

IWOKRAMA INTERNATIONAL CENTRE FOR RAINFOREST CONSERVATION AND DEVELOPMENT

PERMANENT SAMPLE PLOT FINAL REPORT



International Tropical Timber
Organization



Iwokrama International Centre for Rain Forest
Conservation and Development

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Establishment of Permanent Sample Plots (PSP) in the Iwokrama Forest Final Report

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Background

Permanent sample plots (PSP) are permanently demarcated areas of forest, typically of one hectare, which are periodically remeasured. PSP are the base of growth and yield studies (Alder and Synnott, 1992). They allow for gaining knowledge on forest changes under different situations. Forest management, then, can be based on this knowledge and be continuously adapted to new information.

With Iwokrama starting in 2007 the sustainable management of some 108,000 ha of forest for timber production, there was a need of a system of PSP for both sampling and experimental purposes. This system started to be established within the objectives of the ITTO Project PD 297/04 Rev.3 (F) "Implementation of the Sustainable Forest Management Programme of the Iwokrama International Centre."

The objectives and design of the plots and the PSP system for Iwokrama were elaborated in July 2007. The relevant document is *Procedures for Establishing Permanent Sample Plots for Forest Monitoring in the Iwokrama Forest*, included herein as Appendix I. The document establishes the objectives and principles of a system of PSP in the Iwokrama Forest, and defines the establishment and measuring methods for sample and experimental plots (Iwokrama, 2007)

The design attempts to ensure the possibility of integrate analysis with past and future PSP experiences in Guyana. Relevant antecedents of PSP in Guyana were taken into account, together with international theory on the subject and the recent effort by the Guyana Forestry Commission for attaining the standardization of this and other forest research methodology in the country.

Objectives

The system of PSPs in the Iwokrama Forest will be able to register forest change within existing and regular conditions, such as those found in the unlogged forest and in those areas where regular management plan prescriptions are applied. At the same time, experimental PSPs will explore different management regimes, in this case different harvest intensities, to be applied at field trials at a scale which could also facilitate other monitoring and analyses.

In line with goals of environmental conservation and sustainable use of the forest biodiversity, the PSPs will also attempt to provide information on other important elements related to these goals, such as non-timber forest products, the presence of invasive alien species, and carbon storage in specific carbon pools of the forest.

The establishment of twelve one-hectare PSP was originally planned for the project. They include eight PSP to be established as classical sample plots in the four major forest types of the Net Operable Area (NOA) and four experimental plots. Thirteen PSP were finally established, nine sample plots and four experimental plots.

A sample plot program of 50 to 100 PSP can provide an acceptable basis for growth and yield work, according to Synnott (1979). An end objective of the order of 1,000 plots at a national level, well distributed over sites and forest types, was also considered a desirable goal by Alder and Synnott (1992). The sample plot program executed at the Iwokrama Forest in 2007-2008 should be considered as an initial program with objectives of defining a methodology, establishing an important number of plots in the field and training local technical personnel in the tasks.

Principles of the PSP System

Plots consist of one-hectare, 100 m x 100 m square plots divided into twenty five 20 m x 20 m quadrats, where all trees larger than 20 cm dbh are measured. Smaller trees of the pole (5 cm to 19.9 cm dbh), sapling (2 cm to 4.9 cm dbh) and seedling (+ 30 cm height) categories are measured in subplots of the main plot.

Plots are located in areas to be logged in a near future and in reserve areas where no logging is planned.

Plot location takes into account forest type, giving priority to the forest types that are found in the Net Operable Area (NOA) of the Sustainable Utilization Area (SUA).

The GIS grid developed for the pre-harvest inventory, which divides the Iwokrama Forest in 100 ha blocks of 1,000 m x 1,000 m, constitutes the geographical framework for plot location.

Both sample plots and experimental are established. Experimental plots have the same characteristics as other plots, and are located on adjacent blocks of 100 ha where different treatments will be applied on each block.

In all cases, data are collected on the field with the use of hand-held electronic data recorders.

All planning aspects of plot design, establishment and measurement are described in the document on Procedures (Iwokrama, 2007).

Establishment and measurement of the plots

Field work started in early December 2007 and concluded at the end of August 2008. Nine sample plots and four experimental plots were established.

