USDA Caribbean Climate Hub

WORKSHOP REPORT

SALVAGING WOOD FROM FALLEN TREES AFTER HURRICANES IRMA AND MARIA

San Juan, Puerto Rico
December 2017

Overview

The USDA Caribbean Climate Hub and the State and Private Forestry Program of the International Institute of Tropical Forestry of the US Forest Service, held a workshop on November 21, 2017 where more than 80 people gathered to identify the opportunities and resources necessary to take advantage of the wood from fallen trees in Puerto Rico after hurricanes Irma and Maria. Due to the economic and cultural value of tropical timber species, economic activities can be created from the available post-hurricane plant waste. Millions of fallen trees and branches can be processed to produce compost, mulch, coal and biofuels, or raw material for artisans and construction. There is also economic value in the handling of wood materials, the sale of tools and equipment for transporting and processing, and the sale of valuable wood products. In addition, many wood products store carbon indefinitely, mitigating the increase of CO^2 in the atmosphere. The main need identified during the discussion was the need to act quickly to avoid the burning and disposal of wood materials in landfills across the country.

Content

- Motive- Workshop for the retrieval of fallen trees
- Workshop objectives and program
- Brief presentations
- Group discussion- Opportunities and Challenges in the Wood Industry
- Diagram- What should be done with wood from fallen trees?
- Directory of contacts and services
- References

This report and workshop were developed by the USDA Caribbean Climate Hub.

The Caribbean Climate Hub (CCH) is located in Río Piedras, Puerto Rico, and is one of ten Regional Hubs nationwide. This network of Climate Hubs will work with USDA to deliver science based knowledge and practical information to farmers, ranchers, and forest landowners that will help them to adapt to climate change and weather variability

The Mission of the CCH is to help society sustain and improve the viability of forestry and agricultural production, the availability and quality of soil and water resources, the viability and quality of rural lifestyles, and food security in light of climate variability and change. For more information visit: http://caribbeanclimatehub.org/

Summary: Wood Salvage Workshop

The hurricanes Irma and Maria left thousands of fallen trees in streets, yards, farms and forests of Puerto Rico. The wood salvaged from fallen trees is a natural resource that can be transformed to provide multiple services and take advantage of the economic value of certain timber species.

The USDA Caribbean Climate Hub and the International Institute of Tropical Forestry (IITF) of the US Forest Service are collaborating to promote the retrieval of the wood from fallen trees and to promote Puerto Rico's potential for sustainable lumber production.

As part of this effort, a workshop was held on November 21, 2017 in San Juan, where a diverse group of experts from the timber industry, biologists, artisans, arborists, and farm owners, in order to discuss alternative use of organic material collected from fallen trees. .

This report includes the topics discuss in the workshop, a summary of the challenges and opportunities for the fallen tree management, a services and participants contact directory, and a list of forestry publications available in the IITF Library.

Workshop Objectives:

- Promote the use of wood from fallen trees after hurricanes and the valuation of wood as an economic asset;
- Share information regarding the status of trees and forests after the hurricanes, discuss the existing potential for sustainable forestry projects in Puerto Rico ;
- Discuss proper wood management techniques, including measures to cut and store wood, the identification of tree species, their different uses (artisanal, construction, composting) and how to evaluate the value of fallen trees to determinate whether the wood should be rescued for processing or for alternate uses such as compost;
- Create a directory of artisans, sawmills, collection centers, people who are accepting wood, organizations with the capacity to advise on how to manage the wood, and those that are retrieving or processing wood products;
- Collect information on the challenges and opportunities related to the wood recovery and forestry project development in Puerto Rico, in order to provide update information to the Advisory Council for Agro-Forestry Development (CADA).

