PN-ACQ-185

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FOREST RESOURCES ASSESSMENT: SAMAR ISLAND[1]

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by

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January 2001

Samar Island Biodiversity Study (SAMBIO)
Resources, Environment and Economics Center for Studies, Inc. (REECS)

In association with
Orient Integrated Development Consultants, Inc. (OIDCI)
Department of Environment and Natural Resources-Region 8 (DENR-8)

[1] This publication was made possible through support provided by the U. S. Agency for International Development, under the terms of Grant No. 492-G-00-00-00001-00. The opinions expressed herein are those of the author and do not necessarily reflect the views of the U. S. Agency for International Development.

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EXECUTIVE SUMMARY

In assessing the indicative quantity and quality of forest resources of Samar Island under the SAMBIO Project, a forest resource inventory using fixed area cluster along transect was used. The method intended to capture the occurrence and extent of plant resources in the area with particular emphasis on biodiversity.

Three transect lines were established. **Transect 1** took off in Brgy. San Isidro, Paranas, Western Samar having a direction of N 13 ° 00 ' E towards Northern Samar. Due to some peace and order problems, only 4 clusters were established along this line. **Transect 2** started at Sto. Caruyagon Brgy. Potong, San Julian, Eastern Samar. It has 20 cluster plots, a total distance of 10 km. and a direction of S 81 ° 00' W. The transect passed through municipalities of San Julian, Sulat and Hinabangan. **Transect 3** is 17 km long established within the Basey area of Western Samar with a direction of N 86 ° 00 ' from the junction of Basey and Loog River passing through the municipalities of Basey and Maydolong. It has 34 cluster plots.

Assessment Results

Transect 1 - The transect passed through pockets of cultivated areas especially in its first one kilometer. From the content of the limited number of cluster plots established, it was observed that the general landuse type along this transect is second-growth forest with portions of thinly-logged areas as evidenced by the still dense forest.

20 x 20 m plots - On the average, there are 33 trees per cluster which are 20 cm. and above in diameter at breast height (DBH). This translates to 164 trees in all diameter classes per hectare belonging to 22 different timber species. The average DBH is around 34.6 cm. Although there are evidences of cultivation along the transect, the area is adequately stocked with an average volume of 275 cu m per hectare. Considering the provisions of DAO No. 02-92 entitled "Annual Allowable Cut Determination in the Second Growth Forest" the total volume of harvestable trees is least 60 cu m per ha along this transect.

5 x 5 m subplot - Under this subplot, all trees 5 to 19 cm in DBH were counted together with the presence of other economic plants. The results showed that there are at least 4,410 plants present per hectare in the area. Of these, 1,960 are saplings of trees and trees at early pole stage. This high number of small trees per hectare is a characteristic of low dipterocarp forests existing on limestone formations. These small trees serve as reserve stocks or core regenerations for future crops.

1 x 1 m subplots - The plots recorded an average of 32 wildlings per cluster composed of 23 different species of plants. Of these, there are 5 wildlings of trees. Approximately, there exists an average of around 78,750 wildlings of plants per ha in the area. At least 9,000 of them are wildlings of different tree species.

Transect 2 - The transect mostly passed through second growth forests as evidenced by the presence of abandoned logging roads, especially those of UTIMCO Logging Co. However, pockets of cultivated areas were also seen along the transect line. The transect also passed through rocky areas along limestone formations as well as steep ridges and cliffs.

20 x 20 m subplot - There are 48 tallied in each cluster plot on the average. This is equivalent to at least 238 trees in 20 cm and up diameter classes per hectare. The average DBH is relatively smaller at 30.3 cm. This suggests that there are only few big trees existing in the area passed by the transect, an indication that the area had been logged only recently because of the presence of many small trees. The trees are distributed within 37 species composed mainly of lowland dipterocarps such as Tanguile, Gisok-gisok, Red Lauan, Narig, etc. and non-dipterocarp species such as Duguan, Bitanghol, Lanete, Tamayuan, Bansalagin, etc.

With respect to volume, most clusters (13 of them) have over 100 cu m per ha. There is only one cluster that reached an estimated volume of over 200 cu m. All other clusters fall below 100 cu m in content. On the average, the transect has 111.8 cu m of wood volume per hectare. With so many number of trees per ha, this low volume indicates that the area is relatively young. There are only 14 cu m of harvestable timber in the area using the allowable cut formula.

5 x 5 m subplot - The results also showed that there are at least 1,772 plants per ha present in the area. Of these, 948 are saplings and poles of trees. This high sapling content is typical characteristic of low dipterocarp forests existing on limestone formations. These small trees serve as reserve stocks or core regenerations for future crops.

1 x 1 m subplots - The plot showed an average of 41.5 wildlings per cluster composed of around 21 different species of plants. Of these wildlings, there are 5 wildlings of trees. Translated into a per hectare basis, there exists an average of 82,900 wildlings of plants in the area. At least 10,100 of them are wildlings of different tree species.

Transect 3

Transect 3 is the longest transect that was established by the team. It passed through some abandoned kaingin and second growth forests. The transect also passed through rocky areas along limestone formations as well as steep ridges and cliffs. Some plots were located inside virgin forests which were not previously disturbed by any human action.

20 x 20 m subplot - There are 48.0 trees belonging to 20 cm and above in diameter at breast height (DBH) per plot. This is equivalent to approximately 240 trees belonging to these diameter classes existing per hectare. This shows that the area is adequately stocked with various species of trees. The average DBH is around 28.6 cm. which is an indicator that there is a preponderance of many small trees in the area. This is also an indication that the area had been logged only recently because of the presence of many small trees which were released to grow during the logging operations. There are at least 38 species of trees per cluster of plots in the transect. The common lowland dipterocarps species found in the are are Tanguile, Apitong, Bagtikan, Almon, Gisok, Red Lauan, Narig, etc. The common non-dipterocarp species are Duguan, Bitanghol, Lanete, Tamayuan, Bansalagin, etc.

Most clusters (13 of them) have high volumes of over 100 cu m per ha. There are 14 clusters that reached an estimated volume of over 200 cu m. On the average, the transect has 191.0 cu. m of wood volume per hectare. However, there are only 14 cu m of harvestable timber in the area using the allowable cut formula.

5 x 5 m subplot - Based on cluster plot data, there are at least 4,480 plants present in a hectare along the transect. Of these, 1,760 are saplings of trees and trees at the early pole stages. Most of these trees have straight thin boles and are slow growing. These small trees serve as reserve stocks or core regenerations for future crops.

1 x 1 m subplots - The plot showed an average of 36 wildlings per cluster composed of around 20 different species of plants. Of these wildlings, there are 6 wildlings of trees or approximately 72,118 wildlings per ha in the area. At least 12,235 of them are wildlings of different tree species.

Tree species occurrence along transects and elevations

Most of the common species found along the transects (those with at least 50 % occurrence) have a wide range of altitudinal distribution. These species are mostly of the dipterocarp families except Duguan and Ulayan which are non-dipterocarps. Mayapis, for example, is evenly distributed from the lowest of elevations (80 masl) up to the next highest elevation recorded (540 masl). Red lauan is conspicuously absent in lower elevations (from 80 to 240 masl) but consistently present in plots with elevations of 270 masl and higher. The rest of the dipterocarps (Narig, Tangile and Almon) are widely distributed.

With respect to volume distribution, no significant trend was noted with respect to altitudinal ranges except that the highest elevation recorded on the transect (620 masl) has a very low volume owing to the fact that the plot sat on a limestone formation.

Occurrence of other economic plants

The Samar forests abound with economic plants that are useful to local inhabitants. Among those observed in the transects are some bamboo species like bagacay and buho which are useful in house construction and furniture making; wild abaca for fiber production; some rattan species like tumalim and ilhian which are good furniture and basketry materials; some erect palms like anahaw, anibong and pugahan which have many uses; and some pandan species used for mat weaving and native bag making.

The most common economic plants found in ***Transect 1*** are ilhian (a rattan species) which was tallied in 75 percent of the plots, and anibong (an erect palm) and bariw (a pandan species) which both occurred in 50 percent of the plots. In terms of number of stems, ilhian has on the average 281 stems per ha in transect 1. This was followed by anibong with an average of 194 stems occurring per hectare.

Ilhian is also the most common economic plant found occurring in ***Transect 2*** with 90 percent occurrence. This was followed by pugahan (an erect palm) with 50 percent occurrence. The third most common economic plant is kalape which was tallied in 45 percent of the plots. In terms of number of stems, bagacay has the most number with 108 stems per hectare. However, it was tallied only in one cluster plot and very sparsely distributed. This was followed by ilhian with an average of 84 stems per ha. Ilhian is also

the most common economic plant found occurring in Transect 3 with 79.4 percent occurrence. This was followed by sarawag (an erect palm) with 64.7 percent occurrence. The third most common economic plants are nokot (a rattan species) and malabagacay (also a rattan species) which were both recorded in 61.8 percent of the plots. In terms of number of stems, ilhian has also the most number with 146 stems per hectare. This was also followed by nokot which has 114 stems per hectare.

In general, ilhian is consistently the most abundant economic plant in terms of average occurrence with 81.5 percent presence in all transects. This was followed by anibong with 35.1 percent average occurrence and kalape with 34.1 percent occurrence.

Feasibility of tree plantations and second growth harvesting in Samar Island

The average projected yields per hectare of different forest crops in Samar Islands are fairly high. However, in considering commercial plantation establishment, planting density or spacing is of prime consideration. It is often costly, especially in the first three years of establishment. In these initial years, the plantation developers can spend as much as 21,907 pesos or more per hectare for a 4 x 4 m spacing or twice as much (P43,146) under the usual 2 x 3 m spacing on direct costs, including project management costs, which constitute at least 15% of the direct costs. In areas where the actual wood yield is good, these costings are easily justified. Reports on plantation yield in Samar Island are promising and most of the sites yield a range of average to good.

Initial analysis of financial feasibility of plantation establishment in the area showed some promising indicators. At an average rotation of 10 years, gmelina posted a 26.95 % internal rate of return (IRR) with a benefit-cost ratio (BCR) of 7.48. The net present value (NPV) of gmelina at 12% interest rate is P36,580.6. Practically, the first three species analyzed (gmelina, bagras and mangium) generally showed positive but declining indicators, as rotation is lengthened. Mahogany, however, showed increasing feasibility as the rotation is increased with respect to BCR. Certainly, the above indicators are attractive. As such, plantation establishment in some parts of Samar forests is feasible.

Considering the harvesting of second growth forests, it has been calculated that at the areas where the transects were established, it is predominantly a young forest composed of small diameter trees. Based on the financial assessment of harvesting at different years, it was found that harvesting the second growth at present is not as financially rewarding as that of 5 to 15 years from now.

Conclusions

The Forest of Samar is a highly diverse forest with very high regenerative capacity. Results of the forest resources assessment showed a fair number of trees and species belonging to 20 cm and up diameter. However, it may also noted that most of these trees belong to small diameter classes as attested by the average diameter of trees by transect which are very low. Nevertheless, there are few big trees with substantial volume and are nearing overmature stage already.

Regarding the presence of trees in the sapling and early pole stage, the forest of Samar is blessed with abundant trees at this diameter class. These observations show the very high

resiliency of the Samar forests to recover immediately from any disturbance. The number of tree wildlings is also fairly abundant.

With respect to species distribution, no distinct zonation of species was observed as most species are widely distributed along a very narrow range of elevation which is from 80 to 620 meters above sea level. Thus, the danger of species extinction from but potentially destructive activities is very minimal.

The Samar forest also abounds with economic plants that are useful to local inhabitants. Among them are some bamboo species like bagacay and buho which are useful in house construction and furniture making; wild abaca for fiber production; some rattan species like tumalim and ilhian which are good furniture and basketry materials; some erect palms like anahaw, anibong and pugahan which have many uses; and some pandan species used for mat weaving and native bag making.

The most common economic plants found in all Transects is ilhian (a rattan species) with an average of 81.5 percent occurrence in all transects. This was followed by anibong and kalape, an erect palm and rattan species, respectively.

The average yields per hectare of different forest crops in Samar Islands are quite promising. Establishment of forest plantations in Samar is expected to satisfy high wood demand in neighboring provinces or regions. Initial analysis of financial feasibility of plantation establishment in the area showed promising indicators. Thus, plantation establishment in some parts of the forest is highly feasible. The sensitivity analysis conducted showed that the profitability of the four major plantation species considered in this study is not affected by small negative changes in plantation costs and benefits. Considering relatively bigger negative changes, the feasibility indicators still posted promising values.

Samar forest is predominantly young composed of small diameter trees. Based on the financial assessment of harvesting at different years, it was found that harvesting the second growth at present is not as financially rewarding as that of 5 to 15 years from now.

FOREST RESOURCES ASSESSMENT: SAMAR ISLAND

1. FOREST RESOURCES ASSESSMENT

One of the basic instruments in assessing the quantity and quality of forest resources in a given tract of land is the biophysical resources inventory. This refers to the systematic listing and measurement of living and non-living resources in the forest with the purpose of using the information in planning and proper management and development of such resources.

For the SAMBIO Project, the method used in forest resources assessment was fixed area cluster along transect. The method is similar to an integrated biophysical resources inventory except for the absence of sampling intensity estimate. Given the limited time and scope of the forest resources assessment activities, this design was adopted to capture various forest attributes along geographic and altitudinal ranges that are necessary for general and indicative planning. More transect lines are required for the subsequent land management unit allocation in the future.

From the results of the forest resources inventories conducted in the three NRMP pilot areas in 1991 to determine the best sampling method, it was found that the fixed area cluster is the optimum method to capture most of the variability of a forest needed for comprehensive planning. The method involves the use of a cluster of five 0.04-hectare subplots for a total sample area of 0.2 hectares per cluster. Based on the same study, clusters are preferable to single large area plots because they are spread more proportionally over the forest and include more of the natural variability that occurs. Since a large part of the cost of sampling involves travelling to the sample site, cluster sampling attempts to increase the amount of information obtained per unit cost of travel time relative to a simple random sample of plots.

This assessment activity covered most floral resources in the forest such as timber, bamboo, rattan, erect palms and other economic plants or commercial minor forest products.

2. STEPS

2.1 Team Organization

The FRA team was composed of two crews, one for the survey and establishment of cluster plots and the other one for the resource assessment proper. The survey crew was composed of 4 members doing multiple functions, namely: compass man which also acted as the crew leader and recorder, front chainman which also acted as brusher, rear chainman which also acted as marker, and a guide which also acted as brusher and porter. (See ***Appendix B*** for the complete list of the team members.)

The inventory crew is composed of 3 members doing the following tasks; crew leader who also acted as recorder and height measurer, the tape man who was responsible for measuring diameter of trees, pole bearer for measuring height and brushing, and a helper who acted as brusher and tree marker. Two members of the inventory crew are expert dendrologists who identified the local names of trees and other plant resources.

A plant biodiversity expert from the National Museum also joined the team to identify other plant species and collected some specimens for future identification. A member of the team was also assigned to collect soil samples along the transects. Another helper was also hired by the team to serve as porter, camp keeper and cook. Depending on the needs, some porters were also hired to beef up the team during the start of the transect when the supplies are still heavy.

The instruments used by the survey crews were staff-head compass and box compass, meter tape, measuring stick at least 5 meters high for height determination, bolos, wooden sticks or pegs, and tying straws of different colors to denote plot boundaries, plot center, etc.

2.2 Training of the team and familiarization with the area

The team members were oriented to the assessment activities through a lecture/discussion about the method and actual establishment or dry run of the inventory proper. A map of the project area at the scale of 1:50,000 was obtained to familiarize team members about the features of the project area (topography, vegetation, climate and other strategic features) which can help facilitate the resource assessment works. This was necessary in the physical and mental preparation of the team as well as the logistics needed.

2.3 Selection of transect lines

The location of transects were chosen on the basis the variability of landuses traversed by the lines. Among the landuses traversed by the transects are the proposed multiple use zones (cultivated areas, second-growth forests, brushlands and grasslands), old-growth forests, and mining claims and potential mining areas.

2.4 Planning and preparation

Some of the team members are already familiar with the transect locations so reconnaissance surveys were not conducted anymore.

2.5 Survey and establishment of transect lines and survey plots

Transect lines and cluster plots

Transect lines were established where most of the assessment activities took place. The lines ran from the forest edge to the top of the mountain. A cluster of subplots were established every 500 meters along the transect. The reckoning point was the center of each transect.

The survey crew was the first to conduct measurements and establish the cluster plots. These consist of five ***20 x 20 m*** (0.04 hectare) subplots. Additionally, subplots include one

subplot ***5 x 5 m*** established in the southwestern corner of each cluster plot and one ***1 x 1 m*** subplot in the northeastern corner. Whenever the plot falls, it was established at such location and no transfer of location or substitution was made. When the plot was impossible to measure, like when it falls in a river or on otherwise dangerous ground, proper notes were made to that effect. The lines connecting from plot to plot were actually established on the ground and the following information encountered along the strip were noted in the trail notes: a) rivers and creeks (by their direction of flow) and ridges (direction by arrow points); and b) other information such as swamp, rocky areas, mossy forests, mining, kaingin/cultivated areas.

The inventory crew

The inventory crew followed the survey crew and started measurements after each cluster plot was established and took measurements as quickly as possible.

2.6 Measurement Standards

Recording along the strip line from cluster plots and inside the ***20 meter x 20 meter*** subplots.

a. Each cluster on the transect line was numbered consecutively. All forest inventory tally sheets were filled out with necessary information taken during the work.

b. All trees with DBH greater 20 cm or larger inside each ***20 x 20 m*** subplot were tallied. The species, DBH, merchantable height, and form and grade for each 5 meter log were recorded.

c. All bamboos, rattan, palms, anahaw and other useful palms within each 20 meter x 20 meter square subplot were tallied as follows:

- Bamboos were tallied by the total number of matured culms in a clump, the average height of matured culms and the total number of juvenile culms.
- Rattans were measured by cane in the clump for the total number of matured cane having at least a length of 1 meter and longer, the mean length of mature cane, and the total number of juvenile canes.
- Palms were measured and tallied by the number of matured palms in the clump, their mean diameter, and their average merchantable heights.

d. Specimens of barks, leaves, flowers, fruits or wood samples of unidentified or unknown species were collected for identification. For this purpose, possible specimen presser or appropriate polyethylene bags were used. Whenever possible, the local dendrologist provided the local name for unidentified species.

e. For kaingin or cultivated areas traversed, the length of such areas along the cruise lines was indicated in the trail notes and perpendicular lines were drawn to determine the approximate extent occupied. The number of heads of families, length of occupancy, and kinds of crops raised (permanent or perennial) were recorded in the field notes when available.

f. For rivers or creeks, the direction of flow and ridges (their direction by arrow marks) were indicated in the trail notes.

g. Changes in forest conditions such as swamps, rocky areas, mossy forest, mining, were also noted.

h. Roads (passable or unpassable), log landings or cableways (if visible) were also noted.

Recording inside 5 x 5 m subplots

All trees between 5 centimeters to 19 centimeters DBH in diameter were tallied for species, DBH and merchantable height (MH).

All root crops, medicinal plants, and other plants with special or commercial value were enumerated by species.

Recording inside the 1 meter x 1 meter square subplots

All trees/plants/reproductions, 30 centimeters tall but less than 5 centimeters DBH were tallied. The number by species separately recorded for each plot.

Ground cover and low herbaceous species such as ferns, grasses, vines and other ground were noted in percentage of cover over the total area of the plot in 10% class by species (0-10% = 5% class, 10-20% = 15% class, etc.).

3. FOREST RESOURCE ASSESSMENT RESULTS

3.1 Transects established

Transect 1 was projected to be 15 km. It started from the junction of Ulit River and Diit Creek near Sto. Diit, Brgy. San Isidro, Paranas, Western Samar. The transect direction was N 13 ° 00 ' E towards Northern Samar. Due to the very bad weather at the start of the survey and the very steep terrain, only 4 clusters were established along this line. The team decided to transfer the transect to some eastern take off at a later time when the weather would have improved. The team then proceeded to ***Transect 2*** and planned to come back upon improvement of the weather. However, peace and order became a problem later on in this site. Several attempts to get clearance from concerned groups failed. The request for clearance dragged on for several weeks. This time, the team decided to forego this transect and instead gathered secondary data to obtain additional information.

Transect 2 started at Sto. Caruyagon which is 3.5 km from Brgy. Potong, San Julian, Eastern Samar. It has a total distance of 10 km and a direction of S 81 ° 00' W. It was tied at UTM 758 E 1298 N in the same barangay. The transect passed through municipalities of San Julian, Sulat and Hinabangan.

Transect 3 is 17 km long established within the Basey area of Western Samar. The transect followed a direction of N 86 ° 00 ' from the junction of Basey and Loog River. The first cluster plot was established within the ANR (Assisted Natural Regeneration) Project of Loog Watershed Community Based Forest Management Project (CBFM). It is composed of 34 cluster plots and passed through the municipalities of Basey and Maydolong.

3.2 Assessment Results

3.2.1 Transect 1

General description - The transect basically passed through pockets of cultivated areas especially in the first kilometer of the transect. However, from the content of the limited number of cluster plots established, it was observed that the general landuse type along this transect is second-growth forest with pockets of thinly-logged areas as evidenced by the still dense forest.

20 x 20 m subplot

Number of trees and average DBH - On the average, there are 33 trees belonging to 20 cm and above in diameter at breast height (DBH) per plot (***Table 1***). This translates to 164 trees in all diameter classes per hectare. This is a fairly large number and suggests that the area is adequately stocked with various species of trees. The trees range from 20 cm up to 90 cm DBH. The average DBH is around 34.6 cm. This indicates that there are many big trees existing in the area. This also suggests that the area had been logged several decades ago already and that some parts of the area covered by the transect had not been logged thoroughly because it is very rugged and has very steep slopes.

Number of species - On the average, there are 22 species of trees per cluster of plots in the transect.

Stand volume - Although there are evidences of cultivation along the transect, the area possesses a fairly high volume content with an average volume of 275 cu m per hectare. Considering the total volume of trees belonging to 60 cm and up DBH and the diameter limit for sustainable harvest, there are at least 60 cu m of harvestable timber in the area using the allowable cut based on DAO No. 02 – 92 entitled "Annual Allowable Cut Determination in the Second Growth Forest." This Order allows the cutting of 50 per cent of trees belonging to 60-69 cm DBH plus 100 per cent of trees 70 cm DBH and up multiplied by 50 percent reduction factor.

5 x 5 m subplot

Under this subplot, all trees 5 to 19 cm in DBH were counted together with the presence of other economic plants. The results showed that there are at least 4,410 plants present per

hectare in the area (***Table 2***). Of these, 1,960 are saplings of trees and trees at early pole stage. This high number of small trees per hectare is a characteristic of low dipterocarp forests existing on limestone formations. Small trees in the sapling stage are usually abundant along crevices where there are rich spots of accumulated soils from organic debris deposited through thousands of years. These small trees serve as reserve stocks or core regenerations for future crops.

1 x 1 m subplots

The plot showed 32 wildlings per cluster composed of 23 different species of plants (***Table 3***). Of these 32 wildlings, there are 5 wildlings of trees. If translated into a per hectare basis, there exists an average of 78,750 wildlings of plants in the area. At least 9,000 of them are wildlings of different tree species.

Altitude vs. number of trees and volume

It was observed that the number of trees increases as the altitude becomes higher (***Table 4 & Figure 1***). One reason for this is that as the transect goes deeper into the forest, the slopes become steeper. Thus, the magnitude of disturbance from forest occupants becomes lighter.

Number of species by plot size

The number of species is consistently higher in the ***5 x 5 m*** subplots than the other two subplots (***Table 5 & Figure 2***). This information suggests the abundance of small trees in the area as well as other economic plants as also noted earlier. Such abundance reflects high biodiversity in terms of number of species.

Number of trees by subplots

With respect to the number of trees, subplot ***5 x 5 m*** showed the most number, even higher than the number of tree wildlings as found in the 1 x 1 m subplots (***Table 5 & Figure 3***). This observation reflects the relatively dense forest floor as to the number of small trees present. Such characteristic offers high resiliency of the forest to recover from any disturbance assuming that most of the trees in higher DBH classes would be the target of future utilization.

3.2.2 Transect 2

General description - The transect mostly passed through second growth forests as evidenced by the presence of abandoned logging roads, especially those of UTIMCO Logging Co. However, pockets of cultivated areas were also seen along the transect line. The transect also passed through rocky areas along limestone formations as well as steep ridges and cliffs.

20 x 20 m subplot

Number of trees and average DBH - On the average, there are 47.5 trees belonging to 20 cm and above in diameter at breast height (DBH) per plot (***Table 7***). This translates to 238

trees in all diameter classes per hectare. This is a fairly large number and suggests that the area is adequately stocked with various species of trees. The trees range from 20 cm up to 90 cm DBH. The average DBH is around 30.3 cm. which is relatively smaller and suggests that there are only few big trees existing in the area. This is also an indication that the area had been logged only recently because of the presence of many small trees which were released to grow during the logging operations.

Number of species - On the average, there are 37 species of trees per cluster of plots in the transect. This is a fairly high number composed mainly of lowland dipterocarps such as Tanguile, Gisok, Red Lauan, Narig, etc. and non-dipterocarp species such as Duguan, Bitanghol, Lanete, Tamayuan, Bansalagin, etc.

Stand volume - Most clusters (13 of them) have volumes of over 100 cu m per ha. There is only one cluster which reached an estimated volume of over 200 cu m. All other clusters fall below 100 cu m in content. On the average, the transect has 111.8 cu m of wood volume per hectare. With so many number of trees per ha, this low volume indicates that the area is relatively young. There were no distinct patterns as to the volume content considering the distance of the cluster plots to populated areas. Considering the total volume of trees belonging to 60 cm and up DBH and the diameter limit for sustainable harvest, there are only 14 cu m of harvestable timber in the area using the allowable cut formula.

5 x 5 m subplot

Under this subplot, all trees 5 to 19 cm in DBH are counted together with the presence of other economic plants. The results showed that there are at least 1,772 plants present per hectare in the area (***Table 8***). Of these, 948 are saplings of trees and trees at early pole stage. This is relatively high and is typical characteristic of low dipterocarp forests existing on limestone formations. These small trees serve as reserve stocks or core regenerations for future crops.

1 x 1 m subplots

The plot showed an average of 41.5 wildlings per cluster composed of around 21 different species of plants (***Table 9***). Of these wildlings, there are 5 wildlings of trees. If translated into a per hectare basis, there exists an average of 82,900 wildlings of plants in the area. At least 10,100 of them are wildlings of different tree species.

Altitude vs. number of trees and volume

It was observed that the number of trees in this transect is not affected by altitude (***Table 10 & Figure 4***). Some cluster plots have very low number of trees recorded like plot no. 1 with only 40 trees estimated per ha and plot no. 15 with only 15 trees. This is more attributed to the existing land use than the elevation. Plot no. 1 is a cultivated area while plot no. 15 is a rocky and steep area where limestone formation is very prominent. Correspondingly, the volume of trees are minimal in these plots.

Number of species by plot size

On the average, the number of species is higher in the ***20 x 20 m*** subplots than the other two subplots (***Table 11 & Figure 5***). This information suggests the relative abundance of big tree species in the area. Such abundance reflects high biodiversity in terms of number of species.

Number of trees per hectare by subplots

With respect to the number of trees per ha, the ***1 x 1 m*** subplots showed the most number. (***Table 12 & Figure 6***). This observation reflects the relatively dense forest floor as to the number of wildlings of trees present. The number of trees belonging to the pole and sapling stages is also high with at least 7,960 trees observed per ha. Such characteristic offers high resiliency of the forest to recover from any disturbance assuming that most of the trees in higher DBH classes would be the target of future utilization.

3.2.3 Transect 3

General description - Transect 3 is the longest transect that was established by the team. It passed through some abandoned kaingin and second growth forests as evidenced by the presence of abandoned logging roads. The transect also passed through rocky areas along limestone formations as well as steep ridges and cliffs. Some plots were located inside virgin forests which were not previously disturbed by any human action. The last cluster plot which is the highest point along the transect has an elevation of 540 masl.

20 x 20 m subplot

Number of trees and average DBH - On the average, there are 48 trees belonging to 20 cm and above in diameter at breast height (DBH) per plot (**Table 13**). This translates to 240 trees in all diameter classes per hectare. This number of trees suggests that the area is adequately stocked with various species of trees. The trees range from 20 cm up to 90 cm DBH. The average DBH is around 28.6 cm. which is an indicator that there is a preponderance of many small trees in the area. This is also an indication that the area had been logged only recently because of the presence of many small trees which were released to grow during the logging operations.

