

Communication from the National Forest Inventories Working Group of the 16th Caribbean Foresters Meeting: Proposal for a Regional Workshop

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Abstract - We addressed the National Forests Inventories Working Group of the 16th Caribbean Foresters Meeting to propose a series of training modules regarding how to conduct national forest inventories and analyze the data collected. Improving regional capacity is crucial to ensuring the sustainable management of Caribbean forest ecosystems. We focused on the statistical and computer skills that will facilitate appropriate forest inventory planning and design, data summation, data quality assurance and quality control, and information presentation congruent with internationally acceptable standards.

Introduction

The sustainability of Caribbean forest ecosystems and livelihoods requires capacity building for the development of natural-resource inventories in anticipation of potential impacts related to climate change and anthropogenic effects (Lewsey et al. 2004, López-Marrero and Heartsill-Scalley 2012, Taylor et al. 2012). Coordinated regional efforts to produce and maintain baseline data from forest inventories at the national level are increasingly vital because of human reliance on ecosystem services coupled with uneven technical resources within the Caribbean region (Brown et al. 2007, FAO 2001, Leotaud and Bobb-Prescott 2013).

Meetings are recognized as an important venue for sharing expertise and appropriate technology transfer (Geoghehan 2002). This communication is the result of a report developed by the National Forests Inventories Working Group during the 16th Caribbean Foresters Meeting held in the Dominican Republic in August 2013. Participants of the working group included forest officers, biologists, foresters, and researchers in the fields of Caribbean ecology and forestry from Barbados,

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Dominica, Dominican Republic, Jamaica, Puerto Rico, St. Kitts and Nevis, Suriname, and Trinidad and Tobago. By addressing the context and needs of the Caribbean countries represented in the working group, we produced a proposal to develop a series of modules related to technical capacity-building for conducting national forest inventories.

The Caribbean Context

There is a general need for increased technical capacity regarding planning and implementation of national forest-monitoring and analysis by many Caribbean countries. The most recent forest-inventory data from territories represented by participants of the National Forests Inventories Working Group are over 20 years old or are localized and without a national context (Table 1). Most of these inventories were conducted by contracted foreign biologists. Even though local individuals were involved in the process, few local personnel remember what they learned during the inventories. During the working-group session, we emphasized the need for skilled personnel in the planning, design, and implementation of forest monitoring projects, data analysis, report presentation, and quality-assurance processes. We highlighted the idea that Caribbean territories require varying degrees of assistance with common issues such as sustainable forest management, timber production, forest dynamics after the abandonment of agricultural lands and hurricane impacts, characterization of forest types, review of outdated nature reserves management plans, training in tree-species identification techniques, and appropriate networking to adequately assess impacts of climate change (Table 2). We derived as a consensus goal the improvement of regional technical capacity in conducting and maintaining national forest inventories as a crucial requisite for sustainable management of Caribbean forest ecosystems. To achieve that goal, we propose a workshop series on forest monitoring and analysis. The report from the Global Forest Assessment

Table 1. Countries represented by the National Forest Inventories Working Group of the 16th Caribbean Foresters Meeting and the date of their last national forest inventory.

Country	Date of last forest inventory at the national level
Barbados	No national inventory as yet
Dominica	1987
Dominican Republic	1973 New ongoing national inventory (data collection phase)
Jamaica	1970s and 1980s (timber inventory) 1998 (ongoing forest inventory in critical watersheds) 2008 (first permanent sample plots on selected forest reserves)
Puerto Rico	2014
St. Kitts and Nevis	No national inventory as yet
Suriname	1974
Trinidad and Tobago	1980

2010 indicated that globally, data were lacking only for the Caribbean region (FAO 2010). Facilitating the ability of local authorities to implement forest assessments congruent with internationally acceptable standards will be an additional valuable outcome of the workshop.

Workshop Series on Forest Inventory and Monitoring

We propose a series of modules covering specific aspects of the steps leading to a forest inventory and data analysis. We suggest that these modules should be presented at a 1-week workshop to be planned. The working group suggested that the easy accessibility of the forests and flat terrain in Trinidad and Tobago (3 days in Trinidad and 2 days in Tobago) provide the ideal location for hosting the regional workshop. The practical component of the workshop will be greatly facilitated by these circumstances. Opportunities will be presented to review the efficacy of the existing sample-plot program that has been established in Trinidad. However, suggested use of these study plots does not imply that the institution maintaining the plots must assume the costs of hosting the workshop; our intention here is to report on the needs of forestry personnel within the different countries represented on our working group while providing potential solutions for the adequate promotion of forest research, analysis, and reporting of data from the local to the global scale.

Table 2. Specific key forest monitoring and technical issues identified for each country by the members of the National Forests Inventories Working Group of the 16th Caribbean Foresters Meeting.

