



Food and Agriculture Organization of the United
Nations, Forestry Department

and



International Network for Bamboo and Rattan (INBAR)

GLOBAL FOREST RESOURCES
ASSESSMENT UPDATE 2005

<ECUADOR>

COUNTRY REPORT
ON
BAMBOO RESOURCES

QUITO, 13.01.05

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General Guidelines:

The main purpose of the Country Thematic Report on Bamboo Resources (CTRB) is to develop a Global Bamboo Resources Assessment (GBRA) and to integrate it in the global UN FAO FRA. The approach is to create sub-category on Bamboo in the framework of FRA 2005 (www.fao.org/forestry/fra) to provide supplementary information on bamboo resources. This document provides format for compiling information on Bamboo resources and should be treated as a supplement to the basic documents of FRA 2005 including Specification of National Reporting tables, FRA Working Paper No. 81; Guidelines for Country Reporting, FRA Working Paper No. 82 and Terms and Definitions, FRA Working Paper No. 83.

The country Bamboo Resources Thematic Study Report should clearly and concisely document all data sources that have been selected and used for this reporting process and assign quality rating to the data sources. Comment on any problems encountered in finding relevant data sources. The Report should also indicate if no data sources have been found which meet the requirements. Similarly all the relevant national classification and definitions should be documented clearly and concisely. Comments on any problems or incompatibilities in classification and definitions should also be provided, if necessary. Please email the Bamboo Thematic Report directly to the focal point at INBAR (mlobovikov@inbar.int) with the copy to FAO (kailash.govil@fao.org) as a part of GFRA.

General information

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Date of submission of 1st draft:	March 1 2005
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1 Table T1 – Extent of Bamboo Forest

1.1 GBRA 2005 Categories and definitions

Category	Definition
Bamboo on forest land	Bamboo on lands defined as "Forest" in FRA 2005.

1.2 National Data on Bamboo Resources

1.2.1 Data sources

References	Quality (H/M/L)	Variable(s)	Year(s)	Additional comments
CÁRDENAS, E. MARLIN, C., Productive guidelines chains of Guadua in Ecuador, SNV.	M		2 003	
DAGILIS T, DE WIT H. Bamboo Value-Added Export Development : Opportunities for Ecuador	M		2003	
3. MORAN J. Bambúes introducidos en el Ecuador. Comunicación personal.	M		2005	

1.2.2 Classification and definitions

National class	Definition
Native bamboo or caña guadúa	The economically most important bamboo species is <i>Guadua angustifolia</i> a species known for its highly appreciated physical and mechanical properties and the large size of its culms that reach up to 30 meters in height and 25 centimeters in diameter. It is best known as “caña guadúa”, “caña brava”, “caña macho” or just “caña”.

1.2.3 Original data

1.3 Data for National Reporting Table T1

GBRA 2005 Categories	Area (1000 hectares)		
	1990	2000*	2005
Bamboo on forest land	DI	DI	DI
Monopodial bamboo area	DI	0.005	0.0058
Sympodial bamboo area		9.22	10.60
TOTAL		9.22	10.61

1.4 Comments to National Reporting Table T1

Including information about the minimum area of which information is collected

*: The data correspond to year 2 003.

The area of monopodial bamboo refers exclusively to the genus *Phyllostachys*, that was introduced from China. The estimations are quite conservative. There are also native monopodial bamboo genera found in Ecuador, such as *Chusquea*, *Aulonemia*, *Neurolepis*,

Rhipidocladum, *Arthroslidium* that occur in significant areas of the Andes, although their surface area has not been established as yet.

2 Table T2 – Ownership of Bamboo Forest

2.1 GBRA 2005 Categories and definitions

Category	Definition
Private ownership	Same as FRA: Land owned by individuals, families, private co-operatives, corporations, industries, religious and educational institutions, pension or investment funds, and other private institutions.
Public ownership	Same as FRA: Land owned by the State (national, state and regional governments) or government-owned institutions or corporations or other public bodies including cities, municipalities, villages and communes.
Other ownership	Same as FRA: Land that is not classified either as "Public ownership" or as "Private ownership".