Number of species - On the average, there are 38 species of trees per cluster of plots in the transect. This is a fairly high number composed mainly of lowland dipterocarps such as Tanguile, Apitong, Bagtikan, Almon, Gisok, Red Lauan, Narig, etc. and non-dipterocarp species such as Duguan, Bitanghol, Lanete, Tamayuan, Bansalagin, etc.

Stand volume - Most clusters (13 of them) have high volumes of over 100 cu m per ha. There are 14 clusters that reached an estimated volume of over 200 cu m. On the average, the transect has 191.0 cu m of wood volume per hectare. Considering the total volume of trees belonging to 60 cm and up DBH and the diameter limit for sustainable harvest, there are only 14 cu m of harvestable timber in the area using the allowable cut formula.

5 x 5 m subplot

On the average, there are at least 56 number of plants tallied along the cluster plots. On a per hectare basis, there are 4,480 plants counted in these plots. Of these, 1,760 are saplings of trees and trees at the early pole stage (***Table 14***). This high number of small trees per hectare is similar to the other two transects typical of a second growth low dipterocarp forest existing on limestone formations. Most of these trees have straight thin boles and are slow growing. These small trees serve as reserve stocks or core regenerations for future crops.

1 x 1 m subplots

The plot showed an average of 36 wildlings per cluster composed of around 20 different species of plants (***Table 15***). Of these wildlings, there are 6 wildlings of trees. If translated into a per hectare basis, there exists an average of 72,118 wildlings of plants in the area. At least 12,235 of them are wildlings of different tree species.

Altitude vs. number of trees and volume

The number of trees in this transect is not affected by altitude (**Table 16 & Figure 7**). Most cluster plots have very high numbers of trees recorded. Most have high volumes reflective of low disturbance and presence of virgin growths.

Number of species by plot size

On the average, the number of species is higher in the ***20 x 20 m*** subplots than the other two subplots (***Table 17 & Figure 8***). This information suggests the relative abundance of tree species belonging to 20 – 60 cm DBH classes in the area. Such abundance reflects high biodiversity in terms of number of tree species.

Number of trees per hectare by subplots

With respect to the number of trees per ha, the ***5 x 5 m*** subplots showed the most number. (***Table 18 & Figure 9***). This observation reflects the relatively dense growth of saplings and pole sized trees in the area. The number of wildlings is also high with at least 12,235 wildlings per ha. Such characteristic offers high resiliency of the forest to recover from any disturbance assuming that most of the trees in higher DBH classes would be the target of future utilization.

3.3 Tree species occurrence along transects and elevations

Most of the common species found along the transects (those with at least 50% occurrence) have a wide range of altitudinal distribution. These species are mostly of the dipterocarp families, except Duguan and Ulayan which are non-dipterocarps. Mayapis, for example, is evenly distributed from the lowest of elevations (80 masl) up to the next highest elevation recorded (540 masl) (***Table 23***). Red lauan is conspicuously absent in lower elevations (from 80 to 240 masl) but consistently present in plots with elevations of 270 masl and higher. The rest of the dipterocarps (Narig, Tangile and Almon) are widely distributed. Occurrence

of less common species (as far as the transects are concerned) are shown in ***Tables 20, 21 and 22.***

With respect to volume distribution, no significant trend was noted with respect to altitudinal ranges except that the highest elevation recorded on the transect (620 masl) has a very low volume owing to the fact that the plot sat on a limestone formation.

3.4 Occurrence of other economic plants

The Samar forests abound with economic plants that are useful to local inhabitants. Those observed in the transects which have some economic values are listed in ***Table 19***. Among these are some bamboo species like bagacay and buho which are useful in house construction and furniture making; wild abaca for fiber production; some rattan species like tumalim and ilhian which are good furniture and basketry materials; some erect palms like anahaw, anibong and pugahan which have many uses; and some pandan species used for mat weaving and native bag making.

3.4.1 Transect 1

The most common economic plants found in Transect 1 are ilhian (a rattan species) which was tallied in 75 percent of the plots, anibong (an erect palm) and bariw (a pandan species) which both occurred in 50 percent of the plots (**Table 20**). In terms of number of stems, ilhian has on the average 281 stems per ha in transect 1. This was followed by anibong with an average of 194 stems occurring per hectare.

3.4.2 Transect 2

Ilhian is also the most common economic plant found occurring in ***Transect 2*** with 90 percent occurrence (***Table 21***). This was followed by pugahan (an erect palm) with 50 percent occurrence. The third most common economic plant is kalape (a good rattan species) which was tallied in 45 percent of the plots. In terms of number of stems, bagacay has the most number with 108 stems per hectare. However, it was tallied only in one cluster plot and very sparsely distributed. This was followed by ilhian with an average of 84 stems per ha.

3.4.3 Transect 3

Ilhian is also the most common economic plant found occurring in ***Transect 3*** with 79.4 percent occurrence (**Table 22**). This was followed by sarawag (an erect palm) with 64.7 percent occurrence. The third most common economic plants are nokot (a rattan species) and malabagacay (also a rattan species) which were both recorded in 61.8 percent of the plots. In terms of number of stems, ilhian has also the most number with 146 stems per hectare. This was also followed by nokot which has 114 stems per hectare.

3.4.4 Overall % occurrence

In general, ilhian is consistently the most abundant economic plant in terms of average occurrence with 81.5 percent presence in all transects (**Table 23**). This was followed by anibong with 35.1 percent average occurrence and kalape with 34.1 percent occurrence.

4.0 SUTAINABLE HARVEST

Below are some recommendations for sustaining the productivity of resources in Samar Forests especially in harvesting of non-timber forest products.

4.1 Trees

In any natural stand of forests, harvesting of few mature trees is not the threat to its sustainability. The country's dipterocarp forests are characterized by multi-layer multi-aged stand of trees. The number of small trees and wildlings per hectare runs to tens of thousands in number. It has enough regeneration to recover from any disturbance, even severe ones. The forest of Samar is a classic example. It has hundreds of trees belonging to 20 cm and up diameter. It has thousands of trees belonging to sapling and pole stages. Moreover, it has tens of thousands of wildlings. The object of logging, if harvesting regulations are followed, are only few big trees per ha (around 10 to 15 trees). Harvesting of these few big trees during logging releases the rest of the trees to grow actively and replace the removed ones. In community-based harvesting where the intensity of harvest is low, there is a very high chance of sustainability. All we have to do is to prevent kaingin, which is a hundred times more destructive then logging.

4.2 Erect Palms

Edible fruits of erect palms can be gathered as they mature or at any stage they are most useful. Most naturally occurring stands of erect palms are prolific seeders and are easy to propagate. In cases where intensive harvesting is planned, it is necessary to designate some mother trees where fruit harvesting will be conducted to serve as seed source. Suitable areas can be artificially regenerated by planting germinated palm seeds. Wildlings of these palms also abound around mature plants where harvesting was not or rarely done before. These wildlings can be boled and transferred to other designated areas where wildlings are lacking or not present at all.

4.3 Bamboo Species

Bamboos have a very high potential for sustainable harvest. Its stem matures in 2 to 3 years. Some species are very prolific producers of suckers like buho. Observations in Cagayan and Isabela provinces showed that buho clumps produce more young shoots when harvested and maintained regularly. Mature culms are easily distinguishable as they are dull compared to the very shiny young culms. These must be harvested as they would die anyway in the succeeding years. However, a practice of retaining a few mature culms in the clumps is still observed. Other bamboo species are also very simple to sustain. The principles of harvesting are the same with buho.

Harvest during dry season prolongs the life of the harvested bamboo, as attack of powder post beetles is minimized due to less protein content of the culms during the summer period. Culms are harvested close to the ground to prevent the stumps to congest the clump. As part of regular maintenance activities, old stumps from previous harvest and dying stems must be removed to enhance the growth of young culms. Harvested culms can have a length between 15 to 20 feet, depending on the end use they are intended for. Harvest cycle is 2 years in most bamboo stands which means that harvest in a given stand is done every two years.

Due to the restrictions on this activity, no accurate information exists as to the volume of culms harvested yearly from the forests of Samar. However, gauging from the few stands visited, the volume of harvest is very insignificant compared to the potential sustainable harvest of the current bamboo stands in the area.

4.4 Rattan

Most rattan wildlings are slow growers in natural rattan stands where growth is negligible when still very young (1 to 4 years). Upon reaching a foot from the ground, the growth accelerates and may attain harvestable length within 10 to 15 years. Harvesting can be done at an interval of 3 ½ years on the succeeding canes of clustering species like *Calamus merilli* and *Calamus ornatu s var. philippinensis.* (Canopy, 1986). However, shorter rotations can be achieved when selective cutting is possible.

Rattan poles are harvested with a sharp bolo and pulled manually to attain maximum merchantable length. Long stems are usually hard to pull and a harvester requires assistance from other harvesters to fully obtain the maximum length. Cutting of support trees or trees where the rattan stems clamber is very destructive and should be strictly prohibited. Maximum care on the young and unharvestable stems should be observed to prevent damage and assure sustained harvest from the same stand.

4.5 Bikal

Although bikal is not so abundant in Samar forests, it is widely spread in the area. Bikal has no known economic harvest rate or sustainable harvest cycle. Whenever commercial harvesting is resorted to, the rule of thumb is to harvest only the mature ones and avoid damage to residuals or young ones. Applying area control, whereby the total operational area is divided into compartments, can also enhance sustainability. Periodic harvests can be confined in one compartment, to be followed by other compartments in the next harvest period and so on. This cyclic cut ensures the recovery of harvested areas before another harvest is scheduled. Through careful observations relative to when the original conditions have been naturally restored, the forest manager would be able to establish the sustainable harvest cycle for these resources.

5.0 FEASIBILITY OF ESTABLISHING TREE PLANTATIONS

Evaluation of the feasibility of establishing forest plantations for some tree products (e.g., sawtimber, electric poles, pulpwood, etc.) was conducted. The economic potentials of devoting parts of the Samar Forests to forest plantations and/or managing them for wood production were determined.

5.1 Yield and Costs

The average yields per hectare of different forest crops in Samar Island are shown in ***Table 29*** while ***Table 30*** shows the summary of cost of different forest development strategies. For reforestation components, planting density or spacing has a major effect on the total development costs. The plantation establishment cost is almost doubled from ***4 x 4 m to 3 x 2 m*** spacing from P21,907 per ha to P43,146 per ha. ***Tables 31 to 41*** show the detailed costings for each forest development strategy.

5.2 Wood Demand and Supply

Historically, the forestry industry in the Philippines flourished in the 1960s, 70s and early 80s, such that the country then was a net exporter of wood products, specifically logs. In the late 1970s, the highest export was recorded in the country when 75% of log production was shipped abroad. That year, total log export amounted to 7.9 million cu m (Philippine Forestry Statistics, various years). Total wood product exports in the same period totaled almost 10 million cu m. This accounted for almost 10% of the country's total export earnings. Today, the forestry business in the country is considered by many including industry insiders as a sunset industry. This is mainly due to the lack of raw materials to process and sustain operations as well as zero or very little investments in the industry. From a net exporter of wood, the country became a net importer of wood products.

Wood production greatly diminished when cutting from virgin forests has been banned since 1992. Many timber concessions operating in secondary forests were cancelled or suspended in the early 90s in view of emerging environmental problems allegedly caused by logging. The Philippine Constitution prohibits renewal of timber licenses, and all of them would have expired by year 2011.

Demand for wood products continues to soar despite the lack of raw materials from natural forests. In the late 1990s, roughly around 25 percent of the demand was supplied by the remaining timber concessionaires cutting from natural forests. Another 25 percent was supplied from industrial forest plantations where private organizations lease parts of publicly owned forestlands to produce fast-growing timber. A major bulk of the demand for timber (around 30 percent) was sourced from importation. The remaining part of the demand (around 20%) was supplied by timber from privately owned lands and from coconut lumber.

The above conditions rendered wood nowadays as a very precious commodity in the country, at least in major urban areas such as Metro Manila and other progressive cities. The country has been experiencing deficits in almost all wood products for the past five years, except for plywood for some years. The MPFD estimates in 1990 proved to be too optimistic, and the projected increases in wood supply failed to materialize. It projected surpluses for all major wood products except fuelwood/firewood (***Table 43***). However, actual trends in wood production showed declining trends. A serious shortage of wood products is now a reality.

The scenario is also bleak for sawlogs and veneer logs. Over the years, the production level of these products has significantly dropped (***Table 44***). The projected production rates

of different wood products would be less than the projected demand except for plywood (Carandang, et. al., 2000).

The Philippines has been heavily importing wood products to meet the high demand in the local market. ***Table 45*** shows the volume and value of major wood product imports from 1994 to 1998. The country imported more logs than it produced from 1995 to 1997, more lumber from 1995 to 1998 and more veneer from 1995 to 1998 (Carandang, et. al., 2000). The pace of developing forest plantations in the country is not expected to meet the projected wood deficit. Hence, the country would continuously rely heavily on imported wood products.

Considering that there is a commercial logging moratorium in the natural forest of the whole Samar Island, the area is considered a timber deficit region. Based on the current estimated annual per capita wood consumption (0.05 cu. excluding fuelwood MPFD, 1990) by each Filipino, the Island needs at least 70,000 cu. m of wood products yearly, to increase pro-rated with the population which is currently estimated at 1.57 million (extrapolated from NSO, 1997). This is a tremendous requirement that provides high economic potential for timber production in the area.

5.3 Feasibility of Establishing Tree Plantations in Samar Island

Plantation development is costly, especially in the first three years of establishment. In these initial years, the plantation developers can spend as much as 21,907 pesos or more per hectare for a ***4 x 4 m*** spacing or twice as much (P43,146) under the usual ***2 x 3 m*** spacing (***Table 30***) on direct costs, including project management costs, which constitute at least 15% of the direct costs. In areas where the actual wood yield is good, these costings are easily justified. Reports on plantation yield in Mindanao areas are promising and most of the sites yield a range of average to good. This translates to high feasibility of plantation projects in that area. Initial assessment of Samar forests showed that potential sites for tree plantation development are also good. This warrants the use of average yield estimates (***Table 42***).

Initial analysis of financial feasibility of plantation establishment in the area showed some promising indicators. At an average rotation of 10 years, gmelina posted a 26.95% internal rate of return (IRR) with a benefit-cost ratio (BCR) of 7.48. The net present value (NPV) of gmelina investment at 12% interest rate is P36,580.6 (***Table 48***). Practically, the first three species analyzed (gmelina, bagras and mangium) showed generally declining indicators, as rotation is lengthened. Mahogany, however, showed increasing indicators as the rotation is increased with respect to BCR. From a 7.84 BCR at 10 years, it increased to 29.85 at year 20. This is the direct result of the growth rate of this species which increases during the later age of the stand. Certainly, the above indicators are attractive. As such, plantation establishment in some parts of Samar forests is feasible. This would ease a lot of pressure to the remaining natural forests from the local population.

5.4 Sensitivity analysis

The sensitivity analysis conducted showed that the profitability of the four major plantation species considered in this study is not affected by small negative changes in plantation costs and benefits. Given a 10% increase in plantation establishment costs without increase in

corresponding benefits, the feasibility indicators posted minimum decrease in values. For example, from a 30.23% IRR for gmelina at base case, the resulting IRR for a 10% increase in cost is 28.73% or a decrease of only 1.5% (***Table 49***). A 10% decrease in benefits without change in cost would give a slightly lower IRR at 28.57% for the same species. The resulting IRR, considering a combination of both changes, is 27.08%.

Considering relatively larger negative changes in costs and benefits, the feasibility indicators still posted promising values. Given a 20% increase in plantation establishment costs without increase in corresponding benefits, the feasibility indicators also posted minimum decrease in values. For example, from a 28.67 percent IRR for bagras at base case, the resulting IRR for 20 percent increase in cost is 26.73% or a decrease of only 1.94% (***also Table 49***). A 20% decrease in benefits without change in cost would give a slightly lower IRR at 26.30% for the same species. The resulting IRR considering a combination of both changes is 24.39%.

The same trends are true for all species considered. The above indicators show that there is promise in establishing tree plantations in Samar forests, considering minimum yields the area could afford.

5.5 Feasibility of harvesting second growth

A total of 35 cluster plots from all transects were identified as second growth forests. The average diameter at breast height of this group of cluster plots is around 29.4 cm (***Table 50***). The volume ranges from a low 70.1 cu m to a high of 406.5 cu m. This implies the high ranges of second growth ages occurring in the area covered by the transects. However, the ranges of harvestable volume is from 0 to 102 cu m with an average harvestable volume in the area of only around 15.3 cu m. Further, only 3 plots are harvestable at present and these are scattered within the area. Comparatively, harvestable volume is low with respect to the total wood volume present (***Figure 12***). This is confirmation that the residual forests of Samar are still young.

With respect to the projected volume growth, Samar second growth forests are expected to attain more volume through time. This is because of the preponderance of actively growing trees within the 20 – 60 diameter classes which are not yet harvestable. These diameter classes are backed up by semi-dormant sapling and pole-sized trees which form part of future forest stock. Because of total volume growth, there is a consequent increase in the harvestable volume considering some safeguards needed to perpetuate the forests (***Table 51***).

Based on the financial assessment of harvesting at different years, it was calculated that harvesting the second growth would be more financially rewarding 5 to 15 years from now. The net present value (NPV) of utilizing these forests at present is P39,284 per ha (***Table 52***). However, postponing harvest until the fifth year showed higher NPVs. At year 5, the NPV per ha is approximately P101,580 and declining progressively from year 10 onwards. It may be further noted that harvests 10 and 15 years later are still higher than that of year 0. Beyond, year 15, further delays in harvesting of second growth would lead to smaller benefits due to the effect of the interest rate. Hence, it may be inferred that Samar Island would benefit more if the harvest of second growth is started 5 to 15 years from now.

6.0 SUMMARY AND CONCLUSIONS

The forest of Samar is a highly diverse forest with very high regenerative capacity. Results of the forest resources assessment showed a fair number of trees and species belonging to 20 cm and up in diameter. On the average, the number of trees per hectare belonging to these diameter classes are 164, 238 and 240 for ***Transects 1, 2 and 3***, respectively. However, it may also be noted that most of these trees belong to small diameter classes as attested by the average diameter of trees by transect which are very low at 34.5, 30.3 and 28.6 cm, respectively. Nevertheless, there are few big trees with substantial volume and are nearing overmature stage already. There is an observed high diversity of tree species in the area ranging from 22 to 38 different species of trees per cluster plot.

Regarding the presence of trees in the sapling and early pole stage (5 – 19 cm DBH), the forest of Samar is blessed with abundant trees in this diameter class. There are at least 1,960, 948 and 1,760 trees per ha present on the average in this diameter class for ***Transects 1, 2 and 3***, respectively. These figures show the very high resiliency of the Samar forest to recover immediately from any disturbance.

The number of tree wildlings is also fairly abundant. It ranges from 9,000 to 12,235 per ha for the three transects established. Although this figure is at the low end of the figures reported from other forest areas which run to as high as 33,000 per ha in Aras-asan timber concession in Mindanao, the number is fairly compensated by those trees belonging to the sapling and pole stages which is so far the highest value recorded.

With respect to species distribution, no distinct zonation of species was observed as most species are widely distributed along a very narrow range of elevation which is from 80 to 620 meters above sea level. Thus, the danger of species extinction from localized but potentially destructive activities is very minimal

The Samar forest also abounds with economic plants that are useful to local inhabitants. Among them are some bamboo species like bagacay and buho which are useful in house construction and furniture making; wild abaca for fiber production; some rattan species like tumalim and ilhian which are good furniture and basketry materials; some erect palms like anahaw, anibong and pugahan which have many uses; and some pandan species used for mat weaving and native bag making.

The most common economic plants found in all Transects is ilhian (a rattan species) which was tallied in 75 percent of the plots in ***Transect 1***, 90 percent in ***Transect 2*** and 79.4 percent in ***Transect 3***. Overall, ilhian is consistently the most abundant economic plant in terms of average occurrence with 81.5 percent presence in all transects. This was followed by anibong with 35.1 percent average occurrence and kalape with 34.1 percent occurrence.

The average yields per hectare of different forest crops in Samar Islands are quite promising. Establishment of forest plantations in Samar is expected to satisfy high wood demand in the neighboring provinces or regions. Initial analysis of financial feasibility of plantation establishment in the area showed some promising indicators. Practically, gmelina, bagras and mangium showed generally declining indicators, as rotation is lengthened. Mahogany, however, showed increasing indicators as the rotation is increased with respect to BCR.

Considering the above indicators, plantation establishment in some parts of the Samar forest is feasible. This would also ease a lot of pressure to the remaining natural forests from the local population.

The sensitivity analysis conducted showed that the profitability of the four major plantation species considered in this study is not affected by small negative changes in plantation costs and benefits. Considering relatively bigger negative changes, the feasibility indicators still posted promising values. The above indicators show that there is promise in establishing tree plantations in Samar forests, considering minimum yields the area could afford.

The current harvestable volume per ha in second growth forests is low with respect to the total wood volume. These second growth forests are expected to attain more volume through time because of the preponderance of actively growing trees within the 20 – 60 diameter classes which are not yet harvestable. There is a consequent increase in the harvestable volume considering some safeguards needed to perpetuate the forests. The net present value of utilizing these forests at present is P39,284.0 per ha. However, postponing harvest until the fifth year showed higher NPVs (net present value). It was further noted that harvests 10 and 15 years later are still higher than that of year 0. Further delays in harvesting of second growth would lead to smaller benefits due to the effect of interest rate. Hence, it may be inferred that Samar Island would benefit more if the harvest of second growth is started 5 to 15 years from now.

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Table 1
Summary Information for Transect 1 20 x 20 m Plots

	Plot information							
CPN	NOT	NSP	ADBH (cm)	AMH (m)	RDBH (cm)	TVOL (cu m)	V60 (cu m)	V70 (cu m)
1	5	5	26.8	6.2	22-39	1.8	0.0	0.0
2	47	32	35.8	11.0	20–90	76.6	20.3	13.0
3	33	20	38.6	11.9	20-74	60.5	8.1	27.1
4	46	30	37.2	11.5	20-88	81.3	6.1	37.9
Average	33	22	34.6	10.2	20 -90	55.05	8.625	19.5

	Per ha						
CPN	NOT	TVOL (cu m)	V60 (cu m)	V70 (cu m)	HV (cu m)	ALT (masl)	Remarks
1	25	9.0	0.0	0.0	0.0	80	cultivated area
2	235	383.0	101.5	65.0	57.9	220	s.g. steep areas
3	165	302.5	40.5	135.5	77.9	200	s.g. steep areas
4	230	406.5	30.5	189.5	102.4	180	s.g. steep areas
Average	164	275.3	43.125	97.5	59.5		

Note: Per hectare values are extrapolated from plot values.

Table 2
Summary Information for Transect 1, 5 x 5 m Plots

	Plot information			Per hectare	
CPN	NPLT	NSP	TN	NPLT	NOT
1	51	37	14	2,960	1,120
2	69	40	29	3,200	2,320
3	104	74	30	5,920	2,400
4	81	56	25	4,480	2,000
Average	76.25	51.75	24.5	4,140	1,960

Table 3
Summary Information for Transect 1, 1 x 1 m Plots

	Plot information			Per hectare	
CPN	TNOW	NSP	TNTW	TNOW	TNTW
1	54	32	3	108,000	6,000
2	14	24	2	28,000	4,000
3	15	19	1	30,000	2,000
4	43	16	12	86,000	24,000
Average	32	23	5	63,000	9,000

Notes:

CPN -	Cluster Plot Number	V60 -	Volume of 60 - 69 cm DBH class
NOT -	Number of Trees	V70 -	Volume of 70 cm & up DBH class
NSP -	Number of Species	HV -	Harvestable Volume
ADBH -	Average DBH	ALT -	Altitude
AMH -	Average Merchantable Height	NPLT -	Number of Plants
RDBH -	Range DBH	TNOW -	Total Number of Wildlings
TVOL	Total Volume (all DBH Classes)	TNTW -	Total Number of Tree Wildlings
s.g. -	Second Growth Forests		

Table 4
Altitude, Tree Number and Volume (Transect 1, 20 x 20 m)

CPN	ALT (masl)	NOT	TVOL (cu m)
1	80	25	9.0
2	220	235	383.0
3	200	165	302.5
4	180	230	406.5
Average		164	275.3

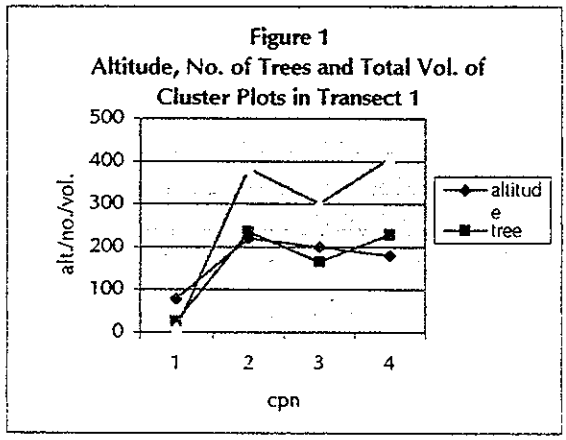


Table 5
Number of Species by Plot Size, Transect 1

CPN	NSP		
	20 x 20	5 x 5	1 x 1
1	5	37	32.0
2	32	40	24.0
3	20	74	19.0
4	30	56	16.0
Average	22	52	23

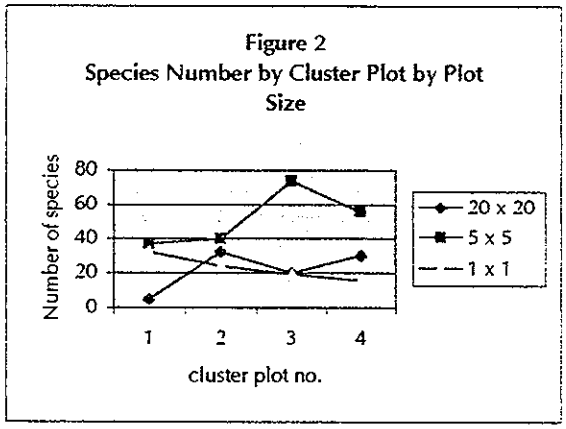


Table 6
Number of Trees by Subplot, Transect 1

CPN	NOT (20 X 20)	NOT (5 X 5)	TNTW (1 X 1)
1	25	1120	6000.0
2	235	2320	4000.0
3	165	2400	2000.0
4	230	2000	24000.0
Average	164	1960	9000.0

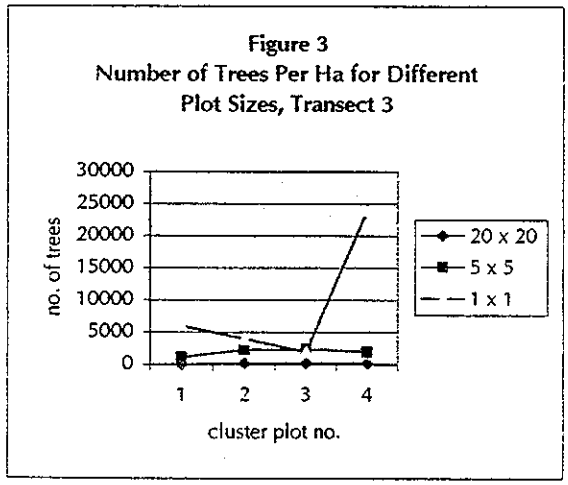


Table 7
Summary Information for Transect 2 (20 X 20 m Subplots)

CPN	Plot Information								Per hectare						
	NOT	NSP	ADBH (cm)	AMH (m)	RDBH (cm)	TVOL (cu m)	V60 (cu m)	V70 (cu m)	NOT	TVOL (cu m)	V60 (cu m)	V70 (cu m)	HV (cu m)	ALT (masl)	Remarks/ Landuse
1	8	7	35.5	8.9	20-60	4.68	3.50	0.00	40	23.42	17.49	74.70	41.73	180	abandoned kaingin
2	53	41	25.7	7.5	20-60	23.74	1.91	0.00	265	118.69	9.54	8.04	6.41	180	s.g.
3	48	43	29.5	7.9	20-76	18.17	0.00	3.57	240	90.85	17.86	19.66	14.30	140	s.g., rocky forms
4	19	12	26.4	6.6	20-56	6.07	0.00	0.00	95	30.35	0.00	0.00	0.00	110	s.g.
5	51	37	24.7	8.6	20-60	26.71	2.31	0.00	255	133.55	11.55	8.65	7.21	140	s.g., partly cultivated
6	60	35	33.1	10.1	20-70	35.15	4.14	1.73	300	175.76	29.33	16.69	15.68	200	s.g.
7	60	46	31.1	9.9	20-70	33.65	0.00	3.25	300	168.26	16.24	9.65	8.88	200	s.g.
8	57	44	29.8	7.9	20-64	21.03	2.31	0.00	285	105.16	11.57	11.00	8.39	260	s.g.
9	58	41	31.7	6.8	20-80	23.60	0.00	9.02	290	118.01	45.09	38.21	30.37	320	s.g.
10	59	43	29.2	8.3	20-80	25.81	1.75	2.83	295	129.03	22.88	17.74	14.59	340	s.g. w/ TSI Proj.
11	68	57	33.0	9.6	20-90	41.72	0.00	12.13	340	208.59	60.65	29.07	29.70	360	s.g. w/ TSI Proj.
12	58	45	27.3	9.0	20-60	20.99	2.23	0.00	290	104.97	11.13	10.61	8.09	420	o.g.
13	62	47	29.1	8.5	20-60	38.78	1.91	0.00	310	193.91	9.54	4.92	4.85	430	o.g., limestone form.
14	48	30	29.5	8.5	20-62	19.32	4.60	0.00	240	96.58	23.02	23.84	17.67	420	o.g., limestone areas
15	3	3	34.0	6.0	20-50	1.04	0.00	0.00	15	5.20	0.00	0.00	0.00	450	o.g., cliff/creekside
16	79	59	30.1	8.3	20-70	34.83	4.68	5.63	395	174.14	51.53	29.59	27.68	360	o.g., forested
17	46	36	31.1	7.8	20-60	19.89	3.82	0.00	230	99.45	19.09	19.19	14.37	400	o.g., near Goho river
18	37	32	28.1	7.5	20-50	12.68	0.00	0.00	185	63.40	0.00	0.00	0.00	460	o.g.
19	44	43	36.4	8.4	20-81	25.74	3.63	3.65	220	128.68	36.40	28.29	23.24	540	o.g., ridge/slope
20	32	31	31.4	7.6	20-60	13.61	0.00	0.00	160	68.06	0.00	0.00	0.00	620	o.g., rocky/sloping
Average	47.5	36.6	30.3	8.2	20-90	22.36	1.84	2.09	238	111.80	19.65	17.49	13.66		

Note: Per hectare values are extrapolated from plot values.