Country	Key forest monitoring and technical issues
Barbados	Forest coverage, composition and dynamics: Characterization and quantification of forest types Monitor influence of regional and local stressors on forest (e.g. hurricanes, agricultural land dynamics and abandonment)
Dominica	National and nature reserves forest inventory: Review of outdated nature reserves management plan Guidelines and expertise for implementation
Dominican Republic	Limited capacity for tree species identification
Jamaica	Forestry data analysis and interpretation
Puerto Rico	More networking opportunities with Caribbean territories to assess forest dynamics and impacts of climate change at the regional level
St. Kitts and Nevis	National Forest Inventory: Guidelines and expertise for implementation
Suriname	Sustainable forest management: Monitoring and verification process Impacts of climate change Sustainable timber production
Trinidad and Tobago	National Forest Inventory: Guidelines and expertise for implementation Forestry data analysis

The workshop targets natural-resource management and forestry-agency personnel. One major aspect of the proposed workshop is the intention of delivering information specific to each Caribbean country regarding forest inventory and monitoring, and target and threshold objectives. In order to attend, each potential participant will have to provide a statement in writing from a key governmental representative in their country describing the needs for forest monitoring and data analysis in accordance with national forest-planning issues and desired forest conditions. By focusing on existing data and experiences from forest inventory and monitoring projects in the Caribbean, participants will be exposed to the following:

- Sampling techniques and considerations: Target population, appropriate sampling-unit size and shape, common sampling designs (simple random, stratified random, systematic, cluster), and sample-size determination.
- Geographical information system (GIS) applications in forest inventory sampling designs and data presentation: Generation of stratified random locations, grid development, and mapping forest inventory and monitoring results.
- Planning of field-data collection: Development of a field manual, plot-establishment protocols, field methods and training, safety procedures, and data quality assurance and control systems in the field.
- Data-quality checking and cleaning: Outliers, scatterplots.
- Descriptive statistics and data exploration: Basic measures of central tendency and dispersion (mean, variance, standard deviation, coefficient of variation), histograms, frequency tables, and normality.
- Data reporting and presentation: Reliability of the data (sampling error, confidence intervals), forest inventory data summaries (core set of tables, graphs, maps, and charts), computer software for data processing and analysis, and reporting from the national to the global level.

We established the following as prerequisite essentials for the proposed workshop: procurement of audiovisual (already available) modules, online tutorials and manuals on basic statistics exercises and GIS, and determination of capacity and available resources (human, technological, financial, time). The statistical and computer skills acquired during the workshop will allow for forest-inventory planning and design, data summation, data quality assurance and quality control, and information presentation using an established forest management information system. The National Forests Inventories Working Group anticipates further data analysis related to hypothesis testing as a result of acquired skills. The working group also considered additional workshop modules on inferential statistics (parametric, non-parametric) as basic for understanding multivariate analysis and as the means for developing a skilled local workforce and much needed regional research agenda within the Caribbean (FAO 2001, Geoghegan 2002, López-Marrero and Heartsill-Scalley 2012, Taylor et al. 2012).

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Literature Cited

- Brown, N., T. Geoghegan, and Y. Renard. 2007. A situation analysis for the wider Caribbean. International Union for Conservation of Nature and Natural Resources (IUCN) Caribbean Initiative, Gland, Switzerland. 52 pp.
- Food and Agriculture Organization (FAO) of the United Nations. 2001. Land resources information systems in the Caribbean. Summary report and recommendations. Pp. 1–6, *In* FAO. Proceedings of a Subregional Workshop held in Bridgetown, Barbados, 2–4 October 2000. FAO, Rome, Italy.
- FAO of the United Nations. 2010. Global forest-resource assessment 2010, main report. FAO Forestry Paper 163. FAO, Rome, Italy.
- Geoghegan, T. 2002. Participatory forest management in the insular Caribbean: Current status and progress to date. Caribbean Natural Resources Institute Technical Report No. 310. Caribbean Natural Resources Institute, Port of Spain, Republic of Trinidad and Tobago. 29 pp.
- Leotaud N., and N. Bobb-Prescott. 2013. The impacts of climate change on biodiversity and biodiversity-dependent livelihoods in the Caribbean islands. Pp. 55–61, *In* J.L. Vernier and M. Burac. (Eds.). Direction de l'Environnement, de l'Aménagement et du Logement de Martinique, Centre de recherche GEODE Caraïbe. Actes du Colloque international Biodiversité insulaire: la flore, la faune et l'homme dans les Petites Antilles, Schoelcher. EA 929, Université des Antilles, Guyane. 192 pp.
- Lewsey, C., G. Cid, and E. Kruse. 2004. Assessing climate-change impacts on coastal infrastructure in the Eastern Caribbean. *Marine Policy* 28:393–409.
- López-Marrero, T., and T. Heartsill-Scalley. 2012. Get up, stand up: Environmental situation, threats, and opportunities in the insular Caribbean. *Caribbean Studies* 40(2):3–14.
- Taylor, M.A., T.S. Stephenson, A.A. Chen, and K.A. Stephenson. 2012. Climate change and the Caribbean: Review and response. *Caribbean Studies* 40(2):169–200.