2.2 National Data on Bamboo Resources

2.2.1 Data sources

References	Quality (H/M/L)	Variable(s)	Year(s)	Additional comments
CÁRDENAS, ENRIQUE AND MARLIN, CHRISTIAN, Productive guidelines chains of Guadua in Ecuador, SNV.	M		2003	
DAGILIS T., DE WIT H. Bamboo Value-Added Export Development: Oportunities for Ecuador	M		2003	

2.2.2 Classification and definitions

National class (Bamboo)	Definition

2.2.3 Original data

2.3 Data for National Reporting Table T2

GBRA 2005 Categories	Area (1000 ha)	
	1990	2000*
Private ownership	DI	4.27
Public ownership	DI	
Other ownership	DI	5.0**
Total		9.27

2.4 Comments to National Reporting Table T2

The surface area of 4 270 has only refers to plantations, including both introduced and native species, such as *Guadua angustifolia*.

*: By 1990, there has not been reported information on land reforested with bamboo. The latest information refers to 2003 and is mentioned in the box that corresponds to year 2000.

** : The study only makes references to areas covered with bamboo plantations (3000 ha). However, it refers to 5000 has of native species, but it was not determined whether they are located on public or private land. For that reason it is located in box "other owners", the information corresponds to year 2003

3 TABLE T3 – CHARACTERISTICS OF BAMBOO FOREST**3.1 GBRA 2005 Categories and definitions**

Category	Definition
Natural bamboo forest	Bamboo area of naturally regenerated native bamboo species.
Plantation	Bamboo area of native or introduced species, established through planting, seeding or assisted natural regeneration.

3.2 National data on Bamboo in Forest**3.2.1 Data sources**

References	Quality (H/M/L)	Variable(s)	Year(s)	Additional comments
1. LONDOÑO X. Evaluation of Bamboo Resources in Latin America. Final report of project No. 96-8300-01-4. 2. MINISTERIO DE AGRICULTURA, (ECUADOR). Inventario de la caña guadúa en la región Litoral del Ecuador	M	Ecuador	1998	

3.2.2 Classification and definitions

National class	Definition

3.2.3 Original data**3.3 Data for National Reporting Table T3**

GBRA 2005 Categories	Area (1000 hectares)		
	1990	2000*	2005
Natural bamboo forest		24.916	5.0
Plantation		0.249	5.61
TOTAL		25.265	10.61

3.4 Comments to National Reporting Table T3

*: The data correspond to year 1998

The provided surface area data correspond to the species *Guadua angustifolia*. This is the most important species cultivated and utilized in Ecuador. There is no information on other species. On the other hand, there is no basic information that allows for exact surface values.

The indicated information are only estimations; regarding native species, the data are not reliable. For example, an inventory conducted by National Forest Program (PRONAF) mentions a surface area of 14 619 has of *G. angustifolia* in 1985, however, 13 years later (1998), the surface area for the same species was estimated at 24 916 has. (Evaluation of bamboo in Latin America, Ximena Londoño).

A valid conclusion has been that the surface area gradually decreases due to intensive harvests, induced by a high demand in local markets and conversion of areas into agriculture.

4. Table T4 – Bamboo Growing Stock.

4.1 GBRA 2005 Categories and definitions

Category	Definition
Bamboo Growing stock	Weight (tons) of all bamboo forest more than X cm in diameter at breast height.
Commercial growing stock of Bamboo	The part of the growing stock of bamboo species that are considered as commercial or potentially commercial under current market conditions, and with a diameter at breast height of Z cm or more.
Growing stock of Common bamboo species	Weight (tons) of the most common bamboo species.

4.2 National data on Bamboo Resources

4.2.1 Data sources

References	Quality (H/M/L)	Variable(s)	Year(s)	Additional comments

4.2.2 Classification and definitions

Category	Definition

4.2.3 Original data

4.3 Data for National Reporting Table T4

GBRA 2005 Categories	Total weight (tons)		
	1990	2000	2005
Bamboo Growing stock	DI	DI	DI
....	DI	DI	DI

Note: if possible, please (1) breakdown by species groups (2) include information on the minimum diameter used as thresholds and (3) provide coefficient of number of culms per a ton of weight

4.4 Comments to National Reporting Table T4

The country does not have the information asked for in the present table.