Table 8
Summary Information for Transect 2, 5 x 5 m Plots

CPN	Plot Information			Per hectare	
	NPLT	NSP	NOT	NPLT	NOT
1	31	19	6	2,480	480
2	18	18	11	1,440	880
3	20	20	11	1,600	880
4	22	19	12	1,760	960
5	40	30	16	3,200	1,280
6	15	14	9	1,200	720
7	32	29	15	2,560	1,200
8	16	16	12	1,280	960
9	15	14	12	1,200	960
10	22	22	13	1,760	1,040
11	22	22	15	1,760	1,200
12	26	22	16	2,080	1,280
13	17	16	11	1,360	880
14	24	23	17	1,920	1,360
15	15	15	6	1,200	480
16	24	23	13	1,920	1,040
17	23	22	12	1,840	960
18	18	16	9	1,440	720
19	19	18	10	1,520	800
20	24	20	11	1,920	880
Average	22.15	19.9	11.85	1,772	948

Table 9
Summary Information for Transect 2, 1 x 1 m Subplot

	Plot Information			Per Hectare	
CPN	TNOW	NSP	TNTW	TNOW	TNTW
1	46	24	1	92,000	2,000
2	88	23	1	176,000	2,000
3	22	17	5	44,000	10,000
4	86	20	3	172,000	6,000
5	81	20	13	162,000	26,000
6	34	18	6	68,000	12,000
7	43	25	2	86,000	4,000
8	35	26	5	70,000	10,000
9	28	15	5	56,000	10,000
10	31	15	6	62,000	12,000
11	31	17	2	62,000	4,000
12	47	23	2	94,000	4,000
13	36	16	3	72,000	6,000
14	31	16	5	62,000	10,000
15	26	20	10	52,000	20,000
16	27	21	6	54,000	12,000
17	39	23	7	78,000	14,000
18	39	23	6	78,000	12,000
19	30	23	9	60,000	18,000
20	29	25	4	58,000	8,000
Average	**41.5**	**20.5**	**5.1**	**82,900**	**10,100**

Table 10
Altitude, Tree Number and Volume
(Transect 2 - 20 x 20 m)

CPN	ALT (masl)	NOT	TVOL (cum)
1	180	40	23.42
2	180	265	118.69
3	140	240	90.85
4	110	95	30.35
5	140	255	133.55
6	200	300	175.76
7	200	300	168.26
8	260	285	105.16
9	320	290	118.01
10	340	295	129.03
11	360	340	208.59
12	420	290	104.97
13	430	310	193.91
14	420	240	96.58
15	450	15	5.20
16	360	395	174.14
17	400	230	99.45
18	460	185	63.40
19	540	220	128.68
20	620	160	68.06
Average	327	238	111.80

Figure 4
Altitude, Number of Trees and Volume Per Ha of Transect 2

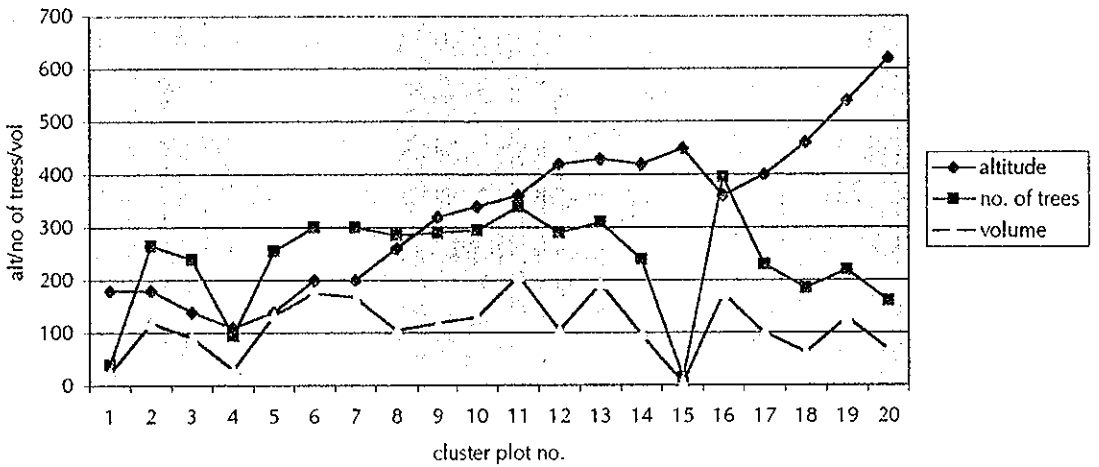


Table 12
Number of Trees by Subplot Size, Transect 2

CPN	NOT (20 X 20)	NOT (5 X 5)	TNTW (1 X 1)
1	40	480	2000
2	265	880	2000
3	240	880	10000
4	95	960	6000
5	255	1,280	26000
6	300	720	12000
7	300	1,200	4000
8	285	960	10000
9	290	960	10000
10	295	1,040	12000
11	340	1,200	4000
12	290	1,280	4000
13	310	880	6000
14	240	1,360	10000
15	15	480	20000
16	395	1,040	12000
17	230	960	14000
18	185	720	12000
19	220	800	18000
20	160	880	8000
Average	238	948	10100

Figure 6.
Number of Trees Per Ha by Subplot Size, Transect 2

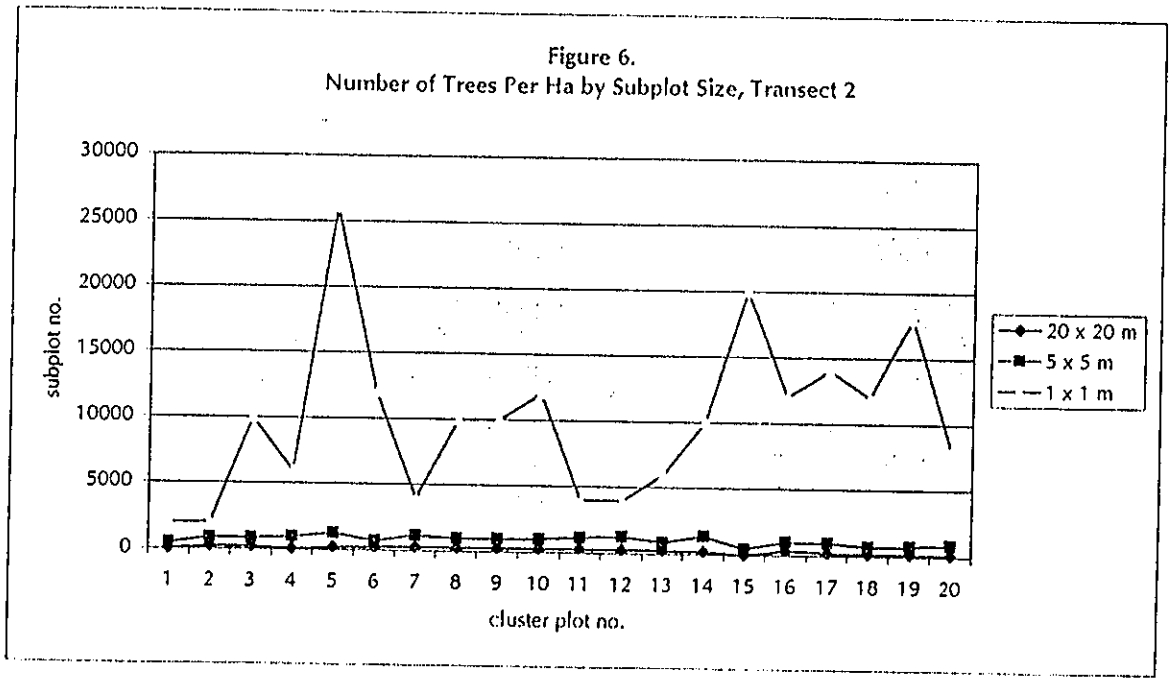


Table 11
Number of Species by Plot Size, Transect 2

CPN	NSP		
	20 x 20	5 x 5	1 x 1
1	7	19	24
2	41	18	23
3	43	20	17
4	12	19	20
5	37	30	20
6	35	14	18
7	46	29	25
8	44	16	26
9	41	14	15
10	43	22	15
11	57	22	17
12	45	22	23
13	47	16	16
14	30	23	16
15	3	15	20
16	59	23	21
17	36	22	23
18	32	16	23
19	43	18	23
20	31	20	25
Average	36.6	19.9	20.5

Figure 5
Species Distribution by Subplot Size, Transect 2

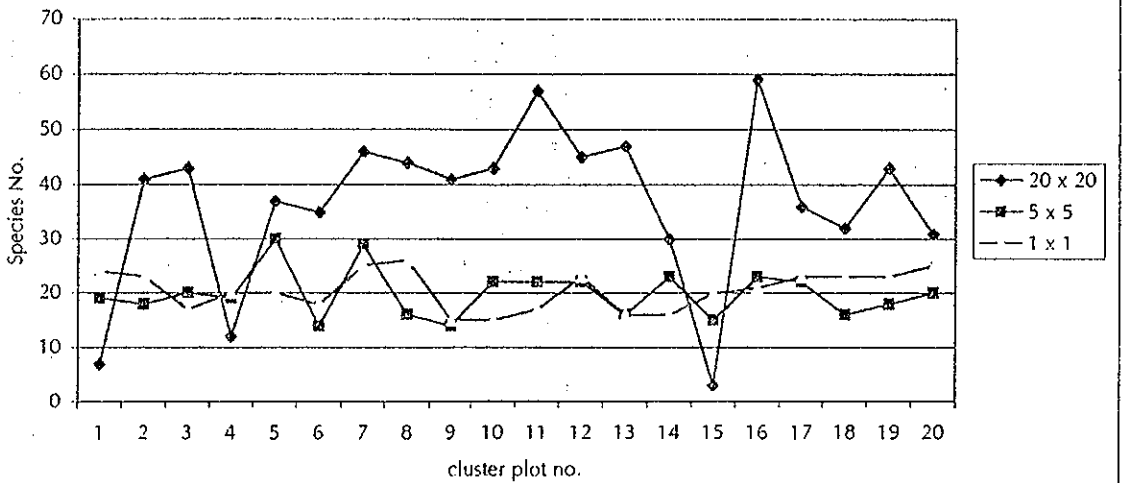


Table 13
Summary Information for Transect 3, 20 x 20 m Plots

CPN	Plot Information								Per hectare						Remarks/
	NOT	NSP	ADBH (cm)	AMH (m)	RDBH (cm)	TVOL (cum)	V60 (cum)	V70 (cum)	NOT	TVOL (cum)	V60 (cum)	V70 (cum)	HV (cum)	Altitude (masl)	Landuse
1	37	27	24.6	7.8	20-39	14.0	0.0	0.0	185	70.1	0.0	0.0	0.0	304	s.g., w/ ab. kaingin
2	50	38	24.4	8.0	20-50.2	22.6	0.0	0.0	250	112.8	0.0	0.0	0.0	310	s.g., w/in Loog WS
3	13	11	24.4	9.2	20-40.9	5.7	0.0	0.0	65	28.6	0.0	0.0	0.0	320	s.g., w/ ab. kaingin
4	52	38	23.5	8.1	20-40.2	20.4	0.0	0.0	260	102.0	0.0	0.0	0.0	340	s.g., w/ ab. kaingin
5	54	40	26.8	9.1	20-95.7	41.7	0.0	10.8	270	208.6	0.0	54.0	27.0	365	s.g, near rattan pltn
6	60	40	26.2	8.2	20-66	39.3	9.6	0.0	300	196.6	48.2	0.0	12.0	400	s.g., near ab. logging rd
7	29	23	30.4	8.0	20-65	22.6	3.7	0.0	145	112.9	18.3	0.0	4.6	340	s.g., creek at left
8	25	20	27.0	7.9	20-88	21.5	0.0	7.3	125	107.7	0.0	36.5	18.2	240	s.g., near ab. logging rd
9	54	38	29.3	8.8	20-72	41.0	3.7	5.9	270	204.9	18.4	29.5	19.4	250	s.g., near skid road
10	32	24	29.8	8.0	20-50	22.6	0.0	0.0	160	113.2	0.0	0.0	0.0	230	s.g., near Soluton rvr
11	17	8	25.4	5.6	20-50	6.6	0.0	0.0	85	33.0	0.0	0.0	0.0	310	s.g.
12	32	29	24.5	8.8	20-35	15.1	0.0	0.0	160	75.5	0.0	0.0	0.0	240	s.g., w/ cultivation
13	18	12	30.4	7.1	21-62	15.8	3.6	0.0	90	78.8	18.1	0.0	4.5	230	s.g.
14	65	41	30.2	9.5	20-64	54.0	3.9	0.0	325	269.8	19.3	0.0	4.8	270	s.g., near ab. kaingin
15	28	16	26.4	8.5	20-52	16.6	0.0	0.0	140	83.1	0.0	0.0	0.0	260	s.g., w/ ab. kaingin
16	11	5	24.6	6.6	20-36	3.5	0.0	0.0	55	17.5	0.0	0.0	0.0	340	s.g., w/ ab. kaingin
17	47	29	28.1	8.4	20-57	29.9	0.0	0.0	235	149.4	0.0	0.0	0.0	360	s.g
18	43	34	28.1	8.8	20-55	30.1	0.0	0.0	215	150.7	0.0	0.0	0.0	380	s.g
19	30	19	25.8	7.6	20-42	13.9	0.0	0.0	150	69.4	0.0	0.0	0.0	360	s.g., w/ new kaingin
20	42	28	30.5	9.5	20-62	31.6	4.2	0.0	210	157.9	21.1	0.0	5.3	320	s.g., w/ cultivation
21	48	46	31.5	9.2	20-60	41.4	9.0	0.0	240	207.2	45.0	0.0	11.3	300	s.g., rocky
22	66	59	33.3	8.8	20-60	59.0	6.2	0.0	330	295.0	31.1	0.0	7.8	300	s.g., ridge/steep slope
23	60	55	31.4	8.7	20-60	47.3	3.4	0.0	300	236.5	17.0	0.0	4.2	320	s.g., ridge/steep slope
24	64	48	31.2	8.3	20-97	66.5	3.6	28.8	320	332.3	18.1	144.1	76.6	340	s.g.
25	93	56	34.6	8.9	20-108	129.7	2.4	84.0	465	648.3	12.0	419.9	213.0	365	s.g
26	62	52	27.4	8.5	20-40	33.7	0.0	0.0	310	168.5	0.0	0.0	0.0	340	s.g., ridge/steep slope
27	49	42	26.2	7.4	20.5-46	21.6	0.0	0.0	245	108.0	0.0	0.0	0.0	320	s.g
28	58	53	31.8	7.2	20-67	42.2	7.0	0.0	290	211.0	35.0	0.0	8.7	380	s.g
29	74	68	33.3	10.5	20-60	83.4	5.1	0.0	370	416.8	25.5	0.0	6.4	380	o.g
30	57	56	35.7	10.4	20-62	78.9	9.7	6.5	285	394.6	48.7	32.6	28.5	400	o.g., near pool.
31	54	41	26.1	7.4	20-41	25.1	0.0	0.0	270	125.3	0.0	0.0	0.0	320	o.g.
32	70	67	34.7	7.2	21-65	60.7	7.5	0.0	350	303.5	37.6	0.0	9.4	420	o.g
33	66	59	29.4	9.0	20-66	90.7	10.0	0.0	330	453.3	49.8	0.0	12.4	500	o.g
34	69	53	25.7	8.1	20-55	50.5	0.0	0.0	345	252.4	0.0	0.0	0.0	540	o.g.
Average	48	38	28.6	8.3	20-108	38.2	2.7	4.2	239.6	191.0	13.6	21.1	13.9		

Note: Per hectare values are extrapolated from plot values.

Table 14
Summary Information for Transect 3, 5 x 5 m Plots

	Plot Information			Per hectare	
CPN	NPLT	NSP	NOT	NPLT	NOT
1	22	21	16	1,760	1,280
2	21	21	16	1,680	1,280
3	16	14	14	1,280	1,120
4	34	32	28	2,720	2,240
5	25	22	13	2,000	1,040
6	18	18	7	1,440	560
7	29	27	20	2,320	1,600
8	27	23	21	2,160	1,680
9	35	33	13	2,800	1,040
10	22	20	13	1,760	1,040
11	10	9	8	800	640
12	27	27	13	2,160	1,040
13	22	21	13	1,760	1,040
14	26	19	12	2,080	960
15	32	23	24	2,560	1,920
16	23	20	12	1,840	960
17	69	34	27	5,520	2,160
18	32	18	8	2,560	640
19	51	23	9	4,080	720
20	31	24	11	2,480	880
21	136	58	37	10,880	2,960
22	106	61	37	8,480	2,960
23	117	74	56	9,360	4,480
24	87	43	37	6,960	2,960
25	69	31	19	5,520	1,520
26	99	45	31	7,920	2,480
27	75	41	23	6,000	1,840
28	91	45	25	7,280	2,000
29	103	62	42	8,240	3,360
30	76	48	21	6,080	1,680
31	79	43	26	6,320	2,080
32	88	49	29	7,040	2,320
33	110	55	31	8,800	2,480
34	106	57	47	8,480	3,760
Average	**56**	**34**	**22**	4,480	1,760

Table 15
Summary Information for Transect 3, 1 x 1 m Subplots

	Plot Information			Per hectare	
CPN	TNOW	NSP	TNTW	TNOW	TNTW
1	42	22	1	84,000	2,000
2	22	15	2	44,000	4,000
3	17	11	3	34,000	6,000
4	36	19	8	72,000	16,000
5	27	18	5	54,000	10,000
6	26	21	11	52,000	22,000
7	22	16	6	44,000	12,000
8	27	14	11	54,000	22,000
9	38	17	10	76,000	20,000
10	27	16	3	54,000	6,000
11	28	11	1	56,000	2,000
12	22	15	1	44,000	2,000
13	47	18	2	94,000	4,000
14	40	23	12	80,000	24,000
15	27	17	4	54,000	8,000
16	55	25	9	110,000	18,000
17	28	17	7	56,000	14,000
18	25	20	4	50,000	8,000
19	31	20	12	62,000	24,000
20	32	19	8	64,000	16,000
21	37	20	4	74,000	8,000
22	49	21	8	98,000	16,000
23	43	21	4	86,000	8,000
24	59	33	15	118,000	30,000
25	33	19	5	66,000	10,000
26	72	23	4	144,000	8,000
27	46	21	4	92,000	8,000
28	44	23	4	88,000	8,000
29	40	29	12	80,000	24,000
30	36	24	2	72,000	4,000
31	33	23	5	66,000	10,000
32	42	23	9	84,000	18,000
33	32	22	5	64,000	10,000
34	41	30	7	82,000	14,000
Average	36	20	6	72,118	12,235

Table 16
Altitude, Tree Number and Volume
(Transect 3 - 20 x 20 m)

CPN	ALT (masl)	NOT	TVOL (cum)
1	304	185	70.1
2	310	230	112.8
3	320	65	28.6
4	340	260	102.0
5	365	270	208.6
6	400	300	196.6
7	340	145	112.9
8	240	125	107.7
9	250	270	204.9
10	230	160	113.2
11	310	85	33.0
12	240	160	75.5
13	230	90	78.8
14	270	325	269.8
15	260	140	83.1
16	340	55	17.5
17	360	235	149.4
18	380	215	150.7
19	360	150	69.4
20	320	210	157.9
21	300	240	207.2
22	300	330	295.0
23	320	300	236.5
24	340	320	332.3
25	365	465	648.3
26	340	310	168.5
27	320	245	108.0
28	380	290	211.0
29	380	370	416.8
30	400	285	394.6
31	320	270	125.3
32	420	350	303.5
33	500	330	453.3
34	540	345	252.4
Average		239.6	191.0

Figure 7
Altitude, Number of Trees and Volume of Cluster Plots in Transect 3

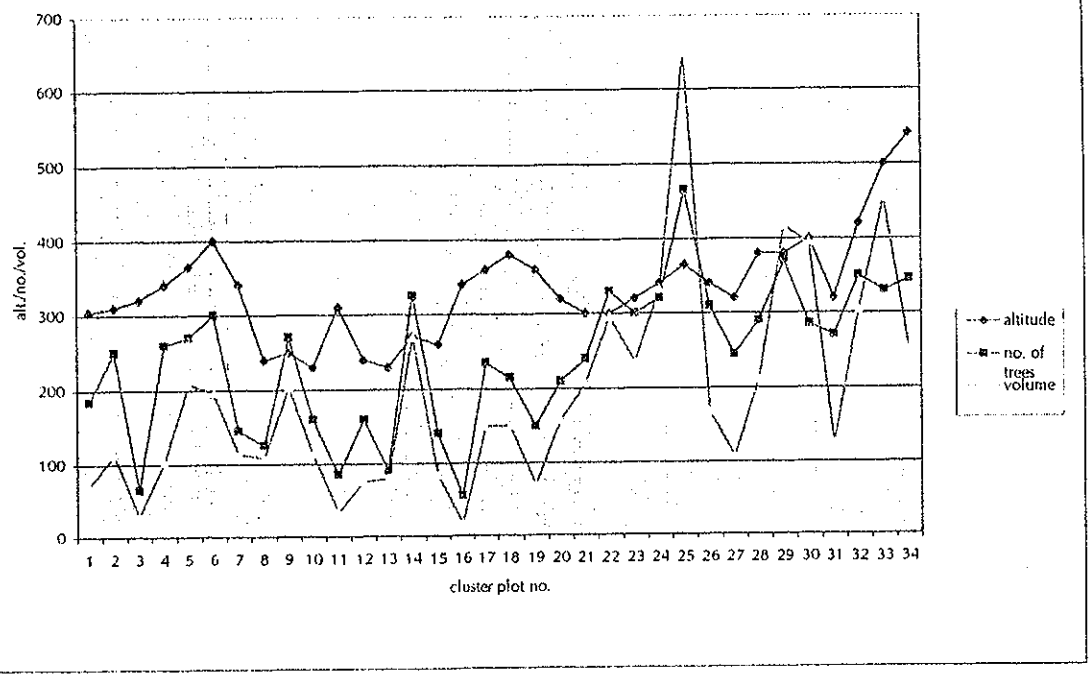


Table 17
Number of Species by Plot Size,
Transect 3

CPN	NSP		
	20 x 20	5 x 5	1 x 1
1	27	21	22
2	38	21	15
3	11	14	11
4	38	32	19
5	40	22	18
6	40	18	21
7	23	27	16
8	20	23	14
9	38	33	17
10	24	20	16
11	8	9	11
12	29	27	15
13	12	21	18
14	41	19	23
15	16	23	17
16	5	20	25
17	29	34	17
18	34	18	20
19	19	23	20
20	28	24	19
21	46	58	20
22	59	61	21
23	55	74	21
24	48	43	33
25	56	31	19
26	52	45	23
27	42	41	21
28	53	45	23
29	68	62	29
30	56	48	24
31	41	43	23
32	67	49	23
33	59	55	22
34	53	57	30
Average	37.5	34	20

Figure 8
Species Number by Cluster Plot by Plot Size

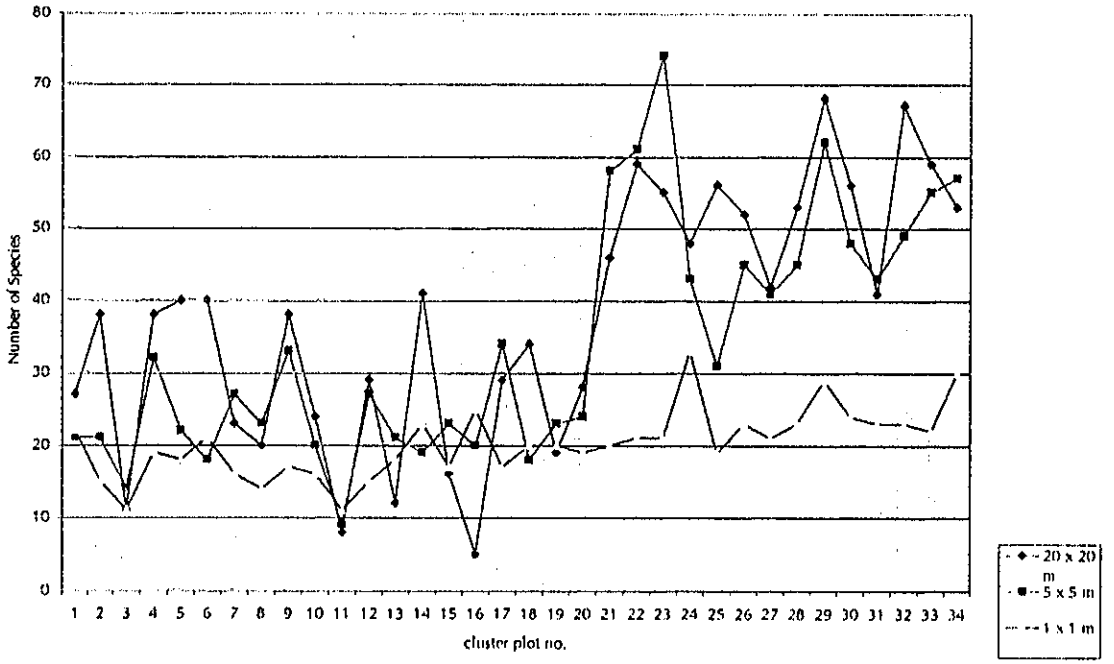


Table 18
Number of Trees by Subplot Size
Taransect 3

CPN	NOT (20 X 20)	NOT (5 X 5)	TNTW (1 X 1)
1	185	1,280	2,000
2	250	1,280	4,000
3	65	1,120	6,000
4	260	2,240	16,000
5	270	1,040	10,000
6	300	560	22,000
7	145	1,600	12,000
8	125	1,680	22,000
9	270	1,040	20,000
10	160	1,040	6,000
11	85	640	2,000
12	160	1,040	2,000
13	90	1,040	4,000
14	325	960	24,000
15	140	1,920	8,000
16	55	960	18,000
17	235	2,160	14,000
18	215	640	8,000
19	150	720	24,000
20	210	880	16,000
21	240	2,960	8,000
22	330	2,960	16,000
23	300	4,480	8,000
24	320	2,960	30,000
25	465	1,520	10,000
26	310	2,480	8,000
27	245	1,840	8,000
28	290	2,000	8,000
29	370	3,360	24,000
30	285	1,680	4,000
31	270	2,080	10,000
32	350	2,320	18,000
33	330	2,480	10,000
34	345	3,760	14,000
Average	239.6	1,786	12,235

