HAITI AGROFORESTRY RESEARCH PROJECT

SOUTH-EAST CONSORTIUM FOR INTERNATIONAL DEVELOPMENT

AND

AUBURN UNIVERSITY

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Haiti
Regional Tree Nursery Cost Study

by

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INTRODUCTION

A. SITUATION

In 1981 USAID/Haiti initiated the Agroforestry Outreach Project as a pilot program to encourage Haitian farmers to plant fast growing trees as a cash crop. This project was part of an overall plan by USAID to curb the devastating erosion which was washing the top soil into the sea. The Pan American Development Foundation was one of three grantees selected to implement the project.

The Pan American Development Foundation (Pwoje Pyebwa) decided to work through the existing network of Private Voluntary Organizations (PVOs), for several reasons. Most rural development in Haiti is conducted by the PVOs who have won the confidence of the local communities, thus easing the implementation of new developmental approaches with the farmers. To ensure the longevity of the project, the PVOs were to be well equipped with the tools necessary to carry out an independent tree planting project once USAID funding was suspended.

The nursery product in the tree planting operation is one of the most important links in the reforestation of Haiti. This critical link demands scrutiny of all the components of costs as a means to improving the efficiency of the overall system. The quality of the seedlings affects the productivity of all trees distributed to farmers. With a project planting around eight million trees per year by the Pan American Development Foundation and CARE, the impact of a better productive system can make a sizable improvement in the tree operations in this country.

In the early days of the project, Pwoje Pyebwa bought all its seedlings from large, central nurseries and shipped them to the PVOs. As the program grew, the shipping of millions of seedlings from Port-au-Prince to the provinces became logistically impractical. As a result, Pwoje Pyebwa established local nurseries with the PVOs and bought the seedlings they produced.

USAID had established a unit price for seedlings with the commercial nurseries which Pwoje Pyebwa adopted for the local nurseries.

Inflation, larger seedling containers, and the fact that Pwoje Pyebwa now requires that PVOs provide boxes and plastic for seedling transportation to the field, have caused production costs to increase. For this reason, Pwoje Pyebwa has requested a study to determine the current cost of producing seedlings in a local nursery. With this information, Pwoje Pyebwa will be able to determine actual production costs.

B. OBJECTIVES

The purpose of this study is to determine the production costs of a typical nursery capable of seeding 50,000 cells per season. A typical nursery will lose 10% of the trees seeded because of normal operations (i.e., insects, disease, management, etc.). Therefore a nursery with a maximum capacity of 50,000 cells will produce 45,000 viable seedlings on the average. The prices used are based on Pwoje Pyebwa's supply list and staff records (See Appendix 1-Nursery Supplies Price List). All prices are in US dollars at the official exchange rate of 5 to 1. The study entails simulations of actual data but does not portray the cost of any one nursery.

The following criteria are applied as standards for the purposes of this report. Container costs are based on the price of the "Deep Five" Rootrainer manufactured by Spencer-Lemaire of Canada. The soil medium is Fafard #2. Seed is a local variety. Locally-made wire racks and concrete blocks are used in the nurseries. The greenhouses are built of fiberglass rods and metal anchors covered with plastic and shadecloth in various combinations. Infrastructure costs are limited to land, a depot, and a simple watering system. Labor is calculated as a local nursery manager, an assistant, and day labor, as needed. Management costs are discussed below.

Production options and their effect on seedling viability are not considered here. Some options, if kept within reasonable limits, would affect costs without affecting seedling viability. Examples of such options are the numbers of blocks used to support racks, or the substitution of a locally produced potting mix for Fafard #2. Other options would affect costs and the number of seedlings delivered. These types of options include the structure used to shade the container from the time the seed is planted until the seedling can withstand full sun. Options increasing both cost and number of viable seedlings may not be cost-effective, or may not be cost-effective every year. Each PVO must decide for itself the cost-effectiveness of the production options available to it.

NURSERY COST ANALYSIS

This study addresses the costs involved in producing seedlings. Pwoje Pyebwa's policy is that the PVO must provide the land, watering system, and management to participate in the Pwoje Pyebwa nursery program. When a PVO does not have the management or technical skills to run a nursery, Pwoje Pyebwa provides the necessary back up. These costs are borne internally by the more experienced PVOs. This study does not address changes to this policy because the objective is to determine nursery costs, not project policy or philosophy.

When this project started several PVOs were already producing seedlings for distribution. Pwoje Pyebwa worked with these nurseries to help expand their capacity and extension outreach. Pwoje Pyebwa also worked with many PVOs in establishing new nurseries and extension programs. The level of effort and help from Pwoje Pyebwa depended on the level of organization and development of the PVO. As a PVO became more experienced, the assistance from Pwoje Pyebwa shifted to a more needy PVO. Thus the financial and technical assistance received from Pwoje Pyebwa were not the same for any two PVOs. It is the project's philosophy to help the PVOs move toward independence from Pwoje Pyebwa resources.