5 Table T5 – Bamboo Biomass stock

5.1 GBRA 2005 Categories and definitions

Category	Definition
Above-ground biomass of Bamboo	All living biomass above the soil including stem, stump, branches, bark, seeds, and foliage.
Below-ground biomass of Bamboo	All living biomass of live roots. Fine roots of less than 2mm diameter are excluded because these often cannot be distinguished empirically from soil organic matter or litter.

5.2 National Data on Bamboo Resources

5.2.1 Data sources

References	Quality (H/M/L)	Variable(s)	Year(s)	Additional comments
STERN, M. 2002. Assesment of Carbono fixing by Guadua plantations in Tropimaderas and Tropiteca. Report prepared by Tropimaderas S.A. Quito.	M		2002	

5.2.2 Classification and definitions

Category	Definition

5.2.3 Original data

5.3 Data for National Reporting Table T5

GBRA 2005 Categorías	Bamboo Biomass (million metric ton dry weight)		
	1990	2000	2005
Above-ground biomass of Bamboo	DI	3.14	0.62
Below-ground biomass of Bamboo	DI	0.88	0.18
Total of living biomass	DI		
TOTAL	DI	4.02	0.80

5.4 Comments to National Reporting Table T5

The analysis was done in accordance with the following relation: dry weight of aerial part of the plant corresponds to 72.0% of total weight (culms 47%, branches and leaves 25%) The rhizomes and roots represent 28% of the total dry weight. The basic data for the analysis were taken from table 3.

6 Table 6 – Diversity of bamboo tree species

6.1 GBRA 2005 Categories and definitions

Category	Definition
Number of native Bamboo species	The total number of native tree species that have been identified within the country.
Number of introduced Bamboo species	The total number of introduced tree species that have been identified within the country.
Number of critically endangered Bamboo species	The number of native tree species that are classified as “Critically endangered” in the IUCN red list.
Number of endangered Bamboo species	The number of native tree species that are classified as “Endangered” in the IUCN red list.
Number of vulnerable Bamboo species	The number of native tree species that are classified as “Vulnerable” in the IUCN red list.

6.2 National Data on Bamboo Resources

6.2.1 Data sources

References to sources of information	Quality (H/M/L)	Variable(s)	Year(s)	Additional comments
LONDOÑO X. Evaluation of Bamboo Resources in Latin America. Final report of project No. 96-8300-01-4.	H	Ecuador	1998	No available 2000 year
MORAN J. Bambúes introducidos en el Ecuador. Comunicación personal.	M		2005	

6.2.2 Classification and definitions

Category	Definition

6.3 Data for National Reporting Table T6

GBRA 2005 Categories	Number of species (Year 2000*)
Native Bamboo species	42
Introduced Bamboo species	23
Critically endangered Bamboo species	0
Endangered Bamboo species	0
Vulnerable Bamboo species	0

6.4 Comments to National Reporting Table T6

Ecuador registers 6 genera and 42 species, of which 11 are endemic, being understood as only occurring in Ecuador. This information was updated in 1998, no so for the year 2000..

7 Table T7 – Bamboo Removal

7.1 GBRA 2005 Categories and Definitions

Category	Definition
Bamboo Wood removal	The Bamboo wood removed (volume) for production of goods and services other than energy production (woodfuel).
Woodfuel Bamboo removal	The Bamboo wood removed for energy production purposes, regardless whether for industrial, commercial or domestic use.

7.2 National Data on Bamboo Resources

7.2.1 Data sources

References to sources of information	Quality (H/M/L)	Variable(s)	Year(s)	Additional comments
MINISTERIO DEL AMBIENTE. Historical volumes of forest removal bambo guadua and authorized. CÁRDENAS, ENRIQUE AND MARLIN, CHRISTIAN, Productive guidelines chains of Guadua in Ecuador, SNV.	M M		1997- 2001 2003	

7.2.2 Classification and definitions

National class	Definition

7.2.3 Original data

AÑO	VOLUMEN m ³	TONELADAS
1 990	50 595,99	35 417,19
1 997	50 636,74	35 445,72
1 998	62 564,13	43 794,89
1 999	43 591,55	30 514,09
2 000	51 339,48	35 937,64
2 001	72 551,48	50 786,04
2 005	75 717,59	53 002,31

DB: 0.7 gr/cm³

7.3 Data for National Reporting Table T7

GBRA2005	Bamboo removal (million ton)		
	1990	2000	2005
Bamboo wood removal	0,035	0.036	0.053
Bamboo fuel wood removal	DI	DI	DI
Total	0,035	0.036	0.053

7.4 Comments to National Reporting Table T7

The values corresponding to harvested bamboo are based on the volumes of native bamboo that the Ministry of Environment allows to be removed. The values correspond to the mobilized volumes towards the different consumer markets. In Ecuador the harvesting of fuel wood is not common practice.