Figure 9
Number of Trees Per Ha in Transect 3 for Different Plot Sizes

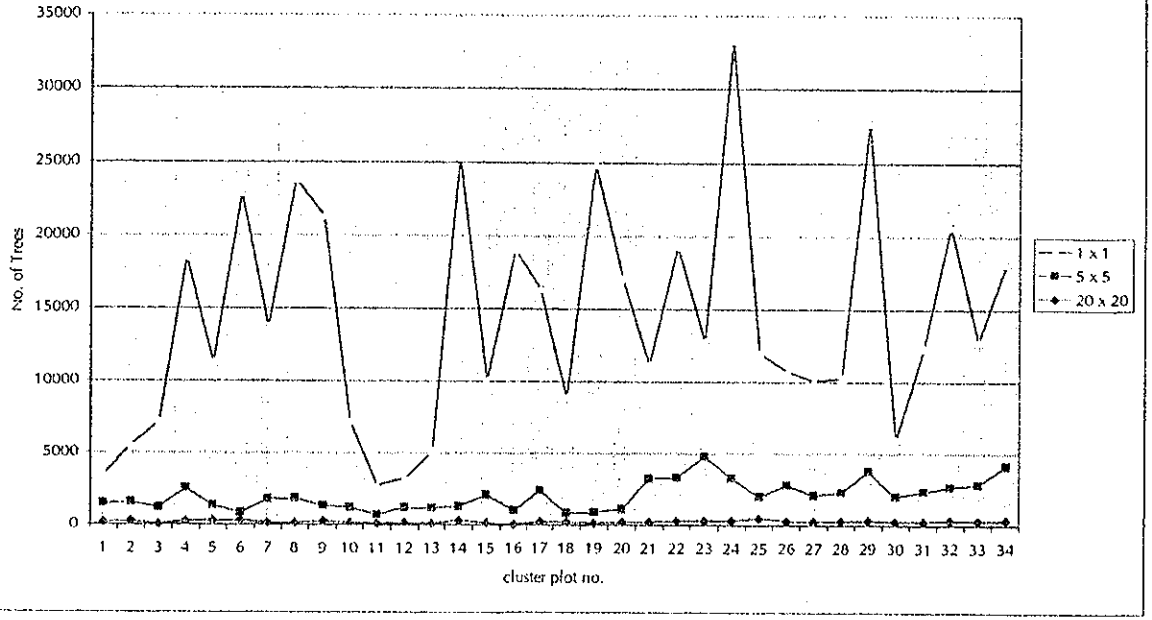


Table 19
Tree Species Occurrence in Transect 1 (20 x 20 m Subplots)

Local Name	CLUSTER PLOTS				Total No.	No. of Plots Occurred	% Occurrence
	1	2	3	4			
Almaciga				1	1	1	25.0
Almon		2	5	3	10	3	75.0
Apitong			2	1	3	2	50.0
Bago			1	1	2	2	50.0
Bagolangon		1			1	1	25.0
Bagolibos				1	1	1	25.0
Bagtikan		1	2	6	9	3	75.0
Bitanghol			1	2	3	2	50.0
Bono			1		1	1	25.0
Buntan	1				1	1	25.0
Duguan		2		1	3	2	50.0
Gango		1	1		2	2	50.0
Gisok-Gisok		3	2		5	2	50.0
Kapulasan	1				1	1	25.0
Langka-langka			1	2	3	2	50.0
Lanutan		1			1	1	25.0
Laura				1	1	1	25.0
Malaabocado				2	2	1	25.0
Malapotat		1			1	1	25.0
Malayakal				1	1	1	25.0
Mamiten		2	2	2	6	3	75.0
Mayapis	1	3	6	7	17	4	100.0
Mili-Pili			1		1	1	25.0
Narig		5	1	5	11	3	75.0
Pahutan	1	1			2	2	50.0
Palosapis		4			4	1	25.0
Panganahawan		1			1	1	25.0
Pili		1			1	1	25.0
Red Lauan		10	2	4	16	3	75.0
Red Nato				1	1	1	25.0
Tamayuan	1				1	1	25.0
Tangile		5	5	4	14	3	75.0
Ulayan		1			1	1	25.0
Wakatan		1			1	1	25.0
White Lauan				1	1	1	25.0
Yakal		1			1	1	25.0
Total	5	47	33	46			

Table 20
Tree Species Occurrence in Transect 2

Local Name	Scientific Name	CLUSTER PLOTS																				Total No.	No. of Plots Occurred	% Occurrence
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20			
Agpapangi				1		1																2	2	10.0
Almon	Shorea almon Foxw.		1	1	1	2		1			1	1					2					10	8	40.0
Anonang			1																		1	1	1	5.0
Anabiong	Trema orientalis (L.) Bl.				1	1					2	1	1								1	7	6	30.0
Anislag	Securinega flexuosa Muell.-Arg.			2																		2	1	5.0
Antipolo	Artocarpus blancoi (Elm.) Merr.			1																		1	1	5.0
Anuping	Gymnacranthera paniculata (A. DC.) Warb.			1				2												2		5	3	15.0
Apanang	Neotrewia cumingii (Muell.-Arg.) Pax & Hoffm.		3												3						2	8	3	15.0
Arahan	Litsea philippinensis Merr.						1	1	2		2	1		1			2					10	7	35.0
Badling	Astronia cumingiana Vid.		1				3			2	1	2	1		1							11	7	35.0
Baga uring	Beilschmiedia nervosa (Elm.) Merr.																1	1			1	3	3	15.0
Bagarilao	Miliusa vidalii J. Sincl.								2					2								4	2	10.0
Bagolimon	Diospyrus curanii Merr.						2	1		2				1			1					7	6	30.0
Bagtikan	Parashorea malaanonan (Blco.) Merr.	1									1				1		1					4	4	20.0
Bahai									1													1	1	5.0
Bahibahian	Leucosyke buderi Unr.	1						3		1												5	3	15.0
Balau	Sindora supa Merr.			1															1	2	1	1	1	5.0
Balokanad	Sterculia graciflora Perk.			1							1											6	5	25.0
Bansalagin	Mimusops elengi L.			2	1	1	15	1	1									1		1	1	24	9	45.0
Banuyo	Wallaceodendron celebicum Koord.		6									1								1	1	6	1	5.0
Batino	Alstonia sp.																				2	3	3	15.0
Bitanghol	Calophyllum blancoi Pl. & Tr.		8	1		3		2		2	3	3	2	4			2	2				34	12	60.0
Bono	Shorea spp.			1		3	2	1	3			3		4	1		1	2	2	2		25	12	60.0
Dalindingan	Hopea plagata (Blco.) Vid			1			1						1				1			1		5	5	25.0
Damol	Hydnocarpus subfalcata Merr.			1																		1	1	5.0
Dangula	Teijsmanniodendron ahernianum (Merr.) Bakh.			1						5		4	5	1	1		1					18	7	35.0
Duguan	Knema glomerata (Blco.) Merr.	2		2		4	7	7	2	11	9	8	6	6	10		16	6	3	1	1	101	17	85.0
Talcatta	Parasorianthes falcataria (L.) Nielsen				1																	1	1	5.0

Table 20. Continued . . .

Local Name	Scientific Name	CLUSTER PLOTS																				Total No.	No. of Plots Occurred	% Occurrence
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20			
Gango	Azidirachta indica A.H.L. Juss.					1			3	4		1	1									10	5	25.0
Gatasgatas	Diploknema ramiflora (Merr.) H.J. Lam.																			1		1	5	25.0
Gisok-Gisok	Hopea philippinensis Dyer			1	1				2	2	2		2	3		1		2	2			18	10	50.0
Gubas	Endospermum peltatum Merr.		9	3																		12	2	10.0
Hindang							1															1	1	5.0
Kalingag																	1					1	1	5.0
Kalongaratong	Baccaurea philippinensis (Merr.) Merr.			1																		1	1	5.0
Kalumpit	Terminalia darlingii Merr.																1					1	1	5.0
Kamaas	Carallia brachiata (Lour.) Merr.		2	2													1				4	9	4	20.0
Kamagong	Diospyrus discolor Willd.																1					1	1	5.0
Kapulasan	Nephelium spp.					1		1			1						1					4	4	20.0
Katmon	Dillenia sp.											1					1	1				3	3	15.0
Katongmatsing																				1		1	1	5.0
Kawidan	Timonius samarensis Merr.						1											1		1	1	4	4	20.0
Kubi	Artocarpus cumingianus Warb.		1																			1	1	5.0
Kurong	Claoxylon subviride Elm.																1					1	1	5.0
Kwakya	Pometia pinnata J.R. & G. Forst.			1																	2	3	2	10.0
Lanio	Dracontomelon dao (Blco.) Merr. & Rolfe									1												1	1	5.0
Lanite	Wrightia pubescens R.Br.							1							1				2	3	2	9	5	25.0
Lanutan	Goniothalamus elmeri Merr.		1	1							1		1			1						5	5	25.0
Laura							1		3		3	1	1	2	2		2	1	1	1		18	11	55.0
Maglimokan			2			2	1							2								7	4	20.0
Mahogany	Swietenia mahagoni Jacq.				1																	1	1	5.0
Makaasim	Syzygium nitidum Benth.			1										2	1					2		6	4	20.0
Mala-Bakbaw	Myristica ceylanica A. DC. var. cylindrica										1											1	1	5.0
Malabayabas	Tristania decorticata Merr.			1																		1	1	5.0
Mala-katmon	Dillenia sp.			1										1							1	3	3	15.0
Mala-Mala	Homonoia javense (Bl.) Muell.-Arg.																1			1	1	3	3	15.0
Malamanga	Kavea paniculata (Blco.) Merr.		1	1								1	1		2		1	2				9	7	35.0
Mala-Nangka	Artocarpus nitidus Trecc.							1	1	1		1	2	1	2				1	1		11	9	45.0
Malaruhat	Syzygium astronioides (C.B. Rob.) Merr.										1											1	1	5.0
Malatambis	Syzygium polycephaloides (C.B. Rob.) Merr.	1		1				1		3	2	1	1	2			1		4		2	19	10	50.0
Malugay	Pometia pinnata J.R. & G. Forst.	1																				1	1	5.0
Manuiten	Syzygium mainitense Elm.		4				2	2	1	2	1	4	1		1		3		1	1		23	12	60.0
Mangachapoi	Vatica mangachapoi Blco. ssp. mangachapoi												2				1			1		4	3	15.0

Table 20. Continued . . .

Local Name	Scientific Name	CLUSTER PLOTS																				Total No.	No. of Plots Occurred	% Occurrence
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20			
Mangasinoro	Shorea assamica Dyer ssp. koordersii (Brandis) Sym							1			1						1			1		4	4	20.0
Marok barok	Pongamia pinnata (L.) Merr. var. xerocarpa (Hassk.) Merr.					1																1	1	5.0
Matang Hipon	Glochidion philippicum (Cav.) C.B. Rob.				1			1				1										3	3	15.0
Mayapis	Shorea palosapis (Blco.) Merr.		2		3	10	10	8	5	4	7	4	10	9	13	1	9	7	8	2		112	17	85.0
Mili-Pili	Canarium hirsutum Willd. ssp. hirsutum var. scabi				1	4		1	1	2	1	2	2	1			2					17	10	50.0
Narig	Vatica mangachapoi Blco. ssp. mangachapoi			1		2		2	1	2	2	1	5	1	4		1	4	1	3		30	14	70.0
Pahutan	Mangifera sp.							1		2												3	2	10.0
Pailig/Amilig					2																	2	1	5.0
Paguringon			3	1						1												5	3	15.0
Pakpakan	Anisoptera thurifera (Blco.) ssp. thurifera							1	1		1											3	1	5.0
Palosapis	Anisoptera aurea Foxw.					1						1										2	2	10.0
Palway	Greeniopsis multiflora (Elm.) Merr.		1		1	2	1	1				1			1		1					9	8	40.0
Panglomboyen																				1		1	1	5.0
Puso-Puso	Litsea glutinosa (Lour.) C.B. Rob.			1							1			1								3	3	15.0
Putian	Hydnocarpus subfalcata Merr.			1			3		2	1												7	4	20.0
Red Lauan	Shorea negrosensis Foxw.	1		4	4		1	5	4	3	5	6	4	2	4		5	1	3		1	53	16	80.0
Sablot	Litsea glutinosa (Lour.) C.B. Rob.											1										1	1	5.0
Salingogon	Cratoxylum sumatranum (Jack.) Bl. ssp. sumatranum			1													1	1		2	1	6	5	25.0
Sudyang	Ctenolophon philippinense Hall.f.			1																		1	1	5.0
Taguang-Uwak	Croton leiophyllus Muell.-Arg.																1					1	1	5.0
Talisay-Gubat	Elaeocarpus monocera Cav.											1										1	1	5.0
Tamayuan	Strombosia philippinensis (Baill.) Rolfe					1		1			2		1				1			1	1	8	7	35.0
Tanghas	Myristica nitida Merr.																	2		1		3	2	10.0
Tangile	Shorea polysperma (Blco.) Merr.		4			1		1		2	1	4	2	3			5	4	1	5	2	35	13	65.0
Tangisang bayaw	Ficus variegata Bl. var. vatiegata Merr.		1																			1	1	5.0
Tiga	Tristania littoralis Merr				1									1			1	3	2	1		9	5	25.0
Tikoko	Teijsmaniodendron pteropodum (Miq.) Bakh.			1				1														2	2	10.0
Tulaanan				2																		2	1	5.0
Ulayan	Lithocarpus wenzelii Merr.		1			3		1	6	3	2	4		3			1		1			25	10	50.0
Wakatan	Pouteria velutina (Elm.) Baehni		1			7	4	3	9	1	4	4	4	8	1		2	5	3	3	4	63	16	80.0
White Nato	Pouteria macrantha (Merr.) Baehni							1	2			2	2	1			4	1				13	7	35.0
Yabnob				1															1			2	2	10.0
Yakal	Shorea astylosa Foxw.			2			4	6	5	1											1	19	6	30.0
Yaw-Yaw	Litsea micrantha Merr.	1		1																		2	2	10.0
Total		8	53	48	19	51	60	60	57	58	59	66	58	62	49	3	79	47	37	43	33			

Table 21
Tree Species Abundance in Transect 3 (20 x 20 m Subplots)

Local Name	CLUSTER PLOT NUMBER																																Total No.	No. of Plots Occurred	% Occurrence
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34			
Alinaciga										2				1							1		2			1									7	5	14.7
Almon				1	2		4	1	1			2		1				1		1	3	3	1		2	1	2	7	3		1	4	4	1	46	21	61.8
Alupag																														1					1	1	2.9
Amilig/Hamitong															2																				2	1	2.9
Anabiong	1						1														2								1						5	4	11.8
Anilao																					1														1	1	2.9
Anislag																														1					1	1	2.9
Antipolo		1																																	1	1	2.9
Anubing																					1														1	1	2.9
Anuping		2			3	2	1	1		1				1		2	2	2				1	2	1		4	2	1	1	2		2			33	19	55.9
Apanang																													1	2					3	2	5.9
Apitong						1	1	1						1			2											2	2	2	3		2	1	18	11	32.4
Arahan															1																				1	1	2.9
Badling		1		4	1	3		1										2	1					6	1	1	1	2	1						25	13	38.2
Bagauring																									1										1	1	2.9
Bago Tambis								1		1								1						2	2										7	5	14.7
Bago-Adlaw														1				1			1		1		1	2			1	1	1			1	11	10	29.4
Bago-langka						3												1					1												5	3	8.8
Bago-langon																							1												1	1	2.9
Bagolimon																													1						1	1	2.9
Bagolibas		1																					1												2	2	5.9
Bagtikan			1																		1	1							2	2			5	1	13	7	20.6
Bahai																											1			1			1		3	3	8.8
Bakan				1	1																						1			1				4	5	14.7
Balikbikan																														1					1	1	2.9
Balitantan																			1											1	1				3	3	8.8
Balite																										1									1	1	2.9
Balokanag																					1								1			1	1	2	5	4	11.8
Balunghasai																														1					1	1	2.9
Banay Banay				1																	1	2													4	3	8.8
Banitlog															2																		1		3	2	5.9
Batino	2	1		2														1			1				1	2									10	7	20.6
Bayuk-Bayukan																					1														1	1	2.9
Bitanghol				2					1					1				1	1			3	3	3	1			2				2			20	11	32.4
Bitaog																			1			2													3	2	5.9
Bitoko						2		1	1		1																								5	4	11.8
Bono		1																																	1	1	2.9
Bubotigan		1					4											1	1			3	2				1	2	1	1		1	3		21	12	35.3
Bulong-Ita																							1						1			1	1		4	6	17.6
Dalindingan		1		1		1														1									2		1	1			8	7	20.6
Damol															1																				1	1	2.9
Dangula		1		2		2		4		2				1	1		2	2		1		1	1	3	3	1					1	3		1	32	18	52.9
Dongu																						1	1												2	2	5.9
Duguan		3						1					1	2	1			2	2	2		4	1	1	2				1	2	1		3	4	33	17	50.0
Dulalog						1																1											1		3	3	8.8

Table 21. Continued . . .

Local Name	CLUSTER PLOT NUMBER																																Total No.	No. of Plots Occurred	% Occurrence
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34			
Dulip																														1			1		2	2	5.9
Falcatta						1		2			1		1		3	6	1	1	7																23	9	26.5
Gango						1									1								1			1	1		3	1			1	1	11	9	26.5
Gapas-Gapas							1		2	3	1	1	5						1				1						1				1		17	10	29.4
Gisok-Gisok			1						1			1		2			2			2	2		1		5	4	3				1	2		3	30	14	41.2
Guijo																					1		1		1	1									4	4	11.8
Hagimit										1	7		1			1							1						2						13	6	17.6
Hamilig																		1																	1	1	2.9
Hamindang	4	6																								3			1	1		1			16	6	17.6
Hanadgon																	9	4		5									2	1					18	4	11.8
Kalimutain																													2						3	2	5.9
Kalingag/Kaningag																													2						2	1	2.9
Kamaas																													3						3	1	2.9
Kamagong																																	1		1	1	2.9
Kamandiis																						3													3	1	2.9
Kanapay						2																	1												3	2	5.9
Kapulasan		1																												1			1		3	3	8.8
Katmon					1	3			3			3			1		1					7	3				2	3	2	1		2	2		34	14	41.2
Kawilan																									1										1	1	2.9
Kisiw				5	1				1																										7	3	8.8
Kulalabong																						2													2	1	2.9
Kulipapa																										1					2				3	2	5.9
Kurong					1														1																2	2	5.9
Kwakya														2									1		2	1		1				1		1	9	7	20.6
Lago					1															1								1				1			4	4	11.8
Langka-Langka			1	1																							2					1			5	4	11.8
Lanite	3	2																						1		1			4						11	5	14.7
Lanutan																					1						2	2	2	1		2			10	6	17.6
Lapnisan					1																													1	1	1	2.9
Laura	4	1			1																												1		7	4	11.8
Luktob																																	1		1	1	2.9
Makaasim			1															1			1		1												4	4	11.8
Mala-Bakhaw						1																										1			2	2	5.9
Malabuko																					1	2													3	2	5.9
Malabayabas				1						3							1			1				2	1	1	1		1				1		13	10	29.4
Malaigang									1																										1	1	2.9
Mala-Igot		3		2		2			1														1	4											13	6	17.6
Malaisaw									1																										1	1	2.9
Malakakaw																	2																1		2	1	2.9
Malakape																																			1	1	2.9
Mala-Katmon				1	2															1					4	3					2	1			14	7	20.6
Mala-Kopa																	1																		1	1	2.9
Mala-Mala																													1						1	1	2.9
Malamanga																							1							1					2	2	5.9
Malamansanas																																1			1	1	2.9

Table 21. Continued . . .

Local Name	CLUSTER PLOT NUMBER																																Total No.	No. of Plots Occurred	% Occurrence
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34			
Mala-Nangka	1									1																					1				3	3	8.8
Mala-Papaya						1																													1	1	2.9
Mala-Pinya					1	1			1														1				2					1			7	6	17.6
Malatambis	1														1			1					1	1					1						6	6	17.6
Mala-Tuba				1			1	1			2		2		1				1	1															10	8	23.5
Malayakal																														1					1	1	2.9
Mamiten		1		3	1	3							1	4				2		1				2	3						1			1	23	12	35.3
Mangachapoi				1		1								1							1		1	5	2				2		1	2	2	1	20	12	35.3
Mangasinoro				1																			1							1					3	3	8.8
Mangium		2																																	2	1	2.9
Marabutom																						1													1	1	2.9
Matang Hipon				6														1					1			1						1			10	5	14.7
Mayapis	5	4	1		10	6	2		10	5		8	1	11	6		11	5	2	11	2	1	1	5	17	8	9	7		1	10	5	3	7	174	29	85.3
Mili-Pili						1			2			1					1				1				1	1				1		1			10	9	26.5
Narig			2	2	3	1	2	1	4			2	1	9	1		5	2	2	4	3	4	3	1	6	3	2	2	1	2	1	2	2	3	76	29	85.3
Pahutan				1	1					1				4									1		1		1	1	3	2	3	5	3	2	29	14	41.2
Paitan						1																			1							1			3	3	8.8
Pagsahingin																							1		1				1						3	3	8.8
Paguringon																						1							1						2	2	5.9
Pakpakan/Liusin		1		1	3	2	1	1						1						1		1					2					1			15	11	32.4
Palosapis														2							2					1		1				3			9	5	14.7
Palway					1						1																				1				3	3	8.8
Pangahawon																			1					1											2	2	5.9
Pangnan																						1													1	1	2.9
Pili							1		3	1									1				1					2				1			10	7	20.6
Piling-Liitan		2	1		2	1			1			1		4	1		1								1						2				17	11	32.4
Potat																					1								1						2	2	5.9
Puso-Puso	1	1				1																		4	1	2				2			1		13	8	23.5
Putian	1			1					2			1																							5	4	11.8
Red Lauan	2	2	1	4	2	5	1	2	7		3		4	2		1	2	3	3	5	6	7	5	8	7	6	5	5	5	4	10	5	7	11	140	32	94.1
Sablot	2	1			1				1			4									1		1							1	2				14	9	26.5
Salingogon														1						3		1										1			6	4	11.8
Sirogan									1																										1	1	2.9
Siyaw		1																																	1	1	2.9
Taguang-Uwak							1											1												1					3	3	8.8
Talisay-Gubat		2											1					1						4	1			1		2		2			14	8	23.6
Tamayuan							1			1								1	1		1	2	1		4				2			2	2		18	11	32.4
Tambalaw													2																						2	1	2.9
Tanghas	1	1			1	1		2	2	3			2	2	1						1			1			3	3		1		2	1		28	17	50.0
Tangile	2		1		2	1		1	2	1		4		7	3	1		2			2	4	3	1	7	3	1	3	5	3	4	4	3	12	82	27	79.4
Tangisang bayawak																														1					1	1	2.9
Tiagkot																					1		1						2	1					5	4	11.8
Tiga							1													1	2		1			1			1	1	3			1	12	9	26.5
Tikoko			1				3		1					1																					6	4	11.8
Tuba-tuba						4																													4	4	11.8

Table 21. Continued . . .

Local Name	CLUSTER PLOT NUMBER																																	Total No.	No. of Plots Occurred	% Occurrence
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34			
Tugawi																													1						1	1	2.9
Tulanan																												2							2	1	2.9
Ulayan	4	2	1	3	3	4	3	4	2	6		3					3	1	1		2	1	3	4	1	3	4	4				3			65	23	67.6
Wakatan		1		1	4	1			2			1		2				1					1	4	5	1				3		1	3	31	15	44.1
White Lauan			1		3						1				1						1	5	1										1	6	20	9	26.5
White Nato		1		1	1												1		2									2				2			10	7	20.6
Yabnob																									2	2	1		2	2		1		1	11	7	20.6
Yakal	3	2		2																	1	2			4	1		2	3	4		1	2	4	31	13	38.2
Total	37	50	13	52	54	60	29	25	54	32	17	32	22	64	28	11	47	43	30	42	48	67	60	64	93	62	49	58	74	57	54	70	66	69			

Table 22
Tree Species with at Least 50 % Occurrence in All Transects , 20 x 20 m Subplots

Local Name	Scientific Name	Total No.	No. of Plots Occurred	% Occurrence
A. Transect 3 (34 subplots)				
1. Red Lauan	*Shorea negrosensis Foxw.*	140	32	94.1
2. Mayapis	*Shorea palosapis (Blco.) Merr.*	174	29	85.3
3. Narig	*Vatica mangachapoi Blco. ssp. mangachapoi*	76	29	85.3
4. Tangile	*Shorea polysperma (Blco.) Merr.*	82	27	79.4
5. Ulayan	*Lithocarpus wenzelii Merr.*	65	23	67.6
6. Almon	*Shorea almon Foxw.*	46	21	61.8
7. Anuping	*Gymnacranthera paniculata (A. DC.) Warb.*	33	19	55.9
8. Dangula	*Teijsmaniodendron ahernianum (Merr.) Bakh.*	32	18	52.9
9. Duguan	*Knema glomerata (Blco.) Merr.*	33	17	50.0
10. Tanghas	*Myristica nitida Merr.*	28	17	50.0
B. Transect 2 (20 subplots)				
1. Duguan	*Knema glomerata (Blco.) Merr.*	101	17	85.0
2. Mayapis	*Shorea palosapis (Blco.) Merr.*	112	17	85.0
3. Red Lauan	*Shorea negrosensis Foxw.*	53	16	80.0
4. Wakatan	*Pouteria velutina (Elm.) Baehni*	63	16	80.0
5. Narig	*Vatica mangachapoi Blco. ssp. mangachapoi*	30	14	70.0
6. Tangile	*Shorea polysperma (Blco.) Merr.*	35	13	65.0
7. Bitanghol	*Calophyllum blancoi Pl. & Tr.*	34	12	60.0
8. Bono	*Shorea falciferoides Foxw. ssp. falciferoides*	25	12	60.0
9. Mamiten	*Syzygium mainitense Elm.*	23	12	60.0
10. Laura		18	11	55.0
11. Gisok-Gisok	*Hopea philippinensis Dyer*	18	10	50.0
12. Malatambis	*Syzygium polycephaloides (C.B. Rob.) Merr.*	19	10	50.0
13. Mili-Pili	*Canarium hirsutum Willd. ssp. hirsutum var. scabium*	17	10	50.0
14. Ulayan	*Lithocarpus wenzelii Merr.*	25	10	50.0
C. Transect 1 (4 subplots)				
1. Mayapis	*Shorea palosapis (Blco.) Merr.*	17	4	100.0
2. Almon	*Shorea almon Foxw.*	10	3	75.0
3. Bagtikan	*Parashorea malaanonan (Blco.) Merr.*	9	3	75.0
4. Mamiten	*Syzygium mainitense Elm.*	6	3	75.0
5. Narig	*Vatica mangachapoi Blco. ssp. mangachapoi*	11	3	75.0
6. Red Lauan	*Hydnocarpus subfalcata Merr.*	16	3	75.0
7. Tangile	*Shorea polysperma (Blco.) Merr.*	14	3	75.0
8. Apitong	*Dipterocarpus grandiflorus (Blco.) Blco.*	3	2	50.0
9. Bago		2	2	50.0
10. Bitanghol	*Alstonia sp.*	3	2	50.0
11. Duguan	*Knema glomerata (Blco.) Merr.*	3	2	50.0
12. Gango	*Azidirachta indica A.H.L. Juss.*	2	2	50.0
13. Gisok-Gisok	*Hopea philippinensis Dyer*	5	2	50.0
14. Langka-langka	*Parinari sp.*	2	2	50.0
15. Pahutan	*Mangifera altissima Blco.*	2	2	50.0

Table 23
Tree Species Occurrence Along Different Elevations

Local Name	Selected Cluster Plots										
	1	2	3	4	5	6	7	8	9	10	11
Elevation (masl)	80	140	180	240	270	320	380	420	500	540	620
Volume/ha (cu m)	9	134	407	76	270	158	211	304	453	252	68
Red Lauan					***	***	***	***	***	***	***
Mayapis	***	***	***	***	***	***	***	***	***	***	
Narig		***	***	***	***	***	***	***	***	***	
Tangile		***	***	***	***		***	***	***	***	***
Ulayan		***		***		***	***	***			
Almon			***	***	***	***	***	***	***	***	
Anuping					***		***	***			
Dangula					***	***	***	***		***	
Duguan		***	***		***	***			***	***	***
Tanghas					***		***	***	***		
Wakatan		***									***
Bitanghol		***	***			***					***
Bono		***	***								
Malatambis										***	***
Milipili		***									
Apitong			***								
Bago			***								
Langka-langka			***								

Note: Entries (***) included species with at least 50 % occurrence in 3 transects.