The field crew regularly consisted of a crew leader, an assistant, a tree spotter and one cutlass man. Toward the end of the period, the crew was able to complete the establishment and measurement of a PSP in eight to nine working days as an average.

The nine sample plots were established to test existing, regular conditions. Those conditions are basically two in the Iwokrama Forest, unlogged forest and forest logged under the management plan prescriptions (ITI, 2007). Following these prescriptions, some 20 cubic meters per ha are harvested in one intervention within a 60-year cycle. This volume per ha may be lower for the two forest types covering lower area in the NOA (Ibid.). Forest types and their areas in the NOA are shown in Table 1.

The nine sample plots include two plots on every major forest type, one in an area to be logged and one in an area that will not be logged. The major forest types are the Mixed Greenheart, Black Kakaralli, Wamara Forest (MGK), the Mora, Manikole, Crabwood, Trysil Forest (MMC), the Mixed Greenheart, Sand Baromalli, Soft Wallaba Forest (MGB), and the Wallaba Forest (WF). A ninth sample plot was established on a Dakama Forest (DF) site, an area originally mapped on the basis of air photographs as Wallaba Forest. No logging is planned on areas of Dakama Forest.

Table 1. Major forest types in the NOA of the Iwokrama Forest

<i>Forest type</i>	<i>Area in NOA (ha)</i>
Mixed Greenheart, Black Kakaralli, Wamara Forest (MGK)	56,650.3
Mora, Manikole, Crabwood, Trysil Forest (MMC)	30,768.0
Mixed Greenheart, Sand Baromalli, Soft Wallaba Forest (MGB)	15,859.2
Wallaba Forest (WF)	5,714.3
<i>Total</i>	<i>108,991.8</i>

Experimental plots were also established, for exploring other treatments. These new treatments basically consist of different logging intensities, and each treatment will be applied on large scale field trials of 100 ha (one block), allowing for carrying out other types of studies on the area. Experimental plots have the same size and characteristics as other plots.

The four experimental plots are established in adjacent blocks that will be subjected to different logging intensities on the most common commercial forest type, MGK. Logging intensities recommended for trial are 17, 20, 23 and 26 cubic meters per ha. Twenty cubic meters per ha is the regularly prescribed maximum logging intensity in Guyana for a 60-year cycle by the Guyana Forestry Commission (GFC) (GFC, 2002). However, this rule of thumb does not discriminate on forest type, site quality, stocking and logging history. The primary condition of the Iwokrama Forest, which has never been logged, and the higher stocking levels associated to unlogged forests, suggest that exploring other logging intensities may be useful.

Table 2. Forest types and number of PSP

<i>Forest type</i>	<i>Sample plots Non-logging areas</i>	<i>Sample plots Logging areas</i>	<i>Experimental plots (Logging areas)</i>
Mixed Greenheart, Black Kakaralli, Wamara Forest (MGK)	1 Block 741	1 Block 887	4 Blocks 987, 988, 1038, 1039
Mora, Manikole, Crabwood, Trysil Forest (MMC)	1 Block 204	1 Block 2235	-
Mixed Greenheart, Sand Baromalli, Soft Wallaba Forest (MGB)	1 Block 1256	1 Block 1323	-
Wallaba Forest (WF)	1 Block 787	1 Block 786	-
Dakama Forest (DK)	1 Block 839	-	-
<i>Total</i>	<i>5</i>	<i>4</i>	<i>4</i>

The sample plot located on block 887 was logged in 2008 after its establishment and measurement, and requires remeasurement before the end of the year.

REFERENCES

- Alder, D. and T.J. Synnott. 1992. Permanent Sample Plot Techniques for Mixed Tropical Forest. Oxford Forestry Institute Tropical Forestry Papers N° 25. Oxford: OFI.
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- Synnott, T.J., 1979. A Manual of Permanent Plot Procedures for Tropical Rainforests. Tropical Forestry Papers, Commonwealth Forestry Institute, University of Oxford. No. 14, 67 pp.

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APPENDIX I
PROCEDURES FOR ESTABLISHING PERMANENT SAMPLE PLOTS
IN THE IWOKRAMA FOREST