8 Table 8 – Value of Wood Removal

8.1 GBRA 2005 Categories and Definitions

Category	Definition
Bamboo Wood removal	The Bamboo wood removed (volume) for production of goods and services other than energy production (wood fuel).
Wood fuel Bamboo removal	The Bamboo wood removed for energy production purposes, regardless whether for industrial, commercial or domestic use.

8.2 National Data

8.2.1 Data sources

References to sources of information	Quality (H/M/L)	Variable(s)	Year(s)	Additional comments
MINISTERIO DEL AMBIENTE. Historical cost of the bamboo or guadua.	M		1997 a 2001	
Central Bank of Ecuador. Bamboo Export Statistics www.ecuadorexporta.org	H	Partida Nandina 1401100000	2000 a 2004	
DAGILIS T, DE WIT H. Bamboo Value-Added Export Development : Opportunities for Ecuador	M		2003	

8.2.2 Classification and definitions

National class	Definition

8.2.3 Original data

8.3 Data for National Reporting Table T8

GBRA2005	Value (million USD)		
	1990	2000	2005
Bamboo wood removal	1.33	1.23	3.07
Bamboo woodfuel removal	DI	DI	DI

Total	1.33	1.23	3.07
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8.4 Comments to National Reporting Table T8

The indicated values for year 2000 correspond to the sum of the value of the bamboo acquired at the harvesting site plus the FOB value of the exports conducted in that year. The values of 1990 and 2005 are estimates. For the present year the average price per cubic meter of native bamboo is 37.5 USD

For the year 1990, the exchange rate registered 821,91 sucres per US dollar, with an inflation rate of 50%. Since 2000, Ecuador has been using the US dollar as official currency with an exchange rate of 25000 sucres per dollar.

9 Table 9 – Non Wood Bamboo Product Removal

9.1 GBRA2005 Categories and Definitions

Category
<u>Plant products / raw material</u>
1. Food
2. Raw material for medicine and aromatic products
3. Raw material for utensils, handicrafts & construction
4. Ornamental plants
5. Other plant products
<u>Animal products / raw material</u>
1. Living animals
2. Other edible animal products
3. Other non-edible animal products

9.2 National Data on Bamboo Resources

9.2.1 Data sources

References to sources of information	Quality (H/M/L)	Variable(s)	Year(s)	Additional comments

9.2.2 Classification and definitions

9.2.3 Original data

9.3 Data for National Reporting Table T9

GBRA 2005 Categories	Scale factor	Unit	NWFP removal		
			1990	2000	2005
<u>Plant products / raw material</u>			DI	DI	
1. Food (bamboo shoots)			DI	DI	
2. Raw material for medicine and aromatic products			DI	DI	
3. Raw material for utensils, handicrafts			DI	DI	

& construction					
4. Ornamental plants			DI	DI	
5. Other plant products			DI	DI	
Animal products / raw material (if any)			DI	DI	
1. Living animals			DI	DI	
2. Other edible animal products			DI	DI	
3. Other non-edible animal products			DI	DI	

9.4 Comments to National Reporting Table T9

10 Table T10– Value of Non Wood Bamboo Product

10.1 GBRA 2005 Categories and Definitions

10.2 National Data on Bamboo Resources

10.2.1 Data sources

References to sources of information	Quality (H/M/L)	Variable(s)	Year(s)	Additional comments
MINISTERIO DEL AMBIENTE. Historic values of Bamboo and Guadua	M			1997 a 2001
DAGILIS T, DE WIT H. Bamboo Value-Added Export Development : Opportunities for Ecuador	M			2003