Workshop Agenda

November 21, 2017
IITF Conference Room
Jardín Botánico Sur, San Juan,
Puerto Rico | 8:00 am -12:00 pm

8:30 - 8:45
Welcome by Dr. William Gould, Director of USDA Caribbean Climate Hub, and Magaly Figueroa, Forest Service State and Private Forestry Program Manager

8:45 - 10:00
Tree and forest outlook after the hurricane; wood as an economic asset; identification of valuable wood; uses of wood according to tree type; business opportunities; retrieval and uses of wood:

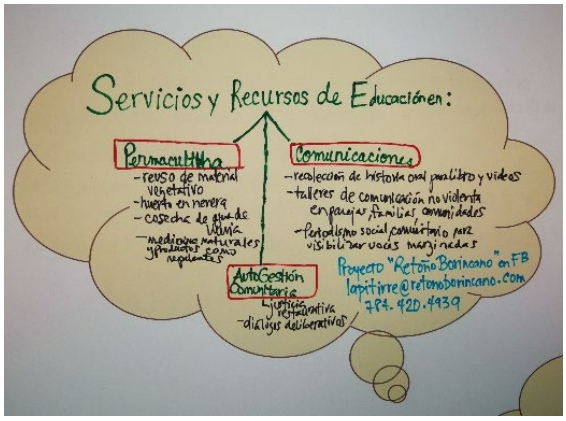
- Humfredo Marcano (IITF member): Tree mortality, abundant woods in Puerto Rico, branches as a valuable resource.
- Dr. Jimena Forero: Sustainable timber production, Puerto Rico's secondary forest potential for forestry projects, value and uses of wood.
- Andres Rúa (PR Hardwoods): Timber retrieval, stockpiling and lessons learned from the process, how to identify valuable timber.

10:00 - 10:30
Group Activity: Compile information on services and contacts for directory

10:30 - 12:00
Panel #2 Topics discussed: Wood retrieval initiatives; types of wood products and business opportunities.

- Jorge Báez, Para La Naturaleza: Wood rescue initiative and aid opportunities for farmers and landowners.
- Joaquín Chong, Agricultural Extension Service (AES): large scale vegetative material composting.
- Luis Reynaldo Santiago, AES: orchard and compost design systems.

12:00 - 12:30
Open discussion with the public, idea exchange



Presentation Summaries

Magaly Figueroa: IITF Forest Service

The US Forest Service is committed to providing technical assistance to farm owners, communities and collaborators. They are working on educational campaigns regarding wood retrieval, tree planting, and the development of management plans. In addition, to continue this effort, they will provide training to partners through workshops.

INFORMATION: Those that are interested in the development of the coal industry in Puerto Rico, there are two ways to obtain a permit:

1. Consult the Air Quality Regulation, section 203 to learn about the process
2. Consult with the Environmental Quality Board

Dr. Humfredo Marcano: Biologist at IITF

The IITF is creating an inventory and analysis of Puerto Rico's forests. Some preliminary results of Hurricane Maria's effect on the forests indicate that although there was significant damage to the trees, **there was no massive mortality considering that the island still has 55% of the forest cover**, just as we had in 2014. The amount of wood in Puerto Rico's forests continue to increase. The most noticeable damage can be seen where landslides occurred. The mortality rate was 15-20%. Between 95-99% of the trees lost their canopy and 85% lost apical dominance (referring to the growth in the tip (apex) of each branch or the main stem). While an arborist would prune a tree in a balanced manner, the hurricane does so in a way that apical dominance is lost, causing that regeneration begin in the lateral branches.

RECOMMENDATIONS: Given the effect of hurricanes on tree structure, it is necessary to consider how we can adapt standards for the artisanal market. In response to tree mortality, we must plan the sowing process of new trees in a manner that considers soil type and accessibility.

Dr. Jimena Forero: UPR - Río Piedras

According to her doctoral thesis, there is potential for small artisan companies and sawyers to manage forests. The objectives of her project were to: 1) describe forest products in the local artisanal market, 2) characterize the local wood production and 3) identify the major problems in the development of the artisanal market. **Of the 83 species of trees that grow in Puerto Rico, the artisans mostly use 8 species (mahogany, female cedar, mahoe, capa prieto, guayacán, oak, teak and capa blanco).**

The majority of local timber production comes from family micro-enterprises. Most (95%) artisans sell their products at festivals. Only 15% have a permanent space and 3% sell through the internet. The majority (70%) have noticed a decreased in product demand in the last five years.

The largest issues faced by artisans and sawyers are: 1) competition of imported crafts and souvenirs, 2) low productivity, 3) high variability in the quality and design of handcrafts, 4) individualism, 5) institutional inefficiency and 6) high level of bureaucracy to obtain permits for forest product harvest.

Recommendations: Employ greater supervision at festivals to ensure the sale of locally made products, strengthen institutional coordination to provide more effective assistance for artisans, support the development of artisan associations, decrease bureaucracy to obtain permits to harvest forest products and identify markets for special products.