Table 24
List of Economic Plants Found in the Transects

Local Name	Scientific Name	Family Name	Uses
Balokawi	*Dinochloa scandens (Bl. ex Nees) O.K.*	Graminae	Construction, Handicraft
Bagacay	*Schizostachyum lima (Blco.) Merr.*	Graminae	Construction, Handicraft
Buho	*Schizostachyum lumampao (Blco.) Merr.*	Graminae	Handicraft, House Construction
Bikal	*Schizostachyum spp.*	Graminae	Construction, Handicraft
Abaca	*Musa textilis Nee*	Musaceae	Fiber, Handicraft
Pakul/Wild Banana	*Musa sp.*	Musaceae	Fiber, Edible, Vinegar
Mono	*Areca caliso Becc.*	Palmae	Edible. Beverage
Bunga	*Areca catechu L.*	Palmae	Edible, Medicinal
Cabonegro	*Arenga pinnata (Wurmb) Merr.*	Palmae	Edible, Beverage, Vinegar, Lumber
Ilhian/Yaming	*Calamus discolor Mart.*	Palmae	Furniture. Handicraft
Yaming	*Calamus discolor Mart.*	Palmae	Furniture. Handicraft
Nokot	*Calamus filisfadix Becc.*	Palmae	Furniture. Handicraft
Palasan	*Calamus merilli Becc.*	Palmae	Furniture. Handicraft
Tumalim	*Calamus mindorensis Becc.*	Palmae	Furniture. Handicraft
Kalape/Limuran	*Calamus ornatus Bl. ex Schultes.f. var. philippinensis Becc.*	Palmae	Furniture, edible
Oway Babae	*Calamus sp. (also Malabagacay)*	Palmae	Furniture
Pugahan	*Caryota cumingii Lodd. ex Mart.*	Palmae	Sago, Beverage
Buri	*Corypha utan Lamk*	Palmae	Fiber, Beverage, Vinegar
Dita an	*Daemonorops mollis (Blco.) Merr.*	Palmae	Furniture. Handicraft
Sagisi	*Heterospathe philippinensis Becc.*	Palmae	Furniture. Handicraft
Anahaw	*Livistonia rotundifolia (Lamk.) Mart. var. luzonnensis Becc.*	Palmae	Lumber, Edible
Anibong	*Oncosperma gracilipes Becc.*	Palmae	Edible, Agricultural implements
Banga	*Orania decipiens Becc. var. montana Becc.*	Palmae	Tools, implements
Sarawag	*Pinanga insignis Becc. ssp. loheriana Becc.*	Palmae	Ornamental
Palmera		Palmae	Ornamental
Ulalahipan	*Freycinetia angulata C.B. Rob.*	Pandanaceae	Matweaving
Bariw	*Pandanus copelandii Merr.*	Pandanaceae	Matweaving
Ulango	*Pandanus radicans Blco.*	Pandanaceae	Matweaving
Punit	*Heterogonium wenzelii Copel*	Aspidiaceae	Driftwood

Table 25
Occurrence of Economic Plants in Transect 1

Local Name	Cluster Plot No.				Ave./ plot	Ave./ ha	Plot Occurrence	% Occurrence
	1	2	3	4				
Abaca	10				2.5	63	1	25.0
Wild Banana	12				3.0	75	1	25.0
Bunga	2				0.5	13	1	25.0
Ilhian/Yaming/Badling		5	26	14	11.3	281	3	75.0
Nokot				2	0.5	13	1	25.0
Kalape/Limuran				1	0.3	6	1	25.0
Pugahan		2			0.5	13	1	25.0
Anibong			19	12	7.8	194	2	50.0
Sarawag			2		0.5	13	1	25.0
Bariw		2		11	3.3	81	2	50.0
Punit	2				0.5	13	1	25.0

Table 26
Occurrence of Economic Plants in Transect 2

Local Name	Cluster Plot No.																				Ave./ plot	Ave./ ha	Plot Occurrence	% Occurrence
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20				
Balokawi	1																				0.1	1	1	5.0
Bagacay/bamboo				86																	4.3	108	1	5.0
Bikal			1																		0.1	1	1	5.0
Abaca	32																				1.6	40	1	5.0
Wild banana	21																				1.1	26	1	5.0
Ilhian/Yaming		1	1		2	3	5	3	3	4	6	2	4	5	5	4	5	5	2	7	3.4	84	18	90.0
Tumalim							2														0.1	3	2	10.0
Kalape	1	1		1	1		2	1				1	1			2					0.6	14	9	45.0
Oway babae/malabagacay			1		3										1	2					0.4	9	4	20.0
Pugahan					5	1	5	1		2	2	5			1		2		1		1.3	31	10	50.0
Anahaw			1		1					1				1				1	2	3	0.5	13	7	35.0
Anibong																1		2	7	6	0.8	20	4	20.0
Palmera		2								1										2	0.3	6	3	15.0
Bariw			3				1			1					1		1			2	0.5	11	6	30.0
Ulango					5			1			1	2	1			2		1			0.7	16	7	35.0
Punit	6		2				1									2					0.6	14	4	20.0

Table 27
Occurrence of Economic Plants in Transect 3

Local Name	Cluster Plot No.																		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Balokawi									2			8							3
Buho																			
Bikal										1									
Abaca			1					4					3		1	9	2	3	7
Mono				7		14	1		1		5		23	2	1		26	1	8
Bunga										4									
Ilhian/Yaming			4		7	3	3	3	17	3		12	4	13	1		1	7	
Nokot	3	2			2									1			3	1	6
Kalape						4	3									3	1		
Pugahan																			
Dita an																			
Sagisi																			
Limuran																			
Palasan																			
Sika																			
M'bagacay/Oway b.					3	2	3					2	4		1			1	13
Anahaw	9								1	1		3		2				3	
Anibong														1			2		3
Banga																			
Sarawag		6	4	6		7	1	2	2	3		1					2	3	
Bariw	2	1																	1
Ulango									1			1							
Punit				3				1								6			1
Nito																			

Local Name	Cluster Plot No.															Ave./ plot	Ave./ ha	Plot Occurr.	% Occurr.
	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34				
Balokawi						5		3								0.6	15	5	14.7
Buho										12						0.4	9	1	2.9
Bikal																0.0	1	1	2.9
Abaca	7		3	6						9	2					1.7	42	13	38.2
Mono	2	1			20	5	2	2	10				6			4.0	101	19	55.9
Bunga			2						2							0.2	6	3	8.8
Ilhian/Yaming	1	14	6	3	17	5	13	9	6	3	3	15	15		10	5.8	146	27	79.4
Nokot	3	4	7	4	6	20	10	15	27	3	4	8	10	10	6	4.6	114	21	61.8
Kalape						4	2	2	5			7	5		12	1.4	35	11	32.4
Pugahan			2							4	5			3		0.4	10	4	11.8
Dita an				5							5			3		0.4	10	3	8.8
Sagisi				3							3			1		0.2	5	3	8.8
Limuran		3	3	7												0.4	10	3	8.8
Palasan		10	5	5						3	4	1		16		1.3	32	7	20.6
Sika		5	5													0.3	7	2	5.9
M'bagacay/Oway b.	5	1	3	14	3		9	10	2	6	6	3	6		5	3.0	75	21	61.8
Anahaw	3	6	5			1	3	1	6			7	1	4		1.6	41	16	47.1
Anibong			2			9	5	2	8	5		6	10		14	2.0	49	12	35.3
Banga				1						1	1					0.1	2	3	8.8
Sarawag	1	12	7	10	2		8			6	6	4		2	9	3.1	76	22	64.7
Bariw											1				2	0.2	5	5	14.7
Ulango					2											0.1	3	3	8.8
Punit	1								5			1				0.5	13	7	20.6
Nito		5	5								1			4		0.4	11	4	11.8

Table 28
Highly Abundant Economic Plants in Three Transects Based on % Occurence

Local Name	TRANSECT			Weighted Ave. Occurrence
	1	2	3	
Abaca	25.0		38.2	24.1
Wild banana	25.0			1.7
Mono			55.9	32.8
Ilhian/Yaming	75.0	90.0	79.4	82.8
Nokot	25.0		61.8	38.0
Kalape	25.0	45.0	32.4	36.2
Pugahan	25.0	50.0		19.0
M'bagacay/Oway b.		20.0	61.8	43.1
Anahaw		35.0	47.1	39.7
Anibong	50.0	20.0	35.3	31.0
Sarawag	25.0		64.7	39.7
Palmera		15.0		5.2
Bariw	50.0	30.0		13.8
Ulango		35.0		12.1
Punit	25.0	20.0	20.6	20.7

Figure 10
Abundance Chart of Non-Timber Economic Plants Found Along the Transects

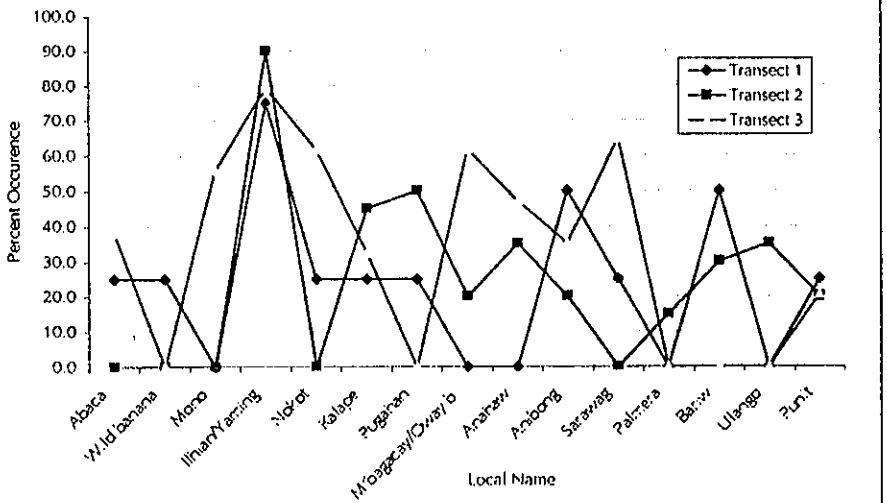


Table 29
Yield Per Hectare and Stumpage Prices of Forest Products and Agroforestry Crops in Samar Island

Species	Planting density	Final product	Harvest Year	Yield per ha	Unit of measure	Stumpage Price (P)
Plantation Forest						
Mahogany	4 x 4	poles	15th	90	cu m	1,908.0
		fuelwood	15th	44	cu m	225.0
		sawlog	20th	202	cu m	3,816.0
		fuelwood	20th	50	cu m	225.0
Bagras	3 x 3	poles	12th	90	cu m	6,000.0
		fuelwood	12th	73	cu m	225.0
	4 x 4	sawlog	16th	175	cu m	2,400.0
		fuelwood	16th	43	cu m	225.0
		pulpwood	8th	127	cu m	1,100.0
Gmelina	4 x 4	sawlog	10th	94	cu m	2,480.3
		fuelwood	10th	62	cu m	225.0
	4 x 4	Poles	12th	74	cu m	4,000.0
		fuelwood	12th	74	cu m	225.0
Mangium	4 x 4	sawlog	10th	140	cu m	2,480.3
		furlwood	10th	40	cu m	225.0
Bamboo	6 x 6	poles	6th	278	pcs	30.0
			8th	556	pcs	30.0
			10th	834	pcs	30.0
			nth	834	pcs	30.0
Rattan	5 x 5	poles	12th	400	pcs	7.5
			15th	200	pcs	7.5
			18th	200	pcs	7.5
			. . .	200	pcs	7.5
			nth	200	pcs	7.5
Natural Forest						
Common Hardwods		tbr	40th yeal	38.3	cu m	3,750.0
Const. & Furniture Wood		tbr	40th yeal	25.5	cu m	3,000.0
Other wood Sp.		tbr	40th yeal	16.3	cu m	1,500.0
Bamboo		poles	yearly	150	pcs	30.0
Rattan		poles	every 5th yr	1200	stems	7.5
Buho		poles	yearly	1500	pcs	3.8
Almaciga Resin		resin	yearly		kg	12.8
Agroforestry Crops						
Citrus	5 x 5	fruit	5th	1400	kg	7.0
			10th-15th	8000	kg	
			16th-25th	6000	kg	7.0
Kalamansi	3 x 3	fruit	5th	1111	kg	4.0
			10th-15th	15000	kg	4.0
			16th-25th	10000	kg	4.0
coffee	3 x 3	dried beans	4th	250	kg	28.0
			10th-25th	2311	kg	28.0
Nangka	5 x 5	ripe fruit	5th	2000	kg	7.0
			11th-25th	16800	kg	7.0
Abaca			4th	600	kg	20.0
			5th-6th	900	kg	20.0
			7th - onwards	1500	kg	20.0

Sources: National Forestation Development Office.

Table 30
Summary of Costs for Different Forest Development Strategies

COMPONENT	SPECIES	SPACING (m)	OPERATIONS COSTS (P)				PROJECT MANAGEMENT COST (P)	TOTAL COSTS (P)
			NURSERY OPERATIONS	PLANTATION ESTABLISHMENT	MAINTENANCE & PROTECTION	INFRAS-TRUCTURE		
Reforestation	FGS	2 x 3	5,846	7,732	22,183	1,757	5,628	43,146
	FGS	5 x 2	3,636	4,719	18,816	1,757	4,339	33,267
	FGS	4 x 4	2,394	3,024	11,874	1,757	2,857	21,907
Agroforestry <a	Fruit tree-based w/ fuelwood	10 x 10 2 x 2	9,636	5,597	15,049	1,757	4,806	36,845
Agroforestry <b	Pure fruittrees	4 x 4	2,544	3,024	13,179	1,757	3,076	23,580
Assisted Natural Regeneration	Assorted	appx 5 x 5	1,648	2,466	12,511	624	2,587	19,837
Bamboo (nursery raised)	Bamboo	5 x 5	5,381	5,130	9,353	1,757	3,243	24,865
Enrichment Planting	FGS/SGS	appx 5 x 5	1,648	2,466	5,608	1,757	1,722	13,202
Rattan	Rattan	5 x 5	1,744	2,736	9,235	624	2,151	16,489
Timber Stand Improvement <c			1,040	3,138	2,840	511	1,129	8,659

Source: DENR MC 2000-19, 2000.

Notes:

1. The data used in updating the cost estimates were gathered during a series of cost validations in JBIC Watershed Subprojects.
2. FGS - fast growing species, SGS - slow growing/indigenous species

<a - Large fruit trees like mango, durian and marang.

<b - Small fruit trees like kalamansi, guava, guyabano, etc.

<c - Plantation establishment costs for TSI include Cost of Access improvement (P525), TSI Implementation (P1,610) and Supplemental Planting (P953).

Table 31
Cost Standards for Forest Tree Plantations (gmelina, falcata, mangium, etc., 3 x 2 m Spacing)

COMPONENT/ACTIVITY	UNIT OF MEASURE	GOAL/ HA	MATERIAL COSTS			LABOR COSTS			TOTAL COSTS / HA(P)	COST PER SDLG(P)
			INPUTS Required	UNIT COST	COST/ ha (P)	Mandays Required	Cost/ Manday	COST/ ha (P)		
A. OPERATIONAL COST		1667					170.00			
1. NURSERY OPERATIONS										
Procurement/handling of certified seeds	seed	2000	seeds	0.30	600.00	0.50	170.00	85.00	685.00	0.41
Nursery bed preparation	sq.m.	8				1.00	170.00	170.00	170.00	0.10
Sowing of seed	seeds	2000				0.82	170.00	139.06	139.06	0.08
Gathering & preparation of soil	cu.m.	3.15				3.15	170.00	534.87	534.87	0.32
Potting of seedlings	pots	2000	p. bags	0.15	300.00	8.06	170.00	1,370.97	1,670.97	1.00
Prepn of potbeds & pot arrangements	pots	2000				0.26	170.00	45.05	45.05	0.03
Maintenance of seedlings *	sdlg	2000				14.40	170.00	2,448.16	2,448.16	1.47
Fertilizer application (5 gm/p. bag)	kg	10.00	fert.	8.50	85.00	0.25	170.00	42.50	127.50	0.08
Tools					25.00				25.00	0.02
SUB TOTAL					1,010.00	28.44	170.00	4,835.60	5,845.60	3.51
PERCENTAGE					17.28			82.72		
2. PLANTATION ESTABLISHMENT										
Brushing (strip 2m-wide, 300 sq m/md)	sq.m.	3333				11.11	170.00	1,888.89	1,888.89	1.13
Staking (500 spots/md)	stake	1667				3.33	170.00	566.67	566.67	0.34
Hole Digging (150 spots/md)	hole	1667				11.11	170.00	1,888.89	1,888.89	1.13
Seedling transport/hauling (240sdlg/md)	sdlg.	1833				7.64	170.00	1,298.61	1,298.61	0.78
Planting (150 sdlg/md)	sdlg.	1667				11.11	170.00	1,888.89	1,888.89	1.13
Tools & materials					200.00				200.00	0.12
SUB TOTAL					200.00	44.31	170.00	7,531.94	7,731.94	4.64
PERCENTAGE					2.59			97.41		
3. PLANTATION MAINTENANCE & PROTECTION (3 yrs)										
Ringweeding/spot cultivation (1 m radius)	spots									
Year 1 (3 passes, 120 spots/md)	spots	1667				41.67	170.00	7,083.33	7,083.33	4.25
Year 2 (3 passes, 150 spots/md)	spots	1667				33.33	170.00	5,666.67	5,666.67	3.40
Year 3 (2 passes, 200 spots/md)	spots	1667				16.67	170.00	2,833.33	2,833.33	1.70
Replanting, 20% (including sdlg transport)	spots	333	sdlgs	3.51	1,169.12	8.86	170.00	1,506.39	2,675.51	8.03
Fertilizer Application										
Year 1 (2 passes, 40g/pass)	spots	1667	fertilizer	8.50	1,133.33	4.17	170.00	708.33	1,841.67	1.11
Year 2 (2 passes, 40g/pass)	spots	1667	fertilizer	8.50	1,133.33	4.17	170.00	708.33	1,841.67	1.11
Patrol work	ha	1				1.33	170.00	226.10	226.10	0.14
Tools					15.00				15.00	0.01
SUB TOTAL					3,450.79	110.19	170.00	18,732.49	22,183.28	19.73
PERCENTAGE					15.56			84.44		
4. INFRASTRUCTURE										
Nursery facilities (1 nursery/400 ha)**					250.00	1.00	170.00	170.00	420.00	0.25
Graded trail (1m-wide, 50m/ha)	meter	50				0.33	170.00	56.67	56.67	0.03
Footpath (1m-wide, 50m/ha)	meter	50				0.33	170.00	56.67	56.67	0.03
Fireline const'n (10 m width, 120m/md)	sq.m.	500				4.17	170.00	708.33	708.33	0.43
Fireline maintenance (200 sq m/md)	sq.m.	500				2.50	170.00	425.00	425.00	0.26
Bunkhouse (1 unit/200 ha)					350.00	0.55	170.00	93.50	443.50	0.27
Lookout tower (1unit/200ha)					50.00	0.10	170.00	17.00	67.00	0.04
SUB TOTAL					400.00	7.33	170.00	1,357.17	1,757.17	1.05
PERCENTAGE					22.76			77.24		
TOTAL OPERATIONAL COST					5,060.79	190.27	170.00	32,457.20	37,517.99	28.93
PERCENTAGE					13.49			86.51		
B. PROJECT MANAGEMENT COST (PMC)(15% of TOC)										
a. First Year (40% of PMC)									2,251.08	1.35
b. Second Year (30% of PMC)									1,688.31	1.01
c. Third Year (30% of PMC)									1,688.31	1.01
SUB TOTAL									5,627.70	3.38
GRAND TOTAL									43,145.68	25.89

Source: DENR MC 2000-19, 2000.

Notes:

* - Maintenance includes cultivation, weeding, fertilization, hardening, grading under DENR supervision, and other activities in the nursery.

** - Estimated nursery establishment cost is P100,000.0

Table 32
Cost Standards for Forest Tree Plantations (gmelina, falcata, mangium, etc., 5 x 2 m Spacing)

COMPONENT/ACTIVITY	UNIT OF MEASURE	MATERIAL COSTS				LABOR COSTS			TOTAL COSTS / HA(P)	COST PER SDLG(P)
		COAU/ HA	INPUTS Required	UNIT COST	COST/ ha (P)	Mandays Required	Cost/ Manday	COST/ ha (P)		
A. OPERATIONAL COST		1000					170.00			
1. NURSERY OPERATIONS										
Procurement/handling of certified seeds	seed	1200	seeds	0.30	360.00	0.50	170.00	85.00	445.00	0.45
Nursery bed preparation	sq.m.	8				1.00	170.00	170.00	170.00	0.17
Sowing of seed	seeds	1200				0.49	170.00	83.43	83.43	0.08
Gathering & preparation of soil	cu.m.	1.89				1.89	170.00	320.92	320.92	0.32
Potting of seedlings	pots	1200	p. bags	0.15	180.00	4.84	170.00	822.58	1,002.58	1.00
Prepn of potbeds & pot arrangements	pots	1200				0.16	170.00	27.03	27.03	0.03
Maintenance of seedlings *	sdlg	1200				8.64	170.00	1,468.89	1,468.89	1.47
Fertilizer application (5 gm/p. bag)	kg	6.00	fert	8.50	51.00	0.25	170.00	42.50	93.50	0.09
Tools					25.00				25.00	0.03
SUB TOTAL					616.00	17.77	170.00	3,020.36	3,636.36	3.64
PERCENTAGE					16.94			83.06		
2. PLANTATION ESTABLISHMENT										
Brushing strip 2m-wide, 300 sq m/md)	sq m.	2000				6.67	170.00	1,133.33	1,133.33	1.13
Staking (500 spots/md)	stake	1000				2.00	170.00	340.00	340.00	0.34
Hole Digging (150 spots/md)	hole	1000				6.67	170.00	1,133.33	1,133.33	1.13
Seedling transport hauling (240sdlg/md)	sdlg.	1100				4.58	170.00	779.17	779.17	0.78
Planting (150 sdlg/md)	sdlg	1000				6.67	170.00	1,133.33	1,133.33	1.13
Tools & materials					200.00				200.00	0.20
SUB TOTAL					200.00	26.58	170.00	4,519.17	4,719.17	4.72
PERCENTAGE					4.24			95.76		
3. PLANTATION MAINTENANCE & PROTECTION (3 yrs)										
Ringweeding/spot cultivation (1 m radius)	spots									
Year 1 (4 passes, 100 spots/md)	spots	1000				40.00	170.00	6,800.00	6,800.00	6.80
Year 2 (4 passes, 120 spots/md)	spots	1000				33.33	170.00	5,666.67	5,666.67	5.67
Year 3 (2 passes, 150 spots/md)	spots	1000				13.33	170.00	2,266.67	2,266.67	2.27
Replanting, 20% (including sdlg transport)	spots	200	sdlg.	3.64	727.27	5.32	170.00	903.83	1,631.11	1.63
Fertilizer Application										
Year 1 (2 passes, 40g)	spots	1000	fertilizer	8.50	680.00	2.50	170.00	425.00	1,105.00	1.11
Year 2 (2 passes, 40g)	spots	1000	fertilizer	8.50	680.00	2.50	170.00	425.00	1,105.00	1.11
Patrol work	ha	1				1.33	170.00	226.10	226.10	0.23
Tools					15.00				15.00	0.02
SUB TOTAL					2,102.27	98.31	170.00	16,713.27	18,815.54	18.82
PERCENTAGE					11.17			88.83		
4. INFRASTRUCTURE										
Nursery facilities (1 nursery/400 ha)**					250.00	1.00	170.00	170.00	420.00	0.42
Graded trail (1m-wide, 50m/ha)	meter	50				0.33	170.00	56.67	56.67	0.06
Footpath (1m-wide, 50m/ha)	meter	50				0.33	170.00	56.67	56.67	0.06
Fireline const'n (10 m width, 120m/md)	sq.m.	500				4.17	170.00	708.33	708.33	0.71
Fireline maintenance (200 sq m/md)	sq.m.	500				2.50	170.00	425.00	425.00	0.43
Bunkhouse (1 unit/200 ha)					350.00	0.55	170.00	93.50	443.50	0.44
Lookout tower (1 unit/200ha)					50.00	0.10	170.00	17.00	67.00	0.07
SUB TOTAL					400.00	7.33	170.00	1,357.17	1,757.17	1.76
PERCENTAGE					22.76			77.24		
TOTAL OPERATIONAL COST					3,318.27	150.00	170.00	25,609.96	28,928.23	28.93
PERCENTAGE					11.47			88.53		
B. PROJECT MANAGEMENT COST (PMC)(15% of TOC)										
a. First Year (40% of PMC)									1,735.69	1.74
b. Second Year (30% of PMC)									1,301.77	1.30
c. Third Year (30% of PMC)									1,301.77	1.30
SUB TOTAL									4,339.23	4.34
GRAND TOTAL									33,267.47	33.27

Source: DENR MC 2000-19, 2000.

Notes:

* - Maintenance includes cultivation, weeding, fertilization, hardening, grading under DENR supervision, and other activities in the nursery

** - Estimated nursery establishment cost is P100,000.0

Table 33
Cost Standards for Forest Tree Plantations (gmelina, falcata, mangium, etc., 4 x 4 m Spacing)

COMPONENT/ACTIVITY	UNIT OF MEASURE	MATERIAL COSTS				LABOR COSTS			TOTAL COSTS / HA(P)	COST PER SDLG(P)
		GOAL/ HA	INPUTS Required	UNIT COST	COST/ ha (P)	Mandays Required	Cost/ Manday	COST/ ha (P)		
A. OPERATIONAL COST		625					170.00			
1. NURSERY OPERATIONS										
Procurement/handling of certified seeds	seed	750	seeds	0.30	225.00	0.50	170.00	85.00	310.00	0.50
Nursery bed preparation	sq.m.	8				1.00	170.00	170.00	170.00	0.27
Sowing of seed	seeds	750				0.31	170.00	52.15	52.15	0.08
Gathering & preparation of soil	cu.m.	1.18				1.18	170.00	200.58	200.58	0.32
Potting of seedlings	pots	750	p. bags	0.15	112.50	3.02	170.00	514.11	626.61	1.00
Prepn of potbeds & pot arrangements	pots	750				0.10	170.00	16.89	16.89	0.03
Maintenance of seedlings *	sdlg	750				5.40	170.00	918.06	918.06	1.47
Fertilizer application (5 gm/p. bag)	kg	3.75	fert.	8.50	31.88	0.25	170.00	42.50	74.38	0.12
Tools					25.00				25.00	0.04
SUB TOTAL					394.38	11.76	170.00	1,999.29	2,393.66	3.83
PERCENTAGE					16.48			83.52		
2. PLANTATION ESTABLISHMENT										
Brushing (strip 2m-wide, 300 sq m/md)	sq.m.	1250				4.17	170.00	708.33	708.33	1.13
Staking (500 spots/md)	stake	625				1.25	170.00	212.50	212.50	0.34
Hole Digging (150 spots/md)	hole	625				4.17	170.00	708.33	708.33	1.13
Seedling transport/hauling (240sdlg/md)	sdlg.	688				2.86	170.00	486.98	486.98	0.78
Planting (150 sdlg/md)	sdlg.	625				4.17	170.00	708.33	708.33	1.13
Tools & materials					200.00				200.00	0.32
SUB TOTAL					200.00	16.61	170.00	2,824.48	3,024.48	4.84
PERCENTAGE					6.61			93.39		
3. PLANTATION MAINTENANCE & PROTECTION (3 yrs)										
Ringweeding/spot cultivation (1 m radius)	spots									
Year 1 (4 passes, 100 spots/md)	spots	625				25.00	170.00	4,250.00	4,250.00	6.80
Year 2 (4 passes, 120 spots/md)	spots	625				20.83	170.00	3,541.67	3,541.67	5.67
Year 3 (2 passes, 150 spots/md)	spots	625				8.33	170.00	1,416.67	1,416.67	2.27
Replanting, 20% (including sdlg transport)	spots	125	sdlgs	3.83	478.73	3.32	170.00	564.90	1,043.63	8.35
Fertilizer Application										
Year 1 (2 passes, 40g)	spots	625	fertilizer	8.50	425.00	1.56	170.00	265.63	690.63	1.11
Year 2 (2 passes, 40g)	spots	625	fertilizer	8.50	425.00	1.56	170.00	265.63	690.63	1.11
Patrol work	ha	1				1.33	170.00	226.10	226.10	0.36
Tools					15.00				15.00	0.02
SUB TOTAL					1,343.73	61.94	170.00	10,530.58	11,874.31	25.68
PERCENTAGE					11.32			88.68		
4. INFRASTRUCTURE										
Nursery facilities (1 nursery/400 ha)**					250.00	1.00	170.00	170.00	420.00	0.67
Graded trail (1m-wide, 50m/ha)	meter	50				0.33	170.00	56.67	56.67	0.09
Footpath (1m-wide, 50m/ha)	meter	50				0.33	170.00	56.67	56.67	0.09
Fireline const'n (10 m width, 120m/md)	sq.m.	500				4.17	170.00	708.33	708.33	1.13
Fireline maintenance (200 sq m/md)	sq.m.	500				2.50	170.00	425.00	425.00	0.68
Bunkhouse (1 unit/200 ha)					350.00	0.55	170.00	93.50	443.50	0.71
Lookout tower (1unit/200ha)					50.00	0.10	170.00	17.00	67.00	0.11
SUB TOTAL					400.00	7.33	170.00	1,357.17	1,757.17	2.81
PERCENTAGE					22.76			77.24		
TOTAL OPERATIONAL COST					2,338.11	97.65	170.00	16,711.51	19,049.62	37.16
PERCENTAGE					12.27			87.73		
B. PROJECT MANAGEMENT COST (PMC)(15% of TOC)										
a. First Year (40% of PMC)									1,142.98	1.83
b. Second Year (30% of PMC)									857.23	1.37
c. Third Year (30% of PMC)									857.23	1.37
SUB TOTAL									2,857.44	4.57
GRAND TOTAL									21,907.06	35.05

Source: DENR MC 2000-19, 2000.