10.2.2 Classification and definitions

10.2.3 Original data

10.3 Data for National Reporting Table T10

GBRA 2005 Categories	Value of the other than culms removal (Million USD)		
	1990	2000	2005
Plant products / raw material			
1. Food (bamboo shoots)	DI	DI	DI
2. Raw material for medicine and aromatic products	DI	DI	DI
3. Raw material for utensils, handicrafts & construction	1.33	1.12	2.89
4. Ornamental plants	DI	DI	DI
5. Other plant products	DI	DI	DI

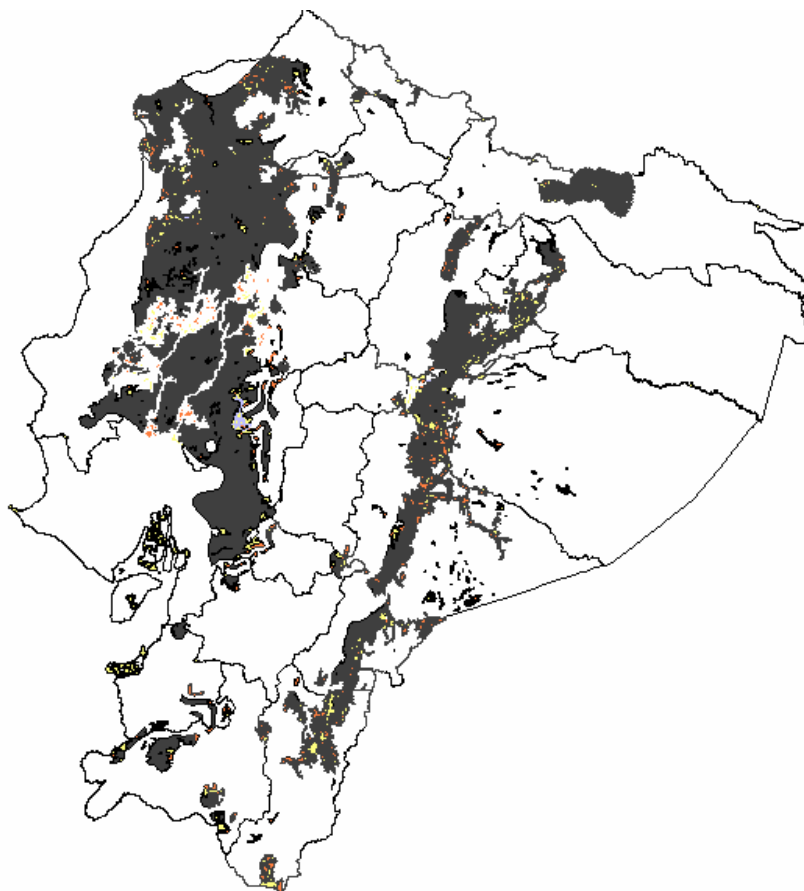
10.4 Comments to National Reporting Table T10

The development of Bamboo industries in Ecuador has been incipient, so that it is not possible to provide any detailed information as required in Table 10. The data of line 3 of Table 10, correspond to those of table 8, without the export values of 2000 and 2005.

11 Map of country's bamboo resources distribution

Please attach a map of bamboo distribution in the country with explanatory notes

GEOGRAPHICAL ANALYSIS



A geographical analysis was made to identify the potential areas for *Guadua angustifolia* in Ecuador. The following criteria were used, based on the ideal growing circumstances for guadua.

- Altitude between 400 and 1800 meters above sea level. Other sources refer to an altitude of 0 to 1800 meters above sea level¹
- Temperatures between 18 and 28 °C
- Annual precipitation more than 1200 mm

The results are shown in the map below and illustrate clearly that there are two regions where the guadua can grow well:

- The area of the Pacific coast has the largest potential, with exception of the coastal regions that have ecosystems with tropical dry forests.
- The other region with potential is formed by the eastern slopes of the Andes, towards the Amazon basin²

¹ : Morán J. Personal communication, 2005

1 **Bamboo production chain in Ecuador.** Arie Klop, Enrique Cárdenas, Christian Marlin, SNV –Ecuador. 2003

This map excludes the highland or Andean regions (2 000 a 3 000 msnm) where bamboo species occur that are known as “highland bamboos”, including the genera *Chusquea*, *Aulonemia*, *Neurolepis*, *Rhipidocladum*, *Arthroslidium*. No distribution map has been made for these genera, because their use is predominantly domestic, however, with commercial potential.