Andrés Rua: CEO of Puerto Rico Hardwoods

Puerto Rico Hardwoods is a company that seeks to divert wood of commercial value from the waste stream. The company started with a tractor and a small sawmill and the objective of maintaining and stimulating the economy of its community. They note that the post-hurricane availability of valuable wood is a fantastic economic opportunity. However, taking advantage of wood requires an initial investment for the purchase of heavy equipment such as a sawmill, tractor and self-loaders. Although months have passed since the hurricanes, there are still many valuable trees on the roads. There is an urgency for swift action to avoid further loss of valuable trees.

Mr. Rúa sees a great opportunity in the use of wood for crafts. He explain that most of Puerto Rico's trees are small in size, which can be use by artisans or for the creation of high quality furniture.

Recommendations: We must establish a timber market on the island. It is important to educate the public because they may not consider wood as part of our usable resources due to the respect they have for the forest. Government agencies, the private sector and community organizations must come to an agreement to help communities see the potential of sustainable forestry.

Jorge Báez: Para La Naturaleza

Para la Naturaleza (PLN) is a non-profit organization dedicated to the conservation of lands with high ecological and environmental education. Hurricane Irma toppled most of the vegetation in the Cabezas de San Juan area, and Maria ended up affecting all other protected areas and their surrounding communities. To mitigate the impact on protected areas and surrounding communities, PLN has programs for fallen tree management and reforestation in response to hurricane Maria. In addition, PLN has a band sawmill at Hacienda La Esperanza and a portable sawmill that are used in the retrieval of wood, creation of sawdust, and clearing access to protected areas.

The reforestation program includes expanding the PLN harvesting capacity and working with 30 communities around PLN protected and managed areas. PLN plans to build another sawmill and set up collection centers to retrieve wood to restore historic buildings and then store wood for other uses.

Recommendation: For more information, please contact personnel in charge of brigade Manuel Mercado: (787) 378-5699

Dr. Joaquín Chong - Experimental Agricultural Station and Composta PR

What are we going to do as a country to manage the problem of the gigantic amount of vegetative material in the soil? According to the latest figure, 6.5 million cubic yards of vegetative material are collected daily. This is equivalent to 13,000 trucks per day with retrieved material since hurricane Maria. An essential aspect to coordinate the management of this vegetative material is to be aware of the actions each agency is taking, from the governmental agencies to the NGOs, in order to coordinate projects together (see Contacts and Services Directory).

One of the main challenges is how to educate rubble collectors to avoid the mixing of vegetative material with rubble, since this contaminates the retrieval and composting process. It is much more expensive to separate the organic and inorganic material in the collection center rather than during the collection process.

Recommendation: Due to the large amount of vegetative material that must be managed, it is necessary to identify locations where industrial composting processes can be established with machinery such as a Windrow Composting, a system that composts large amounts of vegetative material. This system can help reduce the volume of the material by 25%.

What can we do with the compost after the vegetative material is degraded? This organic matter can be used to improve agricultural soil quality, but mechanisms must be created to transfer this organic matter to farms. One option is to establish a consortium through the Environmental Protection Agency so that FEMA can grant funds to establish this kind of operation.

In Puerto Rico there are people who are knowledgeable about wood and composting, but it takes an organized group to coordinate this effort. If we fail to establish a composting project for the reuse of vegetative matter, there are risks that develop, such as fire hazards, pest infestations, the burning of organic material, or the loss of materials to be processed in Dominican Republic. There are already cases of vegetation piles catching fire due to their ability to reach high temperatures (175-200^{o}F).
By properly managing these resources, we can take advantage of the opportunity for Puerto Rico to develop an economic opportunity that would significantly contribute to the country's agricultural industry.