Notes:

* - Maintenance includes cultivation, weeding, fertilization, hardening, grading under DENR supervision, and other activities in the nursery.

** - Estimated nursery establishment cost is P100,000.0

Table 34

Cost Standards for Agroforestry (Mango/durian/marang-based w/ fuelwood, 10 x 10 m & 2 x 2 m Spacing , respectively)

COMPONENT/ACTIVITY	UNIT OF MEASURE	MATERIAL COSTS: GOAL/ HA	INPUTS Required	UNIT COST	COST/ ha (P)	LABOR COSTS: Mandays Required	Cost/ Manday	COST/ ha (P)	TOTAL COSTS/ HA(P)	COST PER SDL(GP)
A. OPERATIONAL COST		1000					170.00			
1. NURSERY OPERATIONS										
Procurement of Grafted Mango Seedlings		100	sedlings	60.00	6000.00				6,000.00	60.00
Procurement/handling of fuelwood seeds	seed	1200	seeds	0.30	360.00	0.50	170.00	85.00	445.00	0.45
Nursery bed preparation	sq.m.	8				1.00	170.00	170.00	170.00	0.17
Sowing of seed	seeds	1200				0.49	170.00	83.43	83.43	0.08
Gathering & preparation of soil	cu.m.	1.89				1.89	170.00	320.92	320.92	0.32
Potting of seedlings	pots	1200	p. bags	0.15	180.00	4.84	170.00	822.58	1,002.58	1.00
Prepn of potbeds & pot arrangements	pots	1200				0.16	170.00	27.03	27.03	0.03
Maintenance of seedlings *	sdlg	1200				8.64	170.00	1,468.89	1,468.89	1.47
Fertilizer application (5 gm/p. bag)	kg	6.00	fert.	8.50	51.00	0.25	170.00	42.50	93.50	0.09
Tools					25.00				25.00	0.03
SUB TOTAL					616.00	17.77	170.00	3,020.36	9,636.36	3.64
PERCENTAGE					6.39			31.34		
2. PLANTATION ESTABLISHMENT										
Spot brushing for mango (1 m radius, 50/md)	spots	100				2.00	170.00	340.00	340.00	
Brushing (strip 1m-wide, 300 sq m/md)	sq m.	2200				7.33	170.00	1,246.67	1,246.67	1.25
Staking (500 spots/md)	stake	1100				2.20	170.00	374.00	374.00	0.37
Hole Digging for Mango (50 spots/md)	spots	100				2.00	150.00	300.00	300.00	0.30
Hole Digging for Forest Trees (150 spots/md)	spots	1100				7.33	170.00	1,246.67	1,246.67	1.25
Seedling transport/hauling (230sdlg/md)	sdlg	1210				5.26	170.00	894.35	894.35	0.89
Planting (140 sdlg/md)	sdlg.	1100				7.86	170.00	1,335.71	1,335.71	1.34
Tools & materials					200.00				200.00	0.20
SUB TOTAL					200.00	31.98	170.00	5,397.40	5,597.40	5.60
PERCENTAGE					3.57			96.43		
3. PLANTATION MAINTENANCE & PROTECTION (3 yrs)										
Ringweeding spot cultivation (1 m radius)	spots									
Year 1 (3 passes, 120 spots/md)	spots	1100				27.50	170.00	4,675.00	4,675.00	4.68
Year 2 (3 passes, 150 spots/md)	spots	1100				22.00	170.00	3,740.00	3,740.00	3.74
Year 3 (2 passes, 200 spots/md)	spots	1100				11.00	170.00	1,870.00	1,870.00	1.87
Replanting, 20% (including sdlg transport)	spots	220	sdlgs	3.64	800.00	6.40	170.00	1,087.48	1,887.48	8.58
Fertilizer Application										
Year 1 (2 passes, 100g & 40g, resp.)	spots	1100	fertilizer	8.50	850.00	2.75	170.00	467.50	1,317.50	1.32
Year 2 (2 passes, 100g & 40g, resp.)	spots	1100	fertilizer	8.50	850.00	2.75	170.00	467.50	1,317.50	1.32
Patrol work	ha	1				1.33	170.00	226.10	226.10	0.23
Tools					15.00				15.00	0.02
SUB TOTAL					2,515.00	73.73	170.00	12,533.58	15,048.58	13.68
PERCENTAGE					16.71			83.29		
4. INFRASTRUCTURE										
Nursery facilities (1 nursery/400 ha)**					250.00	1.00	170.00	170.00	420.00	0.42
Graded trail (1m-wide, 50m/ha)	meter	50				0.33	170.00	56.67	56.67	0.06
Footpath (1m-wide, 50m/ha)	meter	50				0.33	170.00	56.67	56.67	0.06
Fireline const'n (10 m width, 120m/md)	sq.m.	500				4.17	170.00	708.33	708.33	0.71
Fireline maintenance (200 sq m/md)	sq.m.	500				2.50	170.00	425.00	425.00	0.43
Bunkhouse (1 unit/200 ha)					350.00	0.55	170.00	93.50	443.50	0.44
Lookout tower (1unit/200ha)					50.00	0.10	170.00	17.00	67.00	0.07
SUB TOTAL					400.00	7.33	170.00	1,357.17	1,757.17	1.76
PERCENTAGE					22.76			77.24		
TOTAL OPERATIONAL COST					3,731.00	130.81	170.00	22,308.50	32,039.50	24.67
PERCENTAGE					11.64			69.63		
B. PROJECT MANAGEMENT COST (PMC)(15% of TOC)										
a. First Year (40% of PMC)									1,922.37	1.75
b. Second Year (30% of PMC)									1,441.78	1.31
c. Third Year (30% of PMC)									1,441.78	1.31
SUB TOTAL									4,805.93	4.37
GRAND TOTAL									36,845.43	33.50

Source: DENR MC 2000-19, 2000.

Notes:

* - Maintenance includes cultivation, weeding, fertilization, hardening, grading under DENR supervision, and other activities in the nursery.

** - Estimated nursery establishment cost is P100,000.0

Table 35

Cost Standards for Agroforestry (Pure fruit trees; e.g., coffee, cacao, kalamansi, guyabano, etc., 4 x 4 m Spacing)

COMPONENT/ACTIVITY	UNIT OF MEASURE	GOAL/ HA	MATERIAL COSTS			LABOR COSTS			TOTAL COSTS / HA(P)	COST PER SDLG(P)
			INPUTS Required	UNIT COST	COST/ ha (P)	Mandays Required	Cost/ Manday	COST/ ha (P)		
A. OPERATIONAL COST		625					170.00			
1. NURSERY OPERATIONS										
Procurement/handling of certified seeds	seed	750	seeds	0.50	375.00	0.50	170.00	85.00	460.00	0.74
Nursery bed preparation	sq.m.	8				1.00	170.00	170.00	170.00	0.27
Sowing of seed	seeds	750				0.31	170.00	52.15	52.15	0.08
Gathering & preparation of soil	cu.m.	1.18				1.18	170.00	200.58	200.58	0.32
Potting of seedlings	pots	750	p. bags	0.15	112.50	3.02	170.00	514.11	626.61	1.00
Prepn of potbeds & pot arrangements	pots	750				0.10	170.00	16.89	16.89	0.03
Maintenance of seedlings	sdlg	750				5.40	170.00	918.06	918.06	1.47
Fertilizer application (5 gm/p. bag)	kg	3.75	fert.	8.50	31.88	0.25	170.00	42.50	74.38	0.12
Tools					25.00				25.00	0.04
SUB TOTAL					544.38	11.76	170.00	1,999.29	2,543.66	4.07
PERCENTAGE					21.40			78.60		
2. PLANTATION ESTABLISHMENT										
Brushing (strip 2m-wide, 300 sq m/md)	sq.m.	1250				4.17	170.00	708.33	708.33	1.13
Staking (500 spots/md)	stake	625				1.25	170.00	212.50	212.50	0.34
Hole Digging (150 spots/md)	hole	625				4.17	170.00	708.33	708.33	1.13
Seedling transport/hauling (240sdlg/md)	sdlg.	688				2.86	170.00	486.98	486.98	0.78
Planting (150 sdlg/md)	sdlg.	625				4.17	170.00	708.33	708.33	1.13
Tools & materials					200.00				200.00	0.32
SUB TOTAL					200.00	16.61	170.00	2,824.48	3,024.48	4.84
PERCENTAGE					6.61			93.39		
3. PLANTATION MAINTENANCE & PROTECTION (3 yrs)										
Ringweeding/spot cultivation (1 m radius)	spots									
Year 1 (4 passes, 100 spots/md)	spots	625				25.00	170.00	4,250.00	4,250.00	6.80
Year 2 (4 passes, 120 spots/md)	spots	625				20.83	170.00	3,541.67	3,541.67	5.67
Year 3 (2 passes, 150 spots/md)	spots	625				8.33	170.00	1,416.67	1,416.67	2.27
Replanting, 20% (including sdlg transport)	spots	125	sdlgs	4.07	508.73	3.32	170.00	564.90	1,073.63	8.59
Fertilizer Application										
Year 1 (2 passes, 100 g/spot)	spots	625	fertilizer	8.50	1,062.50	1.56	170.00	265.63	1,328.13	2.13
Year 2 (2 passes, 100 g/spot)	spots	625	fertilizer	8.50	1,062.50	1.56	170.00	265.63	1,328.13	2.13
Patrol work	ha	1				1.33	170.00	226.10	226.10	0.36
Tools					15.00				15.00	0.02
SUB TOTAL					2,648.73	61.94	170.00	10,530.58	13,179.31	21.09
PERCENTAGE					20.10			79.90		
4. INFRASTRUCTURE										
Nursery facilities (1 nurserv/400 ha)**					250.00	1.00	170.00	170.00	420.00	0.67
Graded trail (1m-wide, 50m/ha)	meter	50				0.33	170.00	56.67	56.67	0.09
Footpath (1m-wide, 50m/ha)	meter	50				0.33	170.00	56.67	56.67	0.09
Fireline const'n (10 m width, 120m/md)	sq.m.	500				4.17	170.00	708.33	708.33	1.13
Fireline maintenance (200 sq m/md)	sq.m.	500				2.50	170.00	425.00	425.00	0.68
Bunkhouse (1 unit/200 ha)					350.00	0.55	170.00	93.50	443.50	0.71
Lookout tower (1unit/200ha)					50.00	0.10	170.00	17.00	67.00	0.11
SUB TOTAL					400.00	7.33	170.00	1,357.17	1,757.17	2.81
PERCENTAGE					22.76			77.24		
TOTAL OPERATIONAL COST					3,793.11	97.65	170.00	16,711.51	20,504.62	32.81
PERCENTAGE					18.50			81.50		
B. PROJECT MANAGEMENT COST (PMC)(15% of TOC)										
a. First Year (40% of PMC)									1,230.28	1.97
b. Second Year (30% of PMC)									922.71	1.48
c. Third Year (30% of PMC)									922.71	1.48
SUB TOTAL									3,075.69	4.92
GRAND TOTAL									23,580.31	37.73

Source: DENR MC 2000-19, 2000.

Notes:

** - Estimated nursery establishment cost is P100,000.0

Table 36
Cost Standards for Assisted Natural Regeneration (ANR); (5 x 5 m Approximate Spacing)

COMPONENT/ACTIVITY	UNIT OF MEASURE	MATERIAL COSTS: GOAL/ HA	INPUTS Required	UNIT COST	COST/ ha (P)	LABOR COSTS: Mandays Required	Cost/ Manday	COST/ ha (P)	TOTAL COSTS / HA(P)	COST PER SDLG(P)
A. OPERATIONAL COST		400					170.00			
1. NURSERY OPERATIONS										
Same as reforcost at 5 x 5 m spacing					261.40	8.16	170.00	1,386.64	1,648.04	3.71
PERCENTAGE					17.60			82.40		
2 LOCATION AND ASSISTANCE TO REGENERANTS										
Location & staking of regenerants(200/md)	wildlings	600				3.00	170.00	510.00	510.00	1.28
Releasing (underbrushing , 200/md)	wildlings	600	stakes	0.50	300.00	3.00	170.00	510.00	810.00	2.03
Ringweeding and cultivate (150 wldg/md)	wildlings	600				4.00	170.00	680.00	680.00	1.70
3 Supplemental Planting										
Ring brushing (1m radius, 300 sq m/md)	sq.m.	1,257				4.19	170.00	712.10	712.10	1.78
Staking (500 spots/md)	stake	400	stakes	0.50	200.00	0.80	170.00	136.00	336.00	0.84
Hole Digging (150 spots/md)	hole	400				2.67	170.00	453.33	453.33	1.13
Seedling transport/hauling (240sdlg/md)	sdlg	440				1.83	170.00	311.67	311.67	0.78
Planting (150 sdlg/md)	sdlg	400				2.67	170.00	453.33	453.33	1.13
Tools & materials					200.00				200.00	0.50
SUB TOTAL					400.00	12.16	170.00	2,066.43	2,466.43	6.17
PERCENTAGE					16.22			83.78		
4 MAINTENANCE & PROTECTION (ALL COMPONENTS, 3 YRS)										
Ringweeding/spot cultivation (1 m radius)	spots	1000								
Year 1 (3 passes, 120 spots/md)	spots	1000				25.00	170.00	4,250.00	4,250.00	10.63
Year 2 (3 passes, 150 spots/md)	spots	1000				20.00	170.00	3,400.00	3,400.00	8.50
Year 3 (2 passes, 200 spots/md)	spots	1000				10.00	170.00	1,700.00	1,700.00	4.25
Replanting, 20% (including sdlg transport)	spots	80	sdlgs	3.71	296.98	2.43	170.00	413.29	710.27	1.78
Fertilizer Application										
Year 1 (2 passes, 40g)	spots	1000	fertilizer	8.50	680.00	2.50	170.00	425.00	1,105.00	2.76
Year 2 (2 passes, 40g)	spots	1000	fertilizer	8.50	680.00	2.50	170.00	425.00	1,105.00	2.76
Patrol work	ha	1				1.33	170.00	226.10	226.10	0.57
Tools					15.00				15.00	0.04
SUB TOTAL					1,671.98	63.76	170.00	10,839.39	12,511.37	12.51
PERCENTAGE					13.36			86.64		
5 INFRASTRUCTURE										
Nursery facilities (1 nursery/400 ha)**					250.00	1.00	170.00	170.00	420.00	1.05
Graded trail (1m-wide, 50m/ha)	meter	50				0.33	170.00	56.67	56.67	0.14
Footpath (1m-wide, 50m/ha)	meter	50				0.33	170.00	56.67	56.67	0.14
Bunkhouse (1 unit/200 ha)					350.00	0.55	170.00	93.50	443.50	1.11
Lookout tower (1unit/200ha)					50.00	0.10	170.00	17.00	67.00	0.17
SUBTOTAL					400.00	0.67	170.00	223.83	623.83	1.56
PERCENTAGE					64.12			35.88		
TOTAL OPERATIONAL COST					2,733.38	84.74	170.00	14,516.29	17,249.67	23.93
PERCENTAGE					15.85			84.15		
B. PROJECT MANAGEMENT COST (PMC)(15% of TOC)										
a. First Year (40% of PMC)									1,034.98	2.59
b. Second Year (30% of PMC)									776.24	1.94
c. Third Year (30% of PMC)									776.24	1.94
SUB TOTAL									2,587.45	6.47
GRAND TOTAL									19,837.13	49.59

Source: DENR MC 2000-19, 2000.

Notes:

* - Maintenance includes cultivation, weeding, fertilization, hardening, grading under DENR supervision, and other activities in the nursery.

** - Estimated nursery establishment cost is P100,000.0

Table 37
Cost Standards for Bamboo Plantation (Kawayan tinik, 5 X 5 m Spacing)

COMPONENT/ACTIVITY	UNIT OF MEASURE	GOAL/ HA	MATERIAL COSTS INPUTS Required	UNIT COST	COST/ ha (P)	LABOR COSTS Mandays Required	Cost/ Manday	COST/ ha (P)	TOTAL COSTS / HA(P)	COST PER SDLG(P)
A. OPERATIONAL COST		400					170.00			
1. NURSERY OPERATIONS										
Gathering of cuttings (50/md)	cuttings	480	culms	2.50	1,200.00	9.60	170.00	1,632.00	2,832.00	7.08
Gathering & preparation of soil	cu.m.	2.44				4.88	170.00	829.60	829.60	2.07
Potting of soil (200/md)	pots	480	p. bags	0.15	72.00	2.40	170.00	408.00	480.00	1.20
Potting of cuttings (150/md)	pots	480				3.20	170.00	544.00	544.00	1.36
Maintenance of cuttings	sdlg	480				3.46	170.00	587.56	587.56	1.47
Fertilizer application (10 gm/p. bag)	kg	4.80	fert.	8.50	40.80	0.25	170.00	42.50	83.30	0.21
Tools					25.00				25.00	0.06
SUB TOTAL					1,337.80	23.79	170.00	4,043.66	5,381.46	13.45
PERCENTAGE					24.86			75.14		
2. PLANTATION ESTABLISHMENT										
Brushing (strip 2m-wide, 300 sq m/md)	sq.m.	800				2.67	170.00	453.33	453.33	1.13
Staking (400 spots/md)	stake	400				1.00	170.00	170.00	170.00	0.43
Hole Digging (100 spots/md)	hole	400				4.00	170.00	680.00	680.00	1.70
Cuttings transport/hauling (30 cttg/md)	cuttings	440				14.67	170.00	2,493.33	2,493.33	6.23
Planting (60 sdlg/md)	sdlg.	400				6.67	170.00	1,133.33	1,133.33	2.83
Tools & materials					200.00				200.00	0.50
SUB TOTAL					200.00	29.00	170.00	4,930.00	5,130.00	12.83
PERCENTAGE					3.90			96.10		
3. PLANTATION MAINTENANCE & PROTECTION (3 yrs)										
Ringweeding/spot cultivation (1 m radius)	spots									
Year 1 (4 passes, 100 spots/md)	spots	400				16.00	170.00	2,720.00	2,720.00	6.80
Year 2 (4 passes, 120 spots/md)	spots	400				13.33	170.00	2,266.67	2,266.67	5.67
Year 3 (2 passes, 150 spots/md)	spots	400				5.33	170.00	906.67	906.67	2.27
Replanting, 20% (including sdlg transport)	spots	80	sdlg	13.45	1,076.29	5.80	170.00	986.00	2,062.29	25.78
Fertilizer Application										
Year 1 (2 passes), 60 gm/spot	spots	400	fertilizer	8.50	408.00	1.00	170.00	170.00	578.00	1.45
Year 2 (2 passes) 60 gm/spot	spots	400	fertilizer	8.50	408.00	1.00	170.00	170.00	578.00	1.45
Patrol work	ha	1				1.33	170.00	226.10	226.10	0.57
Tools					15.00				15.00	0.04
SUB TOTAL					1,907.29	43.80	170.00	7,445.43	9,352.72	23.38
PERCENTAGE					20.39			79.61		
4. INFRASTRUCTURE										
Nursery facilities (1 nursery/200 ha)**					500.00	1.00	170.00	170.00	670.00	1.68
Graded trail (1m-wide, 50m/ha)	meter	50				0.33	170.00	56.67	56.67	0.14
Footpath (1m-wide, 50m/ha)	meter	50				0.33	170.00	56.67	56.67	0.14
Fireline const'n (10 m width, 120m/md)	sq.m.	500				4.17	170.00	708.33	708.33	1.77
Fireline maintenance (200 sq m/md)	sq.m.	500				2.50	170.00	425.00	425.00	1.06
Bunkhouse (1 unit/200 ha)					350.00	0.55	170.00	93.50	443.50	1.11
Lookout tower (1unit/200ha)					50.00	0.10	170.00	17.00	67.00	0.17
SUB TOTAL					400.00	7.33	170.00	1,357.17	1,757.17	4.39
PERCENTAGE					22.76			77.24		
TOTAL OPERATIONAL COST					3,845.09	103.92	170.00	17,776.26	21,621.35	54.05
PERCENTAGE					17.78			82.22		
B. PROJECT MANAGEMENT COST (PMCX15% of TOC)										
a. First Year (40% of PMC)									1,297.28	3.24
b. Second Year (30% of PMC)									972.96	2.43
c. Third Year (30% of PMC)									972.96	2.43
SUB TOTAL									3,243.20	8.11
GRAND TOTAL									24,864.55	62.16

Source: DENR MC 2000-19, 2000.

Notes:

* - Maintenance includes cultivation, weeding, fertilization, hardening, grading under DENR supervision, and other activities in the nursery.

** - Estimated nursery establishment cost is P100,000.0

Table 38

Cost StandardS for Enrichment Planting (Gmelina, Mangium, Eucalyptus, Falcata ; 5 x 5 m Approximate Spacing)

COMPONENT/ACTIVITY	UNIT OF MEASURE	GOAL/ HA	MATERIAL COSTS: INPUTS Required	MATERIAL COSTS: UNIT COST	MATERIAL COSTS: COST/ ha (P)	LABOR COSTS: Mandays Required	LABOR COSTS: Cost/ Manday	LABOR COSTS: COST/ ha (P)	TOTAL COSTS / HA(P)	COST PER SDLG(P)
A. OPERATIONAL COST		400					170.00			
1. NURSERY OPERATIONS										
Procurement/handling of certified seeds	seed	480	seeds	0.30	144.00	0.50	170.00	85.00	229.00	0.57
Nursery bed preparation	sq.m.	8				1.00	170.00	170.00	170.00	0.43
Sowing of seed	seeds	480				0.20	170.00	33.37	33.37	0.08
Gathering & preparation of soil	cu.m.	0.76				0.76	170.00	128.37	128.37	0.32
Potting of seedlings	pots	480	p. bags	0.15	72.00	1.94	170.00	329.03	401.03	1.00
Prepn of potbeds & pot arrangements	pots	480				0.06	170.00	10.51	10.51	0.03
Maintenance of seedlings *	sdlg	480				3.46	170.00	587.56	587.56	1.47
Fertilizer application (5 gm/p. bag)	kg	2.40	fert.	5.50	20.40	0.25	170.00	42.50	62.90	0.16
Tools					25.00				25.00	0.06
SUB TOTAL					261.40	8.16	170.00	1,386.64	1,648.04	4.12
PERCENTAGE					15.86			84.14		
2. ENRICHMENT PLANTING										
Ring brushing (1m radius, 300 sq m/md)	sq.m.	1257				4.19	170.00	712.10	712.10	1.78
Staking (500 spots/md)	stake	400	stakes	0.50	200.00	0.80	170.00	136.00	336.00	0.84
Hole Digging (150 spots/md)	hole	400				2.67	170.00	453.33	453.33	1.13
Seedling transport/hauling (240sdlg/md)	sdlg	440				1.83	170.00	311.67	311.67	0.78
Planting (150 sdlg/md)	sdlg	400				2.67	170.00	453.33	453.33	1.13
Tools & materials					200.00				200.00	0.50
SUB TOTAL					400.00	12.16	170.00	2,066.43	2,466.43	6.17
PERCENTAGE					16.22			83.78		
3. PLANTATION MAINTENANCE & PROTECTION (3 yrs)										
Ringweeding/spot cultivation (1 m radius)	spots									
Year 1 (3 passes, 120 spots/md)	spots	400				10.00	170.00	1,700.00	1,700.00	4.25
Year 2 (3 passes, 150 spots/md)	spots	400				8.00	170.00	1,360.00	1,360.00	3.40
Year 3 (2 passes, 200 spots/md)	spots	400				4.00	170.00	680.00	680.00	1.70
Replanting, 20% (including sdlg transport)	spots	80	sdlg	4.12	329.61	2.43	170.00	413.29	742.89	9.29
Fertilizer Application										
Year 1 (2 passes, 40g/spot)	spots	400	fertilizer	8.50	272.00	1.00	170.00	170.00	442.00	1.11
Year 2 (2 passes, 40g/spot)	spots	400	fertilizer	8.50	272.00	1.00	170.00	170.00	442.00	1.11
Patrol work	ha	1				1.33	170.00	226.10	226.10	0.57
Tools					15.00				15.00	0.04
SUB TOTAL					888.61	27.76	170.00	4,719.39	5,607.99	14.02
PERCENTAGE					15.85			84.15		
4. INFRASTRUCTURE										
Nursery facilities (1 nursery/400 ha)**					250.00	1.00	170.00	170.00	420.00	1.05
Graded trail (1m-wide, 50m/ha)	meter	50				0.33	170.00	56.67	56.67	0.14
Footpath (1m-wide, 50m/ha)	meter	50				0.33	170.00	56.67	56.67	0.14
Fireline const'n (10 m width, 120m/md)	sq.m.	500				4.17	170.00	708.33	708.33	1.77
Fireline maintenance (200 sq m/md)	sq.m.	500				2.50	170.00	425.00	425.00	1.06
Bunkhouse (1 unit/200 ha)					350.00	0.55	170.00	93.50	443.50	1.11
Lookout tower (1unit/200ha)					50.00	0.10	170.00	17.00	67.00	0.17
SUB TOTAL					400.00	7.33	170.00	1,357.17	1,757.17	4.39
PERCENTAGE					22.76			77.24		
TOTAL OPERATIONAL COST					1,950.01	55.41	170.00	9,529.63	11,479.63	28.70
PERCENTAGE					16.99			83.01		
B. PROJECT MANAGEMENT COST (PMC)(18% of TOC)										
a. First Year (40% of PMC)									688.78	1.72
b. Second Year (30% of PMC)									516.58	1.29
c. Third Year (30% of PMC)									516.58	1.29
SUB TOTAL									1,721.95	4.30
GRAND TOTAL									13,201.58	33.00

Source: DENR MC 2000-19, 2000.

Notes:

* - Maintenance includes cultivation, weeding, fertilization, hardening, grading under DENR supervision, and other activities in the nursery.