12 List of bamboo species in the country

Please attach list of the main bamboo species in the country

Guadua angustifolia

Guadua weberbaueri

Aulonemia queko

Aulonemia patula

Chusquea spp.

Neurolepis elata

Neurolepis rigida

Rhipidocladum harmonicum

Rhipidocladum racemiflorum

List main uses native species

Aulonemia, the culms are valued for its long internodes which have been traditionally used for handcraft activities by people in the highland areas. Also, these culms represent an important complement in the peasant’s economic activities.

Chusquea, the culms are used mainly for house construction (“bahareque” walls, roof, doors, wicker-work in dirt walls), to weave baskets, fan, mats, brooms, and hats. In addition, is it used as forage to feed horses, cows and cuys, the most preferred species for this purpose are *Chusquea sacandens*, *C. abilanata*, *C. subulata*, *C. uniflora* and *C. neurpphylla* (brooms)

Neurolepis. *N. elata* used for construction of roofs on the cow shelter and *N. rigida* as a natural food for the mountain tapir.

Rhipidocladum, the culms are used to make flutes, tubes for blowing fires, and other different domestic artefacts. *R. racemiflorum*, the culms are used in the manufacturing of fireworks and kite farms, the internodes are said to be used to make cigarette holders but not on a commercial scale.

Guadua angustifolia, occupies the first position in the local bamboo economy of Ecuador. It is a fundamental material of Ecuadorian culture both in the traditional past and present. The principal application of bamboo is in the building industry of the coastal region. In addition to its use in the construction of dwellings, guadua is employed for the range of other purposes and objects in daily use. For example: animal farms, latex-and cacao drying trays, banana props, bridges, fences, gates, flag poles, TV aerials, fish traps, fruit-harvesting poles, furniture, source of water and medicinal uses.

Guadua weberbaueri, the culms are used as knives, dart holders, flutes and ceremonial canes.

Ecuador has a substantial supply of *Guadua angustifolia* and *Bambusa vulgaris* (introduced). While *Guadua* is valued for its properties, the *vulgaris* and other species are not widely embraced in the country. Given their potential demands for flooring, laminates, furniture, etc., a range of bamboo species should be considered. Because the BTC should be independent

from influences by groups, organizations, and geographic focal points, it should have a mandate to explore and promote alternative bamboo species and associated development as deemed valuable.

List main uses introduced species

Dendrocalamus asper (chlt.) Bacher ex Heyne

Very good shoots for consumption.

Dendrocalamus giganteus (Wall. romm. rad) Munro.

Large bamboo species for construction.

Shoots have a little bitter taste, but through washing it ones or twice, the shoots is good for consumption.

Dendrocalamus semiscandes Hsueh et D. Z. Li

Shoots good for consumption.

Bambusa intermedia Hsueh et Yi

Culms are used for weaving. It can be planted along river banks, because of its good characteristics for soil preservation.

Bambusa vulgaris cv. vittata

Used for Horticulture

Bambusa ventricosa Mc. Clure.

Used for horticulture.

Bambusa blumeana Schult

Bambusa pervariabilis.

Culms are very hard and good for construction and other production tool.

Phyllostachys nigra

Guadua longifibriata

Add the table: list of the main pest species

Nombre científico	Familia	Observaciones
<i>Podischnus agenor</i>	Scarabeidae	<i>Guadua angustifolia</i>
<i>Dinoderus minutes</i>		<i>Dendrocalamus spp</i> <i>Bambusa spp</i> <i>Guadua angustifolia</i>
<i>Parisoschoenus sp</i>	Curculionidae	<i>Guadua angustifolia</i>

<i>Atta cephalotes</i>	Formicidae	<i>Guadua angustifolia</i>
<i>Crematogaster sp</i>	Formicidae	<i>Guadua angustifolia</i>
<i>Mielobia sp.</i>		<i>Guadua angustifolia</i>

Source: HIDALGO O. Bamboo the gift of gods. Bogotá, Colombia.

CRUZ H. La guadúa: nuestro bambú. Armenia, Colombia.