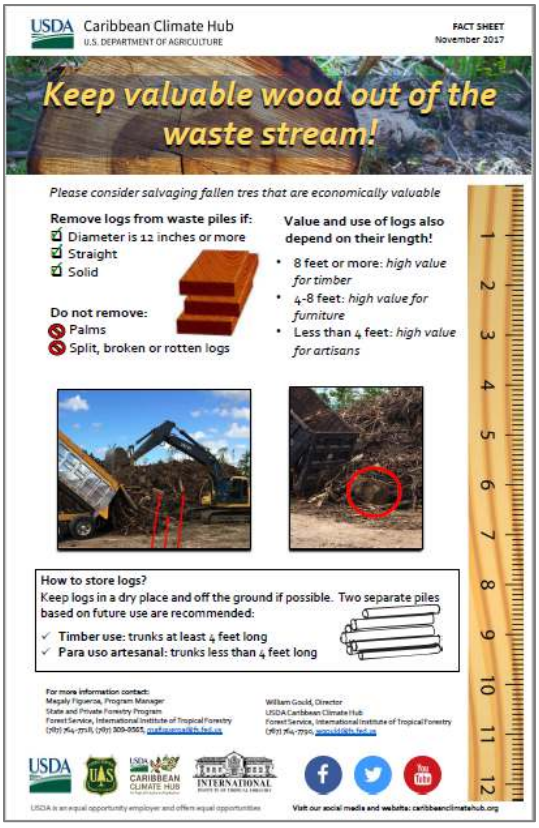
A project is being developed with Natural Resources Conservation to establish a composting demonstration project using a Windrow at Gurabo Experimental Station, where the material collected by the Solid Waste Authority will be processed. Although they will be processing 30-40 tons per month, it is considered a small-scale project, since thousands of tons per month need to be processed across the island. The demonstration area should be ready by January 2018 and the objective is for farmers to use the compost as organic matter on their land. For more information about this project, you can visit Composta PR: http://www.compostapr.org/

Luis Reynaldo Santiago Agricultural Extention Service Río Piedras:

The Botanical Garden of Río Piedras has a Demonstration Garden where visitors can learn about the vegetative compost creation process. There are three basic requirements when making vegetative compost: the proper combination of carbon and nitrogen, layers of green material, and layers of dry material. It is important to moisten the compost and mix it regularly to incorporate oxygen. The smaller the particles, the faster they decompose, so materials must be ground. When the compost is mixed, it generates heat and the temperature indicates breakdown activity (100-150°F). The compost should take between 1 to 4 months to decompose, but if it is not carried out correctly, it can take between 7 months to a year.

For more information and educative videos visit: www.youtube.com/compostapr

Informational material available for download at: http://caribbeanclimatehub.org/madera-wood-salvage/


USDA Caribbean Climate Hub
U.S. DEPARTMENT OF AGRICULTURE
FACT SHEET
November 2017

Keep valuable wood out of the waste stream!

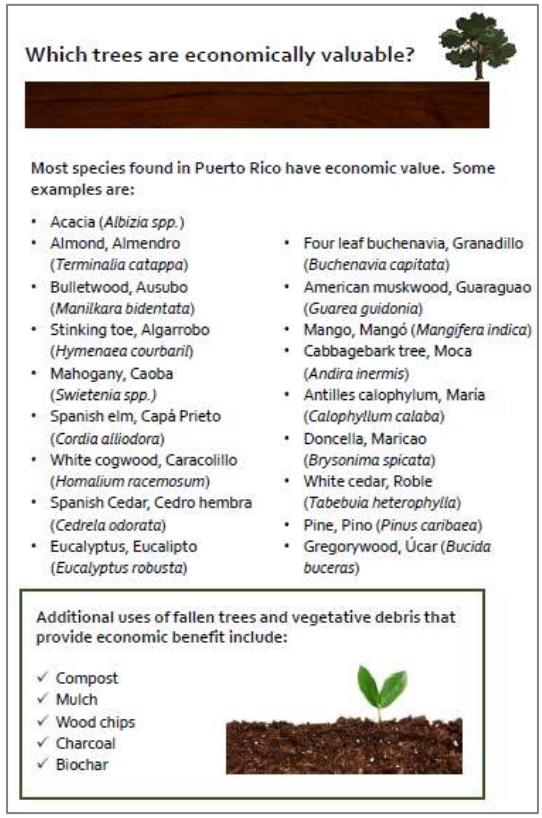
Please consider salvaging fallen tres that are economically valuable

Remove logs from waste piles if:
- ☑ Diameter is 12 inches or more
- ☑ Straight
- ☑ Solid

Do not remove:
- Palms
- Split, broken or rotten logs

Value and use of logs also depend on their length!
- 8 feet or more: *high value for timber*
- 4-8 feet: *high value for furniture*
- Less than 4 feet: *high value for artisans*

How to store logs?
Keep logs in a dry place and off the ground if possible. Two separate piles based on future use are recommended:
- ✓ **Timber use:** trunks at least 4 feet long
- ✓ **Para uso artesanal:** trunks less than 4 feet long


Which trees are economically valuable?