** - Estimated nursery establishment cost is P100,000.0

Table 39
Cost Standards for Rattan Plantation ; 5 x 5 m Spacing)

COMPONENT/ACTIVITY	UNIT OF MEASURE	GOAL/ HA	MATERIAL COSTS INPUTS Required	UNIT COST	COST/ ha (P)	LABOR COSTS Mandays Required	Cost/ Manday	COST/ ha (P)	TOTAL COSTS / HA(P)	COST PER SDLG(P)
A. OPERATIONAL COST		400					170.00			
1. NURSERY OPERATIONS										
Procurement/handling of certified seeds	seed	480	seeds	0.50	240.00	0.50	170.00	85.00	325.00	0.81
Nursery bed preparation	sq.m.	8				1.00	170.00	170.00	170.00	0.43
Sowing of seed	seeds	480				0.20	170.00	33.37	33.37	0.08
Gathering & preparation of soil	cu.m.	0.76				0.76	170.00	128.37	128.37	0.32
Potting of seedlings	pots	480	p. bags	0.15	72.00	1.94	170.00	329.03	401.03	1.00
Prepn of potbeds & pot arrangements	pots	480				0.06	170.00	10.81	10.81	0.03
Maintenance of seedlings *	sdlg	480				3.46	170.00	587.56	587.56	1.47
Fertilizer application (5 gm/p. bag)	kg	2.40	fert.	8.50	20.40	0.25	170.00	42.50	62.90	0.16
Tools					25.00				25.00	0.06
SUB TOTAL					357.40	8.16	170.00	1,386.64	1,744.04	4.36
PERCENTAGE					20.49			79.51		
2. PLANTATION ESTABLISHMENT										
Brushing (spot 0.5 m-radius, 250 sq m/md)	sq.m.	1257				5.03	170.00	854.52	854.52	2.14
Staking (350 spots/md)	stake	400				1.14	170.00	194.29	194.29	0.49
Hole Digging (150 spots/md)	hole	400				2.67	170.00	453.33	453.33	1.13
Seedling transport/hauling (160sdlg/md)	sdlg.	440				2.75	170.00	467.50	467.50	1.17
Planting (120 sdlg/md)	sdlg.	400				3.33	170.00	566.67	566.67	1.42
Tools & materials					200.00				200.00	0.50
SUB TOTAL					200.00	14.92	170.00	2,536.30	2,736.30	6.84
PERCENTAGE					7.31			92.69		
3. PLANTATION MAINTENANCE (3 yrs)										
Ringweeding/spot cultivation (1 m radius)	spots									
Year 1 (4 passes, 80 spots/md)	spots	400				20.00	170.00	3,400.00	3,400.00	8.50
Year 2 (4 passes, 100 spots/md)	spots	400				16.00	170.00	2,720.00	2,720.00	6.80
Year 3 (2 passes, 120 spots/md)	spots	400				6.67	170.00	1,133.33	1,133.33	2.83
Replanting, 20% (including sdlg transport)	spots	80	sldg	4.36	348.81	2.98	170.00	507.26	856.07	10.70
Fertilizer Application										
Year 1 (2 passes 40 g)	spots	400	fertilizer	8.50	272.00	1.00	170.00	170.00	442.00	1.11
Year 2 (2 passes, 40g)	spots	400	fertilizer	8.50	272.00	1.00	170.00	170.00	442.00	1.11
Patrol work	ha	1				1.33	170.00	226.10	226.10	0.57
Tools					15.00				15.00	0.04
SUB TOTAL					907.81	48.98	170.00	8,326.69	9,234.50	23.09
PERCENTAGE					9.83			90.17		
4. INFRASTRUCTURE										
Nursery facilities (1 nursery/400 ha)**					250.00	1.00	170.00	170.00	420.00	1.05
Graded trail (1m-wide, 50m/ha)	meter	50				0.33	170.00	56.67	56.67	0.14
Footpath (1m-wide, 50m/ha)	meter	50				0.33	170.00	56.67	56.67	0.14
Bunkhouse (1 unit/200 ha)					350.00	0.55	170.00	93.50	443.50	1.11
LookOut tower (1unit/200ha)					50.00	0.10	170.00	17.00	67.00	0.17
SUB TOTAL					400.00	0.67	170.00	223.83	623.83	1.56
PERCENTAGE					64.12			35.88		
TOTAL OPERATIONAL COST					1,865.21	72.72	170.00	12,473.47	14,338.68	35.85
PERCENTAGE					13.01			86.99		
B. PROJECT MANAGEMENT COST (PMC)(15% of TOC)										
a. First Year (40% of PMC)									860.32	2.15
b. Second Year (30% of PMC)									645.24	1.61
c. Third Year (30% of PMC)									645.24	1.61
SUB TOTAL									2,150.80	5.38
GRAND TOTAL									16,489.48	41.22

Source: DENR MC 2000-19, 2000.

Notes:

* - Maintenance includes cultivation, weeding, fertilization, hardening, grading under DENR supervision, and other activities in the nursery.

** - Estimated nursery establishment cost is P100,000.0

Table 40
Cost Standards for Timber Stand Improvement (TSI)

COMPONENT/ACTIVITY	UNIT OF MEASURE	MATERIAL COSTS: GOAL/ HA	INPUTS Required	UNIT COST	COST/ ha (P)	LABOR COSTS: Mandays Required	Cost/ Manday	COST/ ha (P)	TOTAL COSTS/ HA(P)	COST PER SQLC(P)
A. OPERATIONAL COST		167					170.00			
1. NURSERY OPERATIONS										
(same as relo nursery cost)										
SUB TOTAL					153.05	5.22	170.00	887.40	1,040.45	4.32
PERCENTAGE					14.71			85.29		
2. ACCESS IMPROVEMENT										
Trails opening (50 m/md)	meter	25				0.50	170.00	85.00	85.00	
Road improvement (10m/md	meter	10				1.00	170.00	170.00	170.00	
Road turnout, (optional) 40/md	sq m	40				1.00	170.00	170.00	170.00	
(2 m W x 10 m L x 2 per km)										
Tools (for all components)					150.00				150.00	
SUB TOTAL					150.00	2.50	170.00	425.00	575.00	-
PERCENTAGE					26.09			73.91		
3. ITSI IMPLEMENTATION										
Diagnostic sampling/planning						1.00	170.00	170.00	170.00	
Marking of trees to be removed/girdled	ha	1	paint	80.00	80.00	1.00	170.00	170.00	250.00	
Removal of climbers /vines	sq m	2000				3.00	170.00	510.00	510.00	
Cutting/girdling of undesirable vegetation	sq m	1000				5.00	170.00	850.00	850.00	
SUB TOTAL					256.09	9.00	170.00	1,530.00	1,610.00	-
PERCENTAGE					15.91			95.03		
4 SUPPLEMENTAL PLANTING *										
Brushing (strip 2m-wide, 300 sq m/md)	sq.m	333				1.11	170.00	188.89	188.89	1.13
Staking (500 spots/md)	stake	167				0.33	170.00	56.67	56.67	0.34
Hole Digging (150 spots/md)	hole	167				1.11	170.00	188.89	188.89	1.13
Seedling transport/hauling (240sdlg/md)	sdlg.	183				0.76	170.00	129.86	129.86	0.78
Planting (150 sdlg/md)	sdlg.	167				1.11	170.00	188.89	188.89	1.13
Tools & materials					200.00				200.00	1.20
SUB TOTAL					200.00	4.43	170.00	753.19	953.19	5.72
PERCENTAGE					20.98			79.02		
5 PLANTATION MAINTENANCE & PROTECTION (3 yrs)										
Ringweeding spot cultivation (1 m radius)	spots									
Year 1 (3 passes, 100 spots/md)	spots	167				5.00	170.00	850.00	850.00	5.10
Year 2 (3 passes, 120 spots/md)	spots	167				4.17	170.00	708.33	708.33	4.25
Year 3 (2 passes, 150 spots/md)	spots	167				2.22	170.00	377.78	377.78	2.27
Replanting, 20% (including sdlg transport)	spots	33	sdlg	4.32	144.01	0.89	170.00	150.64	294.65	8.84
Fertilizer Application										
Year 1 (2 passes, 40g)	spots	167	fertilizer	8.50	113.33	0.42	170.00	70.83	184.17	1.11
Year 2 (2 passes, 40g)	spots	167	fertilizer	8.50	113.33	0.42	170.00	70.83	184.17	1.11
Patrol work	ha	1				1.33	170.00	226.10	226.10	1.36
Tools					15.00				15.00	0.09
SUB TOTAL					385.68	14.44	170.00	2,454.52	2,840.20	24.11
PERCENTAGE					13.58			86.42		
6 INFRASTRUCTURE										
Nursery facilities (1 nursery/500 ha)**					200.00	1.00	170.00	170.00	370.00	2.22
Bunkhouse (1 unit/200 ha)					350.00	0.55	170.00	93.50	443.50	2.66
Lookout tower (1unit/200ha)					50.00	0.10	170.00	17.00	67.00	0.40
SUB TOTAL					400.00	1.65	170.00	110.50	510.50	3.06
PERCENTAGE					78.35			21.65		
TOTAL OPERATIONAL COST					1,544.82	37.24	1,020.00	6,160.61	7,529.34	37.22
PERCENTAGE					20.52			81.82		
B. PROJECT MANAGEMENT COST (PMC)(18% of TOC)										
a. First Year (40% of PMC)									451.76	2.71
b. Second Year (30% of PMC)									338.82	2.03
c. Third Year (30% of PMC)									338.82	2.03
SUB TOTAL									1,129.40	6.78
GRAND TOTAL					1,544.82	37.24	1,020.00	6,160.61	8,658.74	51.95

Source: DENR MC 2000-19, 2000.

Notes:

* - Supplemental planting is conducted in areas where natural regenerations are lacking or very irregular.

** - Estimated nursery establishment cost is P100,000.0

Table 41
Cost Standards for Buho Plantation (5 X 5 m Spacing)

COMPONENT/ACTIVITY	UNIT OF MEASURE	GOAL/ HA	MATERIAL COSTS			LABOR COSTS			TOTAL COSTS / HA(P)	COST PER SDLG(P)
			INPUTS Required	UNIT COST	COST/ ha (P)	Mandays Required	Cost/ Manday	COST/ ha (P)		
A. OPERATIONAL COST		400					170.00			
1. NURSERY OPERATIONS										
Gathering of Suckers (50/md)	cuttings	480	culms	2.50	1,200.00	9.60	170.00	1,632.00	2,832.00	7.08
Gathering & preparation of soil	cu.m.	2.44				4.88	170.00	829.60	829.60	2.07
Potting of soil (200/md)	pots	480	p. bags	0.15	72.00	2.40	170.00	408.00	480.00	1.20
Potting of suckers (150/md)	pots	480				3.20	170.00	544.00	544.00	1.36
Maintenance of planting materials	sdlg	480				3.46	170.00	587.56	587.56	1.47
Fertilizer application (10 gm/p. bag)	kg	4.80	fert.	8.50	40.80	0.25	170.00	42.50	83.30	0.21
Tools					25.00			-	25.00	0.06
SUB TOTAL					1,337.80	23.79	170.00	3,567.93	5,381.46	13.45
PERCENTAGE					24.86			66.30		
2. PLANTATION ESTABLISHMENT										
Brushing (strip 2m-wide, 300 sq m/	sq.m.	800				2.67	170.00	453.33	453.33	1.13
Staking (400 spots/md)	stake	400				1.00	170.00	170.00	170.00	0.43
Hole Digging (100 spots/md)	hole	400				4.00	170.00	680.00	680.00	1.70
Cuttings transport/hauling (30 ctg/m	cuttings	440				14.67	170.00	2,493.33	2,493.33	6.23
Planting (60 sdlg/md)	sdlg.	400				6.67	170.00	1,133.33	1,133.33	2.83
Tools & materials					200.00				200.00	0.50
SUB TOTAL					200.00	29.00	170.00	4,930.00	5,130.00	12.83
PERCENTAGE					3.90			96.10		
3. PLANTATION MAINTENANCE & PROTECTION (3 yrs)										
Ringweeding/spot cultivation (1 m r	spots									
Year 1 (4 passes, 100 spots/md)	spots	400				16.00	170.00	2,720.00	2,720.00	6.80
Year 2 (4 passes, 120 spots/md)	spots	400				13.33	170.00	2,266.67	2,266.67	5.67
Year 3 (2 passes, 150 spots/md)	spots	400				5.33	170.00	906.67	906.67	2.27
Replanting (including sdlg transport)	spots	40				2.13	170.00	362.67	362.67	9.07
Fertilizer Application										
Year 1 (1 pass), 60 gm/spot	spots	400	24.00	8.50	204.00	1.00	170.00	170.00	374.00	0.94
Year 2 (1 pass) 60 gm/spot	spots	400	24.00	8.50	204.00	1.00	170.00	170.00	374.00	0.94
Patrol work	ha	1				1.33	170.00	226.10	226.10	0.57
Tools					15.00				15.00	0.04
SUB TOTAL					423.00	40.13	170.00	6,822.10	7,245.10	18.11
PERCENTAGE					5.84			94.16		
4. INFRASTRUCTURE										
Nursery facilities (1 nursery/200 ha)					500.00	1.00	170.00	170.00	670.00	1.68
Graded trail (1m-wide, 50m/ha)	meter	50				0.33	170.00	56.67	56.67	0.14
Footpath (1m-wide, 50m/ha)	meter	50				0.33	170.00	56.67	56.67	0.14
Fireline const'n (10 m width, 120m	sq.m.	500				4.17	170.00	708.33	708.33	1.77
Fireline maintenance (200 sq m/md)	sq.m.	500				2.50	170.00	425.00	425.00	1.06
Bunkhouse (1 unit/200 ha)					350.00	0.55	170.00	93.50	443.50	1.11
Lookout tower (1 unit/200ha)					50.00	0.10	170.00	17.00	67.00	0.17
SUB T O T A L					400.00	7.33	170.00	1,357.17	1,757.17	4.39
PERCENTAGE					22.76			77.24		
TOTAL OPERATIONAL COST					2,360.80	100.25	170.00	16,677.20	19,513.72	48.78
PERCENTAGE					12.10			85.46		
B. PROJECT MANAGEMENT COST (PMCx15% of TOC)										
a. First Year (40% of PMC)									1,170.82	2.93
b. Second Year (30% of PMC)									878.12	2.20
c. Third Year (30% of PMC)									878.12	2.20
SUB TOTAL									2,927.06	7.32
GRAND TOTAL									22,440.78	56.10

Source: Carandang, 2000.

Notes:

* - Maintenance includes cultivation, weeding, fertilization, hardening, grading and other activities in the nursery.

** - Estimated nursery establishment cost is P100,000.0

Table 42
Predicted Yield of Selected Forest Plantation Species on Different Sites (in cu m)

AGE in	Gmelina			Bagras			Mangium			Mahogan
YEARS	Poor	Ave.	Good	Poor	Ave.	Good	Poor	Ave.	Good	Ave.
2	6.2	23.8	41.4							2.3
3	36.4	61.6	86.7				32.9	48.8	79.3	5.7
4	57.0	87.1	117.1				57.8	86.9	136.0	10.2
5	72.1	105.5	138.9				84.9	125.8	187.8	15.8
6	83.8	119.7	155.6	61.7	75.7	102.0	111.9	160.6	230.1	22.6
7	93.3	131.0	168.8	87.0	103.6	131.0	133.2	189.2	263.1	30.5
8	101.3	140.5	179.8	109.8	127.1	155.0	152.2	212.4	288.2	39.6
9	108.2	148.7	189.1	129.6	146.9	174.6	167.8	230.6	307.2	49.8
10	114.4	155.8	197.2	146.5	163.5	190.4	180.6	244.9	321.4	61.1
11	120.0	162.2	204.4	160.9	177.3	203.3	191.0	255.9	331.8	73.5
12	125.2	168.1	211.0	173.0	188.8	213.7	199.4	265.9	339.3	87.1
13	129.9	173.4	216.9	183.2	198.4	222.2	206.2	274.8	344.5	101.8
14	134.5	178.5	222.5	191.8	206.4	229.0	211.6	281.4	347.9	117.6
15	138.7	183.2	227.6	199.1	213.1	234.7				134.6
16	142.8	187.7	232.5	205.3	218.6	239.3				153.8
17	146.7	191.9	237.1	210.6	223.3	243.0				175.3
18	150.5	196.0	241.6	215.1	227.3	246.1				197.9
19	154.2	200.0	245.8	218.9	230.6	248.6				223.9
20	157.7	203.8	249.9	222.2	233.4	250.6				252.2

Sources:
Gmelina - Gregorio, 1981
Bagras - Carandang and Casinillo, 1989.
Mangium - Casinillo, 1993.
Mahogany - compilation by Revilla, 1985.

Table 43
Demand* and Supply Projections of Different Wood Products, in mil. cu m. (2005 - 2015)

Wood Products	2000	2005	2010	2015
Sawlogs and Veneer Logs				
Demand	3.370	4.030	4.690	5.350
Supply based on Master Plan	5.950	9.600	13.250	16.900
Supply based on actual production trend	0.000	0.000	0.000	0.000
Surplus (Deficit) based on Master Plan	2.580	5.570	8.560	11.550
Surplus (Deficit) based on actual production	-3.370	-4.030	-4.690	-5.350
Pole and Local Construction Timber				
Demand	0.610	0.660	0.710	0.760
Supply based on Master Plan	1.580	2.030	2.480	2.930
Supply based on actual production trend	0.021	0.016	0.011	0.006
Surplus (Deficit) based on Master Plan	0.970	1.370	1.770	2.170
Surplus (Deficit) based on actual production	-0.589	-0.644	-0.699	-0.754
Pulpwood				
Demand	0.900	0.900	0.900	0.900
Supply based on Master Plan	4.030	4.030	4.030	4.030
Supply based on actual production trend	0.111	0.000	0.000	0.000
Surplus (Deficit) based on Master Plan	3.130	3.130	3.130	3.130
Surplus (Deficit) based on actual production	-0.789	-0.900	-0.900	-0.900
Fuelwood/Firewood				
Demand	44.400	46.967	49.533	52.100
Supply based on Master Plan	27.780	30.910	34.040	37.170
Supply based on actual production trend	0.078	0.046	0.014	0.000
Surplus (Deficit) based on Master Plan	-16.620	-16.057	-15.493	-14.930
Surplus (Deficit) based on actual production	-44.322	-46.921	-49.519	-52.100
Sawnwood				
Demand	1.420	1.803	2.187	2.570
Supply based on Master Plan	2.650	4.273	5.897	7.520
Supply based on actual production trend	0.089	0.000	0.000	0.000
Surplus (Deficit) based on Master Plan	1.230	2.470	3.710	4.950
Surplus (Deficit) based on actual production	-1.331	-1.803	-2.187	-2.570
Plywood				
Demand	0.440	0.523	0.607	0.690
Supply based on Master Plan	0.540	0.923	1.307	1.690
Supply based on actual production trend	0.312	0.277	0.242	0.207
Surplus (Deficit) based on Master Plan	0.100	0.400	0.700	1.000
Surplus (Deficit) based on actual production	-0.128	-0.246	-0.365	-0.483

*Demand projections were based on the Master Plan projections for different wood products.
Source: Carandang, et. al., 2000.

Table 44
Projection of Production Rates of Different Wood Products Based on Actual Production in Million cu m, 1999-2015

YEAR	SAWLOG/ VENEER LOG	POLES AND PILES	PULPWOOD	FUELWOOD/ FIREWOOD	LUMBER	PLYWOOD
ACTUAL PRODUCTION						
1981	4.904	0.020	0.496	0.122	1.219	0.457
1982	3.973	0.075	0.541	0.085	1.200	0.422
1983	3.698	0.038	0.732	0.077	1.222	0.459
1984	2.876	0.009	0.987	0.408	1.234	0.438
1985	3.185	0.015	0.368	0.346	1.062	0.350
1986	3.078	0.038	0.318	0.154	0.977	0.424
1987	3.412	0.054	0.681	0.106	1.233	0.517
1988	3.185	0.009	0.615	0.084	1.033	0.415
1989	2.796	0.022	0.351	0.048	0.975	0.344
1990	2.156	0.012	0.335	0.093	0.841	0.397
1991	1.561	0.012	0.349	0.312	0.726	0.321
1992	0.800	0.151	0.487	0.319	0.647	0.321
1993	0.685	0.096	0.241	0.130	0.440	0.273
1994	0.805	0.003	0.149	0.106	0.407	0.258
1995	0.589	0.002	0.167	0.110	0.286	0.290
1996	0.400	0.006	0.365	0.033	0.313	0.508
1997	0.241	0.003	0.312	0.037	0.351	0.484
1998	0.546	0.009	0.082	0.056	0.222	0.246
PROJECTED PRODUCTION						
1999	-0.338	0.022	0.141	0.085	0.157	0.319
2000	-0.601	0.021	0.111	0.078	0.089	0.312
2001	-0.864	0.020	0.082	0.072	0.021	0.305
2002	-1.127	0.019	0.052	0.066	-0.046	0.298
2003	-1.390	0.018	0.023	0.059	-0.114	0.291
2004	-1.653	0.017	-0.006	0.053	-0.182	0.284
2005	-1.916	0.016	-0.036	0.046	-0.249	0.277
2006	-2.179	0.015	-0.065	0.040	-0.317	0.270
2007	-2.442	0.014	-0.095	0.033	-0.385	0.263
2008	-2.705	0.013	-0.124	0.027	-0.452	0.256
2009	-2.968	0.012	-0.154	0.021	-0.520	0.249
2010	-3.231	0.011	-0.183	0.014	-0.588	0.242
2011	-3.494	0.010	-0.213	0.008	-0.655	0.235
2012	-3.757	0.009	-0.242	0.001	-0.723	0.228
2013	-4.020	0.008	-0.272	-0.005	-0.791	0.221
2014	-4.283	0.007	-0.301	-0.012	-0.858	0.214
2015	-4.546	0.006	-0.331	-0.018	-0.926	0.207

Source: Carandang M. et. al., 2000.

Table 45

Importation of Other Wood Products, 1994-1998 (Volume in Various Units, Value in 000 US$ C.I.F.)

PRODUCT	1998		1997		1996		1995		1994		TOTAL
	VOLUME	VALUE	VOLUME	VALUE	VOLUME	VALUE	VOLUME	VALUE	VOLUME	VALUE	VOLUME
Plywood, veneered panels and similar laminated wood products, cu m	2.6	3,631.20	11.4	8,057.00	10.1	6,233.30	1.9	1,852.80	6.2	3,016.00	41
Particleboard, gross kilo	14,255.20	4,597.10	27,250.60	8,716.30	23,305.90	7,735.30	28,929.10	9,439.20	19,033.00	5,461.00	125,769.30
Fiberboard, net kilo	45,803.90	14,634.60	59,503.00	19,910.10	62,982.90	24,476.20	44,977.30	13,350.90	34,849.00	9,177.90	261,815.20
Other wood, worked <6 mm, cu m	5	1,391.80	12.5	4,036.90	7.2	2,432.50	6.3	1,960.00	4.2	1,264.30	42.7
Wood, simply shaped, gross kilo	26	32.4	37.5	26.3	198	143.3	16.4	51.7	17.2	43.7	306.7
Wood wool, wood flour, net kilo	592.6	522	592.6	522	596.4	596.7	406.8	446.1	168	133.4	2,356.40
Wood continuously shaped along any of its edges or faces, gross kilo	602.6	527.4	1,040.00	1,488.10	32.7	53.8	-	-	-	-	2,112.60
Wood manufactures*, gross kilo	6,710.50	7,755.10	6,675.10	9,212.10	3,135.20	6,305.20	2,910.00	3,913.20	2,167.30	3,191.80	21,562.70
Furniture, pcs	581.5	16,899.10	584.7	21,983.60	427.6	17,465.80	224.3	8,134.50	137.3	4,301.50	1,958.70
Pulp and wastepaper, net kilo	397,650.80	86,872.70	335,663.10	97,096.90	344,716.40	113,942.50	360,088.00	138,939.40	322,009.00	79,307.70	1,698,139.60
Paper and paperboard, articles from paper and paperboard, net kilo	418,162.50	302,524.30	492,230.80	383,627.20	422,131.80	356,762.90	373,698.60	349,859.00	423,106.50	297,349.40	2,203,398.60
TOTAL VALUE	-	439,387.50	-	554,676.50	-	536,147.50	-	527,946.80	-	403,246.70	-

*Includes packing cases, boxes, crates, drums, pallets, load boards, casks, barrels, windows, doors, assembled panels, joints and carpentry, wooden frames,

Source: Carandang M., et. al., 2000.

Table 46
Product Flows, Revenues and Costs for Four Major Plantation Species

Species/ Products	YEAR 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Gmelina		6.2	16.4	57.0	72.1	83.8	93.3	101.3	108.2	114.4	120.0	125.2	129.9	134.5	138.7	142.8	146.7	150.5	154.2	157.7
Timber		3.7	21.8	34.2	43.3	50.3	56.0	60.8	64.9	68.6	72.0	75.1	77.9	80.7	83.2	85.7	88.0	90.3	92.5	94.6
Fuelwood		2.5	14.6	22.8	28.8	33.5	37.3	40.5	43.3	45.8	48.0	50.1	52.0	53.8	55.5	57.1	58.7	60.2	61.7	63.1
Bagras						61.7	87.0	109.8	129.6	146.5	160.9	173.0	183.2	191.8	199.1	205.3	210.6	215.1	218.9	222.2
Pole						33.9	47.9	60.4	71.3	80.6	88.5	95.2	100.8	105.5	109.5	112.9	115.8	118.3	120.4	122.2
Fuelwood						27.8	39.2	49.4	58.3	65.9	72.4	77.9	82.4	86.3	89.6	92.4	94.8	96.8	98.5	100.0
Mangium			32.9	57.8	84.9	111.9	133.2	152.2	167.8	180.6	191.0	199.4	206.2	211.6						
Timber			23.0	40.5	59.4	78.3	93.2	106.5	117.5	126.4	133.7	139.6	144.3	148.1						
Fuelwood			9.9	17.3	25.5	33.6	40.0	45.7	50.3	54.2	57.3	59.8	61.9	63.5						
Mahogany		2.3	5.7	10.2	15.8	22.6	30.5	39.6	49.8	61.1	73.5	87.1	101.8	117.6	134.6	153.8	175.3	197.9	223.9	252.2
Timber		1.8	4.5	8.1	12.7	18.1	24.4	31.7	39.8	48.9	58.8	69.7	81.4	94.1	107.7	123.1	140.2	158.3	179.2	201.8
Fuelwood		0.5	1.1	2.0	3.2	4.5	6.1	7.9	10.0	12.2	14.7	17.4	20.4	23.5	26.9	30.8	35.1	39.6	44.8	50.4
Revenue Schedule																				
Gmelina			57,444.7	89,954.6	113,784.6	132,249.0	147,241.4	159,866.6	170,755.8	180,540.4	189,378.0	197,584.4	205,001.7	212,261.2	218,889.4	225,359.8	231,514.6	237,511.6	243,350.7	248,874.3
Bagras			-	-	-	209,857.1	295,908.8	373,457.3	440,802.0	498,283.1	547,261.1	588,416.3	623,109.0	652,359.8	677,188.9	698,276.6	716,303.3	731,608.9	744,533.6	755,757.8
Mangium			59,340.9	104,252.4	153,132.0	201,831.2	240,249.5	274,519.3	302,656.7	325,743.7	344,501.9	359,652.8	371,917.8	381,657.6	-	-	-	-	-	-
Mahogany			17,518.6	31,533.5	49,052.1	70,074.4	94,600.4	122,630.2	154,163.6	189,200.8	227,741.7	269,786.3	315,334.7	364,386.7	416,942.5	476,505.7	543,076.4	613,150.8	693,736.3	781,329.3
Project Costs	12,803.4	4,551.8	4,551.8	1,000.0	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000

Table 47
Net Incremental Benefits (at various rotations)

Species	YEAR 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Gmelina																				
8	(12,803)	(4,552)	(4,552)	(1,000)	(1,000)	(1,000)	(1,000)	158,867												
10	(12,803)	(4,552)	(4,552)	(1,000)	(1,000)	(1,000)	(1,000)	(1,000)	(1,000)	179,540										
12	(12,803)	(4,552)	(4,552)	(1,000)	(1,000)	(1,000)	(1,000)	(1,000)	(1,000)	(1,000)	(1,000)	196,584								
Bagras																				
12	(12,803)	(4,552)	(4,552)	(1,000)	(1,000)	(1,000)	(1,000)	(1,000)	(1,000)	(1,000)	(1,000)	587,416								
14	(12,803)	(4,552)	(4,552)	(1,000)	(1,000)	(1,000)	(1,000)	(1,000)	(1,000)	(1,000)	(1,000)	(1,000)	(1,000)	651,360						
16	(12,803)	(4,552)	(4,552)	(1,000)	(1,000)	(1,000)	(1,000)	(1,000)	(1,000)	(1,000)	(1,000)	(1,000)	(1,000)	(1,000)	(1,000)	697,277				
Mangium																				
8	(12,803)	(4,552)	(4,552)	(1,000)	(1,000)	(1,000)	(1,000)	273,519												
10	(12,803)	(4,552)	(4,552)	(1,000)	(1,000)	(1,000)	(1,000)	(1,000)	(1,000)	324,744										
12	(12,803)	(4,552)	(4,552)	(1,000)	(1,000)	(1,000)	(1,000)	(1,000)	(1,000)	(1,000)	(1,000)	358,653								
Mahogany																				
10	(12,803)	(4,552)	(4,552)	(1,000)	(1,000)	(1,000)	(1,000)	(1,000)	(1,000)	188,201										
15	(12,803)	(4,552)	(4,552)	(1,000)	(1,000)	(1,000)	(1,000)	(1,000)	(1,000)	(1,000)	(1,000)	(1,000)	(1,000)	(1,000)	415,943					
20	(12,803)	(4,552)	(4,552)	(1,000)	(1,000)	(1,000)	(1,000)	(1,000)	(1,000)	(1,000)	(1,000)	(1,000)	(1,000)	(1,000)	(1,000)	(1,000)	(1,000)	(1,000)	(1,000)	780,329

