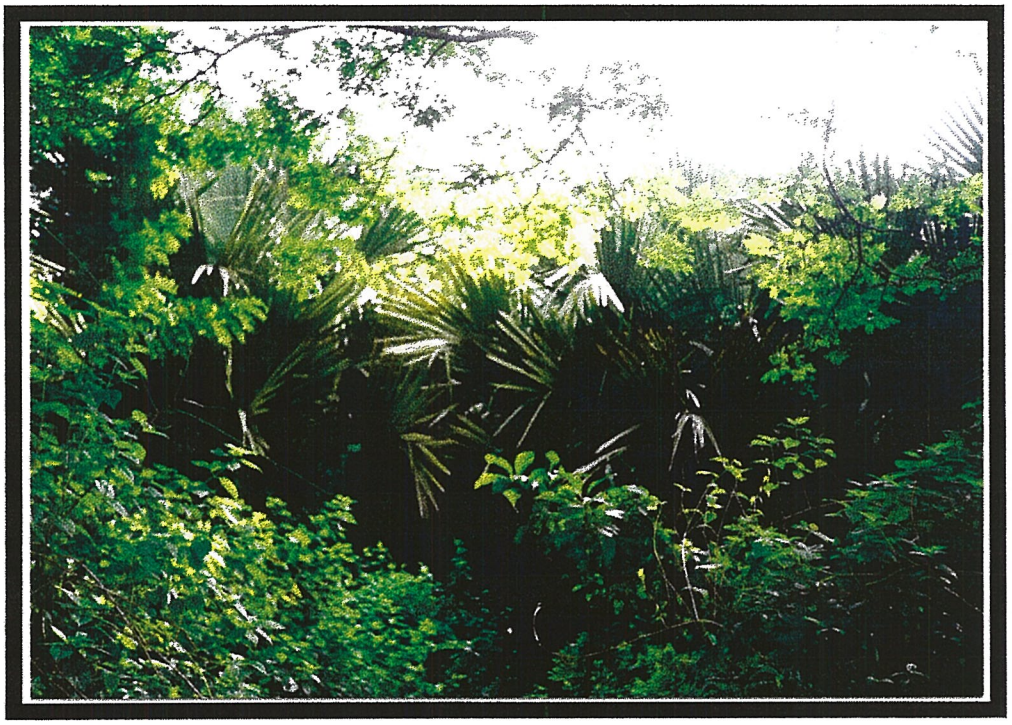
Mature individuals of pandan (*Pandanus sp.*) bearing fruit.

Trees of anahaw (*Livistona*) and its young wildlings.

Harvested stems of *Livistona* ready for transport.

Buri (*Corypha elata*) showing leaf stalk and basal portion of cut off stalks.

Profuse germination of buri (*corypha ulan*) seedlings under shade.



Young wildlings of *Corypha* on partly-shaded area.

Fruiting tree of kaong (*Arenga pinnata*). Notice long, hanging characteristic of infructescence.

Young wildlings of *Calamus* (rattan) growing under shade of young secondary forest in Western Samar.

The climbing *Freycinetia sp.* of Pandanaceae, a very important material for handicraft.

Freycinetia sp., a climbing *pandan* used as material for handicraft.

Bundle of economically-important forest vine, hingiu (*Ichnocarpus sp.*) used for handicraft.