I. Containers cost the PVO $153 per case of 2500 cells. The estimated life of a "Deep Five" Rootrainer is 8 seasons. The per-seedling cost is $0.0085 estimating a 10% seedling loss in-nursery.

II. The soil mix costs $22.50 per bale and will fill 1450 cells of a Rootrainer. The per-seedling cost is $0.0172 estimating a 10% seedling loss in-nursery.

III. Local cassia seeds with 50% germination and 10% seedling loss in-nursery cost $0.0033 per seedling. This figure is a minimum and increases when more expensive imported seeds are used.

IV. Locally-made wire racks that hold 180 seedlings and cost $4.00 each, with an estimated life of 14 seasons, is used as the standard rack. The per-seedling cost is $0.0018 estimating a 10% seedling loss in-nursery.

V. The wire racks are supported by concrete blocks with a unit cost of $.50. Nine blocks for every four wire racks totals 625 blocks for 50,000 seedlings. Estimating a 10 year life for blocks and a nursery seedling loss of 10%, the per-seedling cost is $0.0003.

VI. Water soluble fertilizer costs $21.50 per 25 pound bag. Estimating that a nursery uses 50 pounds per season to produce 50,000 seedlings with a 10% loss, the per-seedling cost is $0.001.

VII. PVOs are now responsible for providing the boxes used to transfer trees from the nursery to the field. Pwoje Pyebwa uses a box which holds 150 seedlings and costs $28.50 per 50, or $0.0038 per seedling. Seedlings are put in plastic bags capable of holding 25 trees each before being placed in boxes. The bags cost $0.022 per unit. These items come to a per-seedling cost of $.0009 for bags and a total for box and plastic of $.0047 per seedling.

VIII. When building a nursery, the type of construction determines the cost. Using figures from actual building costs from Pwoje Pyebwa's Region 5, it requires an average of $1250 to construct a depot. The estimate could be lower or higher depending on the materials used. Based on a 20-year life, and a 10% in-nursery loss, a depot will cost $0.0007 per seedling.

IX. Land costs differ greatly from region to region. The PVO will need roughly 1/8 carreau to produce 50,000 seedlings. As land does not depreciate, the calculated rental value is $75.00 per season which amounts to a per-seedling cost of $0.0008 with a 10% seedling loss in-nursery.

X. Water costs vary from region to region; therefore, it was necessary to base the evaluations upon both a high and low range. Low range (A) estimates include costs for well digging ($800), pump installation ($1000), and operating expenses per season ($150). Calculating a 10% in-nursery seedling loss the per-seedling cost is $0.0059. (See Options IA, IIa, and IIIA).

High range (B) estimates include the cost of well digging at $3500, pump installation at $1000, and operating expenses at $150 per season. Under these circumstances, per-seedling costs are $0.0074 with a 10% in-nursery loss (See Options IB, IIb, and IIIB).

XI. There are three greenhouse and/or shadehouse options. Observations of functioning nurseries indicate that they are using either one 75 ft. plastic greenhouse or two 50 ft. shadehouses. In the future, Pwoje Pyebwa plans to convert all its PVO nurseries to plastic and eliminate shadecloth completely. Nevertheless, cost tables have been presented for all three options.

Option I shows costs for one 75 ft. x 28 ft. greenhouse, constructed with 14 fiberglass rods at $38.00 each with a useful life of 20 years. Twenty-eight anchors are used with a unit cost of $2.50 and a useful life of 20 years. Plastic costs $135.25 with a two year life span. In-nursery losses are estimated at 10%. Using this option, the per-seedling cost is $0.0011. (See Options IA and IB).

Option II shows costs for two 50 ft. x 28 ft. shadehouses using enough plastic to cover one of the shadehouses. Twenty fiberglass rods, 40 anchors, one roll of shadecloth at $331 per roll and a useful life of 4 years, and 50 ft. of plastic at $90.17 with a two year life span are used in this option. Using this option, the per-seedling cost with a 10% seedling loss is $0.0018. (See Options IIA and IIB).

Option III shows costs for two 50 ft. x 28 ft. greenhouses covered with plastic. Twenty fiberglass rods and 40 anchors are used. Plastic costs $180.33 and has a two year life span. Using this option, the per-seedling cost with a 10% seedling loss is $0.0014.

XII. Miscellaneous supply costs are estimated as follows: $150 for buckets, sprayers, etc. with a useful life of two years and $50.00 worth of chemicals per season. The per-seedling cost with a 10% seedling loss is $0.0020.