Most species found in Puerto Rico have economic value. Some examples are:

- Acacia (*Albizia spp.*)
- Almond, Almendro (*Terminalia catappa*)
- Bulletwood, Ausubo (*Manilkara bidentata*)
- Stinking toe, Algarrobo (*Hymenaea courbaril*)
- Mahogany, Caoba (*Swietenia spp.*)
- Spanish elm, Capá Prieto (*Cordia alliodora*)
- White cogwood, Caracolillo (*Homalium racemosum*)
- Spanish Cedar, Cedro hembra (*Cedrela odorata*)
- Eucalyptus, Eucalipto (*Eucalyptus robusta*)
- Four leaf buchenavia, Granadillo (*Buchenavia capitata*)
- American muskwood, Guaraguao (*Guarea guidonia*)
- Mango, Mangó (*Mangifera indica*)
- Cabbagebark tree, Moca (*Andira inermis*)
- Antilles calophylum, Maria (*Calophyllum calaba*)
- Doncella, Maricao (*Brysonima spicata*)
- White cedar, Roble (*Tabebuia heterophylla*)
- Pine, Pino (*Pinus caribaea*)
- Gregorywood, Úcar (*Bucida buceras*)

Additional uses of fallen trees and vegetative debris that provide economic benefit include:
- ✓ Compost
- ✓ Mulch
- ✓ Wood chips
- ✓ Charcoal
- ✓ Biochar

Wood Industry Opportunities and Challenges in Puerto Rico

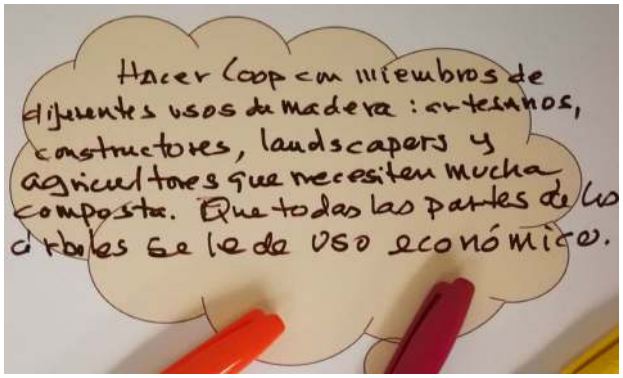
Group Discussion Summary:

Opportunities

- ✓ Extensive knowledge available for public education on the subject
- ✓ Capture success stories
- ✓ Light wood construction
- ✓ Potential for wood export
- ✓ Unused machinery available
- ✓ Knowledge to create step by step manual for fallen trees wood retrieval
- ✓ Puerto Rico has mahogany, one of the most valuable types of wood in the world
- ✓ Create cooperative for the sharing of machinery
- ✓ Potential for biomass rescue
- ✓ Create an action plan (public forum)
- ✓ Promote more recycling in Puerto Rico
- ✓ Promote vegetative use as an economic venue for rural communities
- ✓ Create educational programs for wood construction code
- ✓ Provide training on how to use equipment and identify wood species
- ✓ Improve transfer of information from academia to the public
- ✓ Make a wood species valuation table
- ✓ Preventative campaign for the next hurricane season
- ✓ Create a blog; **the Caribbean Climate Center is doing this task:** http://caribbeanclimatehub.org/madera-wood-salvage/