Table 48
Financial Feasibility Indicators of Selected Plantation Species

Species	Rotation	NPV (12%)	IRR	BCR
Gmelina	8	43,701.4	34.64%	6.84
	10	36,580.6	26.95%	7.48
	12	28.622.2	22.02%	7.99
Bagras	12	128,939.0	35.98%	23.78
	14	110,959.2	30.35%	25.86
	16	91,031.7	26.09%	27.68
Mangium	8	90,007.7	46.58%	11.75
	10	83,332.2	36.43%	13.50
	12	70,221.2	29.55%	14.54
Mahogany	10	39,369.0	27.68%	7.84
	15	53,464.6	23.36%	16.39
	20	57,630.1	20.40%	29.85

Table 49
Sensitivity Analysis of Four Plantation Species at Average Rotation

Year	Plantation Cost	GMELINA (Rotation 10) Incremental Benefits				BAGRAS (Rotation 14) Incremental Benefits				MANGIUM (Rotation 10) Incremental Benefits				MAHOGANY (Rotation 10) Incremental Benefits			
		Base Case	10% ↑ in Cost	10% ↓ in Ben.	Comb. of Both	Base Case	10% ↑ in Cost	10% ↓ in Ben.	Comb. of Both	Base Case	10% ↑ in Cost	10% ↓ in Ben.	Comb. of Both	Base Case	10% ↑ in Cost	10% ↓ in Ben.	Comb. of Both
1	12,803	-12,803	-14,084	-12,803	-14,084	-12,803	-14,084	-12,803	-14,084	-12,803	-14,084	-12,803	-14,084	-12,803	-14,084	-12,803	-14,084
2	4,552	-4,552	-5,007	-4,552	-5,007	-4,552	-5,007	-4,552	-5,007	-4,552	-5,007	-4,552	-5,007	-4,552	-5,007	-4,552	-5,007
3	4,552	-4,552	-5,007	-4,552	-5,007	-4,552	-5,007	-4,552	-5,007	-4,552	-5,007	-4,552	-5,007	-4,552	-5,007	-4,552	-5,007
4	1,000	-1,000	-1,100	-1,000	-1,100	-1,000	-1,100	-1,000	-1,100	-1,000	-1,100	-1,000	-1,100	-1,000	-1,100	-1,000	-1,100
5	1,000	-1,000	-1,100	-1,000	-1,100	-1,000	-1,100	-1,000	-1,100	-1,000	-1,100	-1,000	-1,100	-1,000	-1,100	-1,000	-1,100
6	1,000	-1,000	-1,100	-1,000	-1,100	-1,000	-1,100	-1,000	-1,100	-1,000	-1,100	-1,000	-1,100	-1,000	-1,100	-1,000	-1,100
7	1,000	-1,000	-1,100	-1,000	-1,100	-1,000	-1,100	-1,000	-1,100	-1,000	-1,100	-1,000	-1,100	-1,000	-1,100	-1,000	-1,100
8	1,000	-1,000	-1,100	-1,000	-1,100	-1,000	-1,100	-1,000	-1,100	-1,000	-1,100	-1,000	-1,100	-1,000	-1,100	-1,000	-1,100
9	1,000	-1,000	-1,100	-1,000	-1,100	-1,000	-1,100	-1,000	-1,100	-1,000	-1,100	-1,000	-1,100	-1,000	-1,100	-1,000	-1,100
10	1,000	221,246	221,246	199,121	199,121	-1,000	-1,100	-1,000	-1,100	334,323	334,323	300,891	300,891	-1,000	-1,100	-1,000	-1,100
11	1,000					-1,000	-1,100	-1,000	-1,100					-1,000	-1,100	-1,000	-1,100
12	1,000					-1,000	-1,100	-1,000	-1,100					-1,000	-1,100	-1,000	-1,100
13	1,000					-1,000	-1,100	-1,000	-1,100					-1,000	-1,100	-1,000	-1,100
14	1,000					556,969	556,969	501,272	501,272					-1,000	-1,100	-1,000	-1,100
15	1,000													439,429	439,429	395,487	395,487
NPV		50,009	47,886	42,885	40,762	91,645	89,413	80,248	78,016	86,416	84,294	75,652	73,529	57,756	55,503	49,727	47,475
IRR		30.23%	28.73%	28.57%	27.08%	28.67%	27.65%	27.54%	26.54%	36.91%	35.34%	35.18%	33.63%	23.88%	22.97%	22.87%	21.96%

Year	Cost	Base Case	20% ↑ in Cost	20% ↓ in Ben.	Comb. of Both	Base Case	20% ↑ in Cost	20% ↓ in Ben.	Comb. of Both	Base Case	20% ↑ in Cost	20% ↓ in Ben.	Comb. of Both	Base Case	20% ↑ in Cost	20% ↓ in Ben.	Comb. of Both
1	12,803	-12,803	-15,364	-12,803	-15,364	-12,803	-15,364	-12,803	-15,364	-12,803	-15,364	-12,803	-15,364	-12,803	-15,364	-12,803	-15,364
2	4,552	-4,552	-5,462	-4,552	-5,462	-4,552	-5,462	-4,552	-5,462	-4,552	-5,462	-4,552	-5,462	-4,552	-5,462	-4,552	-5,462
3	4,552	-4,552	-5,462	-4,552	-5,462	-4,552	-5,462	-4,552	-5,462	-4,552	-5,462	-4,552	-5,462	-4,552	-5,462	-4,552	-5,462
4	1,000	-1,000	-1,200	-1,000	-1,200	-1,000	-1,200	-1,000	-1,200	-1,000	-1,200	-1,000	-1,200	-1,000	-1,200	-1,000	-1,200
5	1,000	-1,000	-1,200	-1,000	-1,200	-1,000	-1,200	-1,000	-1,200	-1,000	-1,200	-1,000	-1,200	-1,000	-1,200	-1,000	-1,200
6	1,000	-1,000	-1,200	-1,000	-1,200	-1,000	-1,200	-1,000	-1,200	-1,000	-1,200	-1,000	-1,200	-1,000	-1,200	-1,000	-1,200
7	1,000	-1,000	-1,200	-1,000	-1,200	-1,000	-1,200	-1,000	-1,200	-1,000	-1,200	-1,000	-1,200	-1,000	-1,200	-1,000	-1,200
8	1,000	-1,000	-1,200	-1,000	-1,200	-1,000	-1,200	-1,000	-1,200	-1,000	-1,200	-1,000	-1,200	-1,000	-1,200	-1,000	-1,200
9	1,000	-1,000	-1,200	-1,000	-1,200	-1,000	-1,200	-1,000	-1,200	-1,000	-1,200	-1,000	-1,200	-1,000	-1,200	-1,000	-1,200
10	1,000	221,246	221,246	176,997	176,997	-1,000	-1,200	-1,000	-1,200	334,323	334,323	267,458	267,458	-1,000	-1,200	-1,000	-1,200
11	1,000					-1,000	-1,200	-1,000	-1,200					-1,000	-1,200	-1,000	-1,200
12	1,000					-1,000	-1,200	-1,000	-1,200					-1,000	-1,200	-1,000	-1,200
13	1,000					-1,000	-1,200	-1,000	-1,200					-1,000	-1,200	-1,000	-1,200
14	1,000					556,969	556,969	445,575	445,575					-1,000	-1,200	-1,000	-1,200
15	1,000													439,429	439,429	351,544	351,544
NPV		50,009	45,763	35,762	31,516	91,645	87,180	68,852	64,387	86,416	82,171	64,808	60,642	57,756	53,250	41,699	37,194
IRR		30.23%	27.36%	26.73%	23.92%	28.67%	26.73%	26.30%	24.39%	36.91%	33.93%	33.27%	30.35%	23.88%	22.14%	21.75%	20.02%

Table 50
Average Diameter and Volume Information of All Plots Under Second Growth Forests

Cluster Plots	ADBH (cm)	TVOL (cu m)	HVOL (cu m)
1	23.5	102.0	0.0
2	24.4	112.8	0.0
3	24.5	75.5	0.0
4	24.6	70.1	0.0
5	24.7	133.6	2.9
6	25.7	118.7	2.4
7	25.8	69.4	0.0
8	26.2	196.6	12.0
9	26.2	108.0	0.0
10	26.4	83.1	0.0
11	26.8	208.6	27.0
12	27.0	107.7	18.2
13	27.4	168.5	0.0
14	28.1	149.4	0.0
15	28.1	150.7	0.0
16	29.2	129.0	9.2
17	29.3	204.9	19.4
18	29.5	90.9	9.0
19	29.8	105.2	2.9
20	29.8	113.2	0.0
21	30.2	269.8	4.8
22	30.4	112.9	4.6
23	30.5	157.9	5.3
24	31.1	168.3	8.1
25	31.2	332.3	76.6
26	31.4	236.5	4.2
27	31.5	207.2	11.3
28	31.7	118.0	22.6
29	31.8	211.0	8.7
30	33.0	208.6	30.3
31	33.1	175.8	9.5
32	33.3	295.0	7.8
33	35.8	383.0	57.9
34	37.2	406.5	102.4
35	38.6	302.5	77.9
Average	29.4	173.8	15.3

Figure 11
Total and Harvestable Volume by Average Diameter

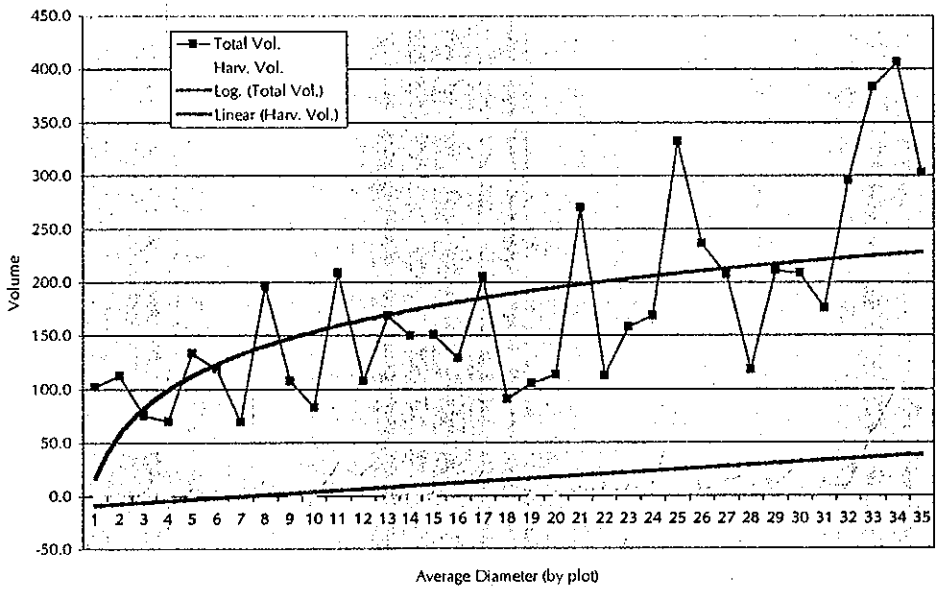


Table 51
Volume Prediction of Second Growth Forests in All Transects

Cluster Plots	Base Year (Year 0)			Year 5		Year 10		Year 15		Year 20		Year 25		Year 30		Year 35		Year 40	
	ADBH (cm)	TVOL (cu m)	HVOL (cu m)	TVOL (cu m)	HVOL (cu m)	TVOL (cu m)	HVOL (cu m)	TVOL (cu m)	HVOL (cu m)	TVOL (cu m)	HVOL (cu m)	TVOL (cu m)	HVOL (cu m)	TVOL (cu m)	HVOL (cu m)	TVOL (cu m)	HVOL (cu m)	TVOL (cu m)	HVOL (cu m)
1	25.8	69.4	0.0	93.1	0.0	116.8	11.7	140.4	28.2	164.1	44.8	187.8	61.4	211.5	78.0	235.1	94.5	258.8	111.1
2	24.6	70.1	0.0	93.8	0.0	117.5	12.2	141.2	28.7	164.8	45.3	188.5	61.9	212.2	78.5	235.9	95.0	259.5	111.6
3	24.5	75.5	0.0	99.2	0.0	122.9	15.9	146.5	32.5	170.2	49.1	193.9	65.6	217.6	82.2	241.2	98.8	264.9	115.4
4	26.4	83.1	0.0	106.8	4.7	130.4	21.2	154.1	37.8	177.8	54.4	201.5	70.9	225.1	87.5	248.8	104.1	272.5	120.7
5	29.5	90.9	9.0	114.5	10.1	138.2	26.7	161.9	43.2	185.6	59.8	209.2	76.4	232.9	93.0	256.6	109.5	280.3	126.1
6	23.5	102.0	0.0	125.7	17.9	149.4	34.5	173.1	51.1	196.7	67.6	220.4	84.2	244.1	100.8	267.8	117.4	291.4	133.9
7	29.8	105.2	2.9	128.8	20.1	152.5	36.7	176.2	53.3	199.9	69.8	223.5	86.4	247.2	103.0	270.9	119.5	294.6	136.1
8	27.0	107.7	18.2	131.4	21.9	155.1	38.5	178.7	55.0	202.4	71.6	226.1	88.2	249.8	104.8	273.4	121.3	297.1	137.9
9	26.2	108.0	0.0	131.7	22.1	155.3	38.7	179.0	55.2	202.7	71.8	226.4	88.4	250.0	105.0	273.7	121.5	297.4	138.1
10	24.4	112.8	0.0	136.5	25.5	160.2	42.0	183.8	58.6	207.5	75.2	231.2	91.8	254.9	108.3	278.5	124.9	302.2	141.5
11	30.4	112.9	4.6	136.6	25.5	160.3	42.1	183.9	58.7	207.6	75.3	231.3	91.8	255.0	108.4	278.6	125.0	302.3	141.6
12	29.8	113.2	0.0	136.9	25.7	160.5	42.3	184.2	58.9	207.9	75.4	231.6	92.0	255.2	108.6	278.9	125.2	302.6	141.7
13	31.7	118.0	22.6	141.7	29.1	165.4	45.7	189.0	62.3	212.7	78.8	236.4	95.4	260.1	112.0	283.7	128.5	307.4	145.1
14	25.7	118.7	2.4	142.4	29.6	166.0	46.2	189.7	62.7	213.4	79.3	237.1	95.9	260.7	112.4	284.4	129.0	308.1	145.6
15	29.2	129.0	9.2	152.7	36.8	176.4	53.4	200.1	70.0	223.7	86.5	247.4	103.1	271.1	119.7	294.8	136.3	318.4	152.8
16	24.7	133.6	2.9	157.2	40.0	180.9	56.6	204.6	73.1	228.3	89.7	251.9	106.3	275.6	122.9	299.3	139.4	323.0	156.0
17	28.1	149.4	0.0	173.0	51.1	196.7	67.6	220.4	84.2	244.1	100.8	267.7	117.4	291.4	133.9	315.1	150.5	338.8	167.1
18	28.1	150.7	0.0	174.3	52.0	198.0	68.5	221.7	85.1	245.4	101.7	269.0	118.2	292.7	134.8	316.4	151.4	340.1	168.0
19	30.5	157.9	5.3	181.6	57.0	205.3	73.6	228.9	90.2	252.6	106.8	276.3	123.3	300.0	139.9	323.6	156.5	347.3	173.0
20	31.1	168.3	8.1	191.9	64.3	215.6	80.9	239.3	97.4	263.0	114.0	286.6	130.6	310.3	147.1	334.0	163.7	357.7	180.3
21	27.4	168.5	0.0	192.1	64.4	215.8	81.0	239.5	97.6	263.2	114.1	286.8	130.7	310.5	147.3	334.2	163.9	357.9	180.4
22	33.1	175.8	9.5	199.4	69.5	223.1	86.1	246.8	102.7	270.5	119.3	294.1	135.8	317.8	152.4	341.5	169.0	365.2	185.5
23	26.2	196.6	12.0	220.3	84.1	243.9	100.7	267.6	117.3	291.3	133.8	315.0	150.4	338.6	167.0	362.3	183.5	386.0	200.1
24	29.3	204.9	19.4	228.6	90.0	252.3	106.5	276.0	123.1	299.6	139.7	323.3	156.3	347.0	172.8	370.7	189.4	394.3	206.0
25	31.5	207.2	11.3	230.8	91.5	254.5	108.1	278.2	124.7	301.9	141.2	325.5	157.8	349.2	174.4	372.9	190.9	396.6	207.5
26	33.0	208.6	30.3	232.3	92.5	255.9	109.1	279.6	125.7	303.3	142.2	327.0	158.8	350.6	175.4	374.3	192.0	398.0	208.5
27	26.8	208.6	27.0	232.3	92.6	256.0	109.1	279.7	125.7	303.3	142.3	327.0	158.8	350.7	175.4	374.4	192.0	398.0	208.6
28	31.8	211.0	8.7	234.7	94.2	258.4	110.8	282.0	127.3	305.7	143.9	329.4	160.5	353.1	177.1	376.7	193.6	400.4	210.2
29	31.4	236.5	4.2	260.2	112.1	283.9	128.6	307.6	145.2	331.2	161.8	354.9	178.4	378.6	194.9	402.3	211.5	425.9	228.1
30	30.2	260.8	4.8	293.4	135.3	317.1	151.9	340.8	168.5	364.5	185.1	388.1	201.6	411.8	218.2	435.5	234.8	459.2	251.3
31	33.3	295.0	7.8	318.7	153.0	342.4	169.6	366.0	186.2	389.7	202.7	413.4	219.3	437.1	235.9	460.7	252.4	484.4	269.0
32	38.6	302.5	77.9	326.2	158.3	349.9	174.8	373.5	191.4	397.2	208.0	420.9	224.5	444.6	241.1	468.2	257.7	491.9	274.3
33	31.2	332.3	76.6	356.0	179.1	379.7	195.7	403.3	212.3	427.0	228.8	450.7	245.4	474.4	262.0	498.0	278.5	521.7	295.1
34	35.8	381.0	57.9	406.7	214.6	430.4	231.2	454.0	247.7	477.7	264.3	501.4	280.9	525.1	297.5	548.7	314.0	572.4	330.6
35	37.2	406.5	102.4	430.2	231.1	453.9	247.6	477.5	264.2	501.2	280.8	524.9	297.3	548.6	313.9	572.2	330.5	595.9	347.1
Average	29.4	173.8	15.3	197.5	68.4	221.2	84.7	244.8	101.3	268.5	117.9	292.2	134.5	315.9	151.0	339.5	167.6	363.2	184.2

Assumptions

1. Average net growth is 4.735 cu m per ha per year (Catindig, et. al., 2000)
2. Minimum volume of third growth residual set at (77 cu m. per ha + 30 %.
3. Maximum harvest = (TVOL - Minimum Volume) * 0.70, where there is a 30 % safety factor.

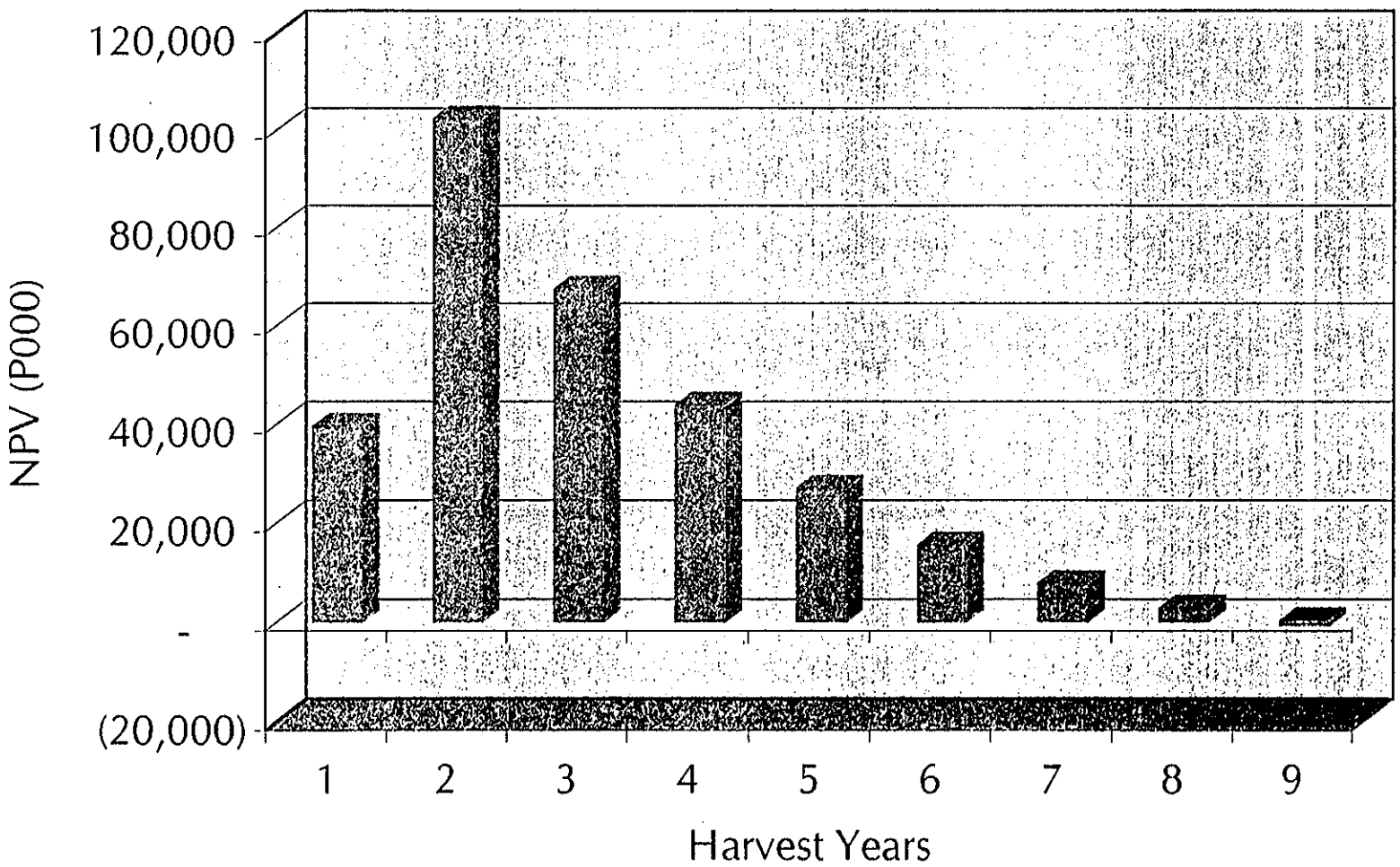
Table 52
Financial Analysis of Harvesting Second Growth Forests in Samar Island Under Different Years (per ha)

H-year	0	5	10	15	20	25	30	35	40
HVOL	15.3	68.4	84.7	101.3	117.9	134.5	151.0	167.6	184.2
Year 0	45,646	(200)	(200)	(200)	(200)	(200)	(200)	(200)	(200)
1	(200)	(200)	(200)	(200)	(200)	(200)	(200)	(200)	(200)
2	(200)	(200)	(200)	(200)	(200)	(200)	(200)	(200)	(200)
3	(200)	(200)	(200)	(200)	(200)	(200)	(200)	(200)	(200)
4	(200)	(200)	(200)	(200)	(200)	(200)	(200)	(200)	(200)
5	(200)	204,640	(8,659)	(8,859)	(8,859)	(8,859)	(8,859)	(8,859)	(8,859)
6	(200)	(200)	(200)	(200)	(200)	(200)	(200)	(200)	(200)
7	(200)	(200)	(200)	(200)	(200)	(200)	(200)	(200)	(200)
8	(200)	(200)	(200)	(200)	(200)	(200)	(200)	(200)	(200)
9	(200)	(200)	(200)	(200)	(200)	(200)	(200)	(200)	(200)
10	(200)	(200)	254,005	(200)	(200)	(200)	(200)	(200)	(200)
11	(200)	(200)	(200)	(200)	(200)	(200)	(200)	(200)	(200)
12	(200)	(200)	(200)	(200)	(200)	(200)	(200)	(200)	(200)
13	(200)	(200)	(200)	(200)	(200)	(200)	(200)	(200)	(200)
14	(200)	(200)	(200)	(200)	(200)	(200)	(200)	(200)	(200)
15	(200)	(200)	(200)	303,723	(200)	(200)	(200)	(200)	(200)
16	(200)	(200)	(200)	(200)	(200)	(200)	(200)	(200)	(200)
17	(200)	(200)	(200)	(200)	(200)	(200)	(200)	(200)	(200)
18	(200)	(200)	(200)	(200)	(200)	(200)	(200)	(200)	(200)
19	(200)	(200)	(200)	(200)	(200)	(200)	(200)	(200)	(200)
20	(200)	(200)	(200)	(200)	353,440	(200)	(200)	(200)	(200)
21	(200)	(200)	(200)	(200)	(200)	(200)	(200)	(200)	(200)
22	(200)	(200)	(200)	(200)	(200)	(200)	(200)	(200)	(200)
23	(200)	(200)	(200)	(200)	(200)	(200)	(200)	(200)	(200)
24	(200)	(200)	(200)	(200)	(200)	(200)	(200)	(200)	(200)
25	(200)	(200)	(200)	(200)	(200)	403,158	(200)	(200)	(200)
26	(200)	(200)	(200)	(200)	(200)	(200)	(200)	(200)	(200)
27	(200)	(200)	(200)	(200)	(200)	(200)	(200)	(200)	(200)
28	(200)	(200)	(200)	(200)	(200)	(200)	(200)	(200)	(200)
29	(200)	(200)	(200)	(200)	(200)	(200)	(200)	(200)	(200)
30	(200)	(200)	(200)	(200)	(200)	(200)	452,875	(200)	(200)
31	(200)	(200)	(200)	(200)	(200)	(200)	(200)	(200)	(200)
32	(200)	(200)	(200)	(200)	(200)	(200)	(200)	(200)	(200)
33	(200)	(200)	(200)	(200)	(200)	(200)	(200)	(200)	(200)
34	(200)	(200)	(200)	(200)	(200)	(200)	(200)	(200)	(200)
35	(200)	(200)	(200)	(200)	(200)	(200)	(200)	502,593	(200)
36	(200)	(200)	(200)	(200)	(200)	(200)	(200)	(200)	(200)
37	(200)	(200)	(200)	(200)	(200)	(200)	(200)	(200)	(200)
38	(200)	(200)	(200)	(200)	(200)	(200)	(200)	(200)	(200)
39	(200)	(200)	(200)	(200)	(200)	(200)	(200)	(200)	(200)
40	(200)	(200)	(200)	(200)	(200)	(200)	(200)	(200)	552,310
NPV (12%)	39,284	102,128	67,142	43,539	26,695	15,147	7,465	2,465	(736)
NPV (24%)	36,140	55,516	20,693	6,513	646	(1,713)	(2,640)	(2,997)	(3,134)

Notes:

- Stumpage value of timber is P3,000 per cu m (NFDO, 2000).
- TSI cost is P8,859 per ha. applied in year 5.
- Management & protection cost is set at P200/ha/year.

Figure 12
NPV of Utilizing Second Growth at 12% i.



APPENDIX A

TALLY SHEETS

Tally Sheet for Other Plants Inside 5m x 5m Subplots

Transect No. ______________ Date ___________

Cluster Plot No. ______________ No. of Pages __________

Subplot No. ______________ Page No. ____________

Plant No.	Species		No. of Wildlings > = 30 cm tall, 1 - 5 cm dia.	For Grass, Vines & Ferns	Remarks
	Local Name	Official Com. name		% Cover	

Tally Sheet for Other Plants Inside 5m x 5m Subplots

Transect No. ______________ Date ___________

Cluster Plot No. ______________ No. of Pages __________

Subplot No. ______________ Page No. ____________

Plant / Clump No.	Species		Trees with DBH 5 - 19 cm		Count of Economic Plants	Remarks
	Local Name	Official Com. name	DBH (cm)	TH (m)		

Tally Sheet for Other Plants Inside 5m x 5m Subplots
(Bamboo, rattan, erect palms, etc.)

Transect No. ______________ Date ____________
Cluster Plot No. ________________ No. of Pages ____________
Subplot No. ______________ Page No. ______________

Plant / Clump No.	Species		Number of Matured culms/ stems	Length/ height (m)	Number of Juvenile culms/ stems	Remarks
	Local Name	Official Com. name				

Tally Sheet for Other Plants Inside 5m x 5m Subplots

Transect No. ______________ Date ____________

Cluster Plot No. ________________ No. of Pages __________

Subplot No. ______________ Page No. ____________

Tree No.	Species		DBH (cm)	MH (m)	Remarks (Log form by 5m , defects)
	Local name	Off. Common name			

APPENDIX B

FOREST RESOURCES ASSESSMENT TEAM

1. Mario Tubaña	Team Leader (Transect 1)
2. Conrado Corado	Team Leader (Transect 2 and 3)
3. Rodrigo Marquez	Team Member
4. Romeo Grefaldeo	Team Member
5. Noel Pacampara	Team Member
6. Estanislao Butihen	Team Member
7. Ferdie Gaerlan	Team Member
8. Gilbert Hubalde	Team Member