XIII. Labor costs are very difficult to determine because the PVOs try to employ as many people in their region as possible, thus inflating the operating costs of the nursery. For the purposes of this report, Stuart North's figures on a new nursery in region 5, which produced roughly 100,000 seedlings last year, were used. The nursery employed one manager, one assistant, and day labor on an as-needed basis for a total payroll of $2206. Estimating a 10% in-nursery seedling loss the per-seedling cost is $0.0245.

XIV. Transportation costs vary from PVO to PVO. The more long standing nurseries bear their own costs, while Pwoje Pyebwa staff transports most supplies for the smaller nurseries on their routine supervisory trips. The estimated cost of transportation is $200 per season per nursery. Allowing for a 10% in-nursery loss, the per-seedling cost is $0.0044.

XV. PVO management costs are very difficult to determine. Many PVOs do not keep adequate records of their management costs making verification of these costs impossible. Many PVOs have volunteers serving in management positions and the books, therefore, do not show any expense for management. Sometimes in the first season of production, Pwoje Pyebwa provides almost all management and supervision, and maintains cost records. As these nurseries gain more experience, they are able to assume more responsibility. Estimates of management costs are based on the figures of time invested by Pwoje Pyebwa staff in nursery related activities.

Using Pwoje Pyebwa's figures, a per-seedling cost can be applied to all nursery operations. Regional teams spend approximately 25% of their time on nursery related business. Using 1989 budgeted costs a per-seedling amount was calculated for a regional management team and a nursery specialist and his team

members. For the purposes of this study it is assumed that if Pwoje Pyebwa does not provide management services, the PVOs will, and that the costs will be comparable.

The average Pwoje Pyebwa regional team cost $140,460 per year. If each region has an average production rate of 1.24 million seedlings per year with management assistance from Pwoje Pyebwa, the cost of regional management is $0.0283 per seedling. The nursery specialist and his team, operating expenses included, cost $123,400 per year. This amount would bring the per-seedling cost to $0.0199 for the nursery specialist and his team. The total management cost is $.0482 per seedling.

The cost of PVO overhead is not included in the study.

The cost of fencing is not included in the study because most small nurseries do not construct a wire fence. The cost of a living fence is so small that it will have little reflection in the per-seedling cost. If a wire fence were used, the cost would need to be included in the calculations.

SUMMARY OF COST ANALYSIS

The study used several nursery infrastructure options in determining the different per-seedling costs of each method. The most expensive per seedling cost was $.1266 and the least expensive was $.1244. These costs include direct and indirect costs except for the cost of capital. These costs are expended by the nurseries, Pwoje Pyebwa, and the US government in varying amounts depending on how capable the PVO is at managing a nursery.

The study shows that the different costs of infrastructure have little effect on the price of a seedling. Labor was the most expensive direct cost at $.0245 per seedling or 12% of total direct and indirect costs, excluding credit. Indirect costs of management and credit were $.0482 and $.0492, respectively, using the 9% rate for credit. Management costs are roughly 39% of total direct and indirect costs, excluding credit.

RECOMMENDATIONS

All PVOs should be encouraged to establish and maintain financial records that can be verified. This action would help in determining the actual cost of production for future price increases. After each nursery has established cost records, then Pwoje Pyebwa can compare among costs. This process will help determine in which areas a particular nursery may be overspending. It will also help in determining possible economies of scale. PVOs should be encouraged to keep better records voluntarily by explaining the value of such data, but record keeping should not be used as a condition of funding.

Since management costs are 39% of the total costs of production, excluding credit, Pwoje Pyebwa should try to push the PVOs to manage their own nurseries as soon as possible. Pwoje Pyebwa might try to monitor their actual time spent on nursery-related activities, by nursery, by season. Comparing one nursery with another would help to spot nurseries that are taking too much of the regional team's time. Comparing seasons would show the nurseries that are not making progress toward independence, which is a Pwoje Pyebwa goal.

OPTION IA (1) 75'x 28' TONNEL IN PLASTIC*
LOW-WATER COST*

DIRECT COSTS	COST PER SEEDLING
I. Container	$0.0085
II. Soil Mix	.0172
III. Seed	.0033
IV. Racks	.0018
V. Blocks	.0003
VI. Fertilizer	.0010
VII. Box and Plastic	.0047
VIII. Depot	.0007
IX. Land	.0008
X. Water (Low)	.0059*
XI. Shadehouse 75'x 28' Plastic	.0011*
XII. Misc. Supplies	.0020
XIII. Labor	.0245
XIV. Transportation	.0044
Sub Total - Direct Costs	$.0762
INDIRECT COSTS	
XV. Management - Regional	$.0283
- Nursery Specialist	.0199
Total Direct and Indirect	$.1244

Note: The cost of credit on most of this project is borne by the US government. Credit is a real cost. This study uses a simple 9% rate applied to the total cost of the establishment and operation of a nursery for one year of $24,859. The cost of credit under these circumstances would be $2237 per year with a per-tree cost of $.0492. The local cost of credit could easily double the 9% rate and thus raise the per-tree cost to $.0984. This cost is applied to the first year and does not cover future income, expenses, nor loan repayments.