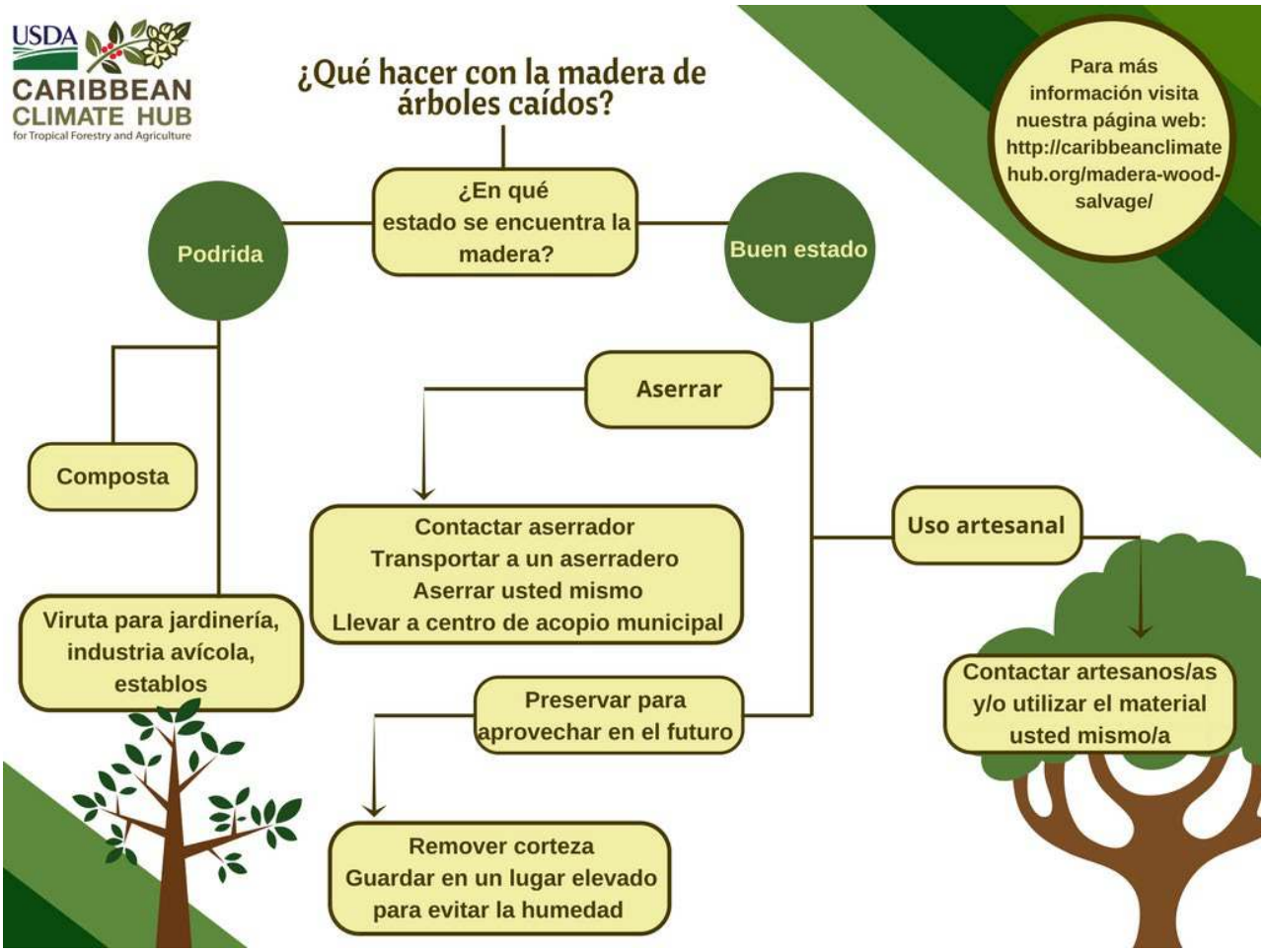
Challenges

- × Government support- government entities require education on the issue
- × Lack of funding
- × Lack of equipment for wood retrieval (i.e. portable sawmills, machinery, transportation)
- × Connect crane owners with needed equipment
- × Obtain permits to export wood
- × Lack of collaboration and equipment sharing
- × Long-term waste management
- × Working as a team among small industries
- × Community integration
- × Education about dividing organic from inorganic material
- × Promote young people to work with wood
- × Lack of education on how to identify tree types and their potential uses
- × Difficult to retrieve wood from stockpiling center due to current regulation
- × Sharing information with the people
- × Education on the value of trees and forests
- × Making adequate wood construction
- × Public policy for wood disposal
- × Lack of information on which species should be planted where, for risk prevention
- × Uses for low value woods
- × Lack of infrastructure to manage the organic matter
- × Immediate reaction for individual wood discard/retrieval



Educational materials developed by the USDA Caribbean Climate Hub

Diagram about wood salvaging:



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Contact the USDA Caribbean Climate Hub: caribbeanclimatehub@gmail.com