OPTION IB (1) 75'x 28' TONNEL IN PLASTIC*
HIGH-WATER COST*

DIRECT COSTS	COST PER SEEDLING
I. Container	$0.0085
II. Soil Mix	.0172
III. Seed	.0033
IV. Racks	.0018
V. Blocks	.0003
VI. Fertilizer	.0010
VII. Box and Plastic	.0047
VIII. Depot	.0007
IX. Land	.0008
X. Water (High)	.0074*
XI. Shadehouse	.0011*
XII. Misc. Supplies	.0020
XIII. Labor	.0245
XIV. Transportation	.0044
Sub Total - Direct Costs	$.0777
INDIRECT COSTS	
XV. Management - Regional	$.0283
- Nursery Specialist	.0199
Total Direct and Indirect	$.1259

(See Note, Option IA)

OPTION II A (2) 50 ft. x 28 ft. SHADE HOUSE + 1/2 PLASTIC*
LOW-WATER COST*

DIRECT COSTS	COST PER SEEDLING
I. Container	$0.0085
II. Soil Mix	.0172
III. Seed	.0033
IV. Racks	.0018
V. Blocks	.0003
VI. Fertilizer	.0010
VII. Box and Plastic	.0047
VIII. Depot	.0007
IX. Land	.0008
X. Water (Low)	.0059*
XI. Shadehouse	.0018*
XII. Misc. Supplies	.0020
XIII. Labor	.0245
XIV. Transportation	.0044
Sub Total - Direct Costs	$.0769
INDIRECT COSTS	
XV. Management - Regional	$.0283
- Nursery Specialist	.0199
Total Direct and Indirect	$.1251

(See Note, Option IA)

OPTION IIB (2) 50 ft. x 28 ft. SHADE HOUSE + 1/2 PLASTIC*
HIGH-WATER COST*

DIRECT COSTS	COST PER SEEDLING
I. Container	$0.0085
II. Soil Mix	.0172
III. Seed	.0033
IV. Racks	.0018
V. Blocks	.0003
VI. Fertilizer	.0010
VII. Box and Plastic	.0047
VIII. Depot	.0007
IX. Land	.0008
X. Water (High)	.0074*
XI. Shadehouse	.0018*
XII. Misc. Supplies	.0020
XIII. Labor	.0245
XIV. Transportation	.0044
Sub Total - Direct Costs	$.0784
INDIRECT COSTS	
XV. Management - Regional	$.0283
- Nursery Specialist	.0199
Direct and Indirect	$.1266

(See Note, Option IA)

OPTION III A (2) 50 ft. x 28 ft. TONNEL IN PLASTIC*
LOW-WATER COST*

DIRECT COSTS	COST PER SEEDLING
I. Container	$0.0085
II. Soil Mix	.0172
III. Seed	.0033
IV. Racks	.0018
V. Blocks	.0003
VI. Fertilizer	.0010
VII. Box and Plastic	.0047
VIII. Depot	.0007
IX. Land	.0008
X. Water (Low)	.0059*
XI. Shadehouse	.0014*
XII. Misc. Supplies	.0020
XIII. Labor	.0245
XIV. Transportation	.0044
Sub Total - Direct Costs	$.0765
INDIRECT COSTS	
XV. Management - Regional	$.0283
- Nursery Specialist	.0199
Total Direct and Indirect	$.1247

(See Note, Option IA)

OPTION III B (2) 50 ft. x 28 ft. TONNEL IN PLASTIC*
HIGH-WATER COST*

DIRECT COSTS	COST PER SEEDLING
I. , Container	$0.0085
II. Soil Mix	.0172
III. Seed	.0033
IV. Racks	.0018
V. Blocks	.0003
VI. Fertilizer	.0010
VII. Box and Plastic	.0047
VIII. Depot	.0007
IX. Land	.0008
X. Water (High)	.0074*
XI. Shadehouse	.0014*
XII. Misc. Supplies	.0020
XIII. Labor	.0245
XIV. Transportation	.0044
Sub Total - Direct Costs	$.0780
INDRIECT COSTS	
XV. Management - Regional	$.0283
- Nursery Specialist	.0199
Total Direct and Indirect	$.1262

(See Note, Option IA)

APPENDIX 1

NURSERY SUPPLIES PRICE LIST
PROJE PYEBWA

FAFARD PEATMIX	$ 22.25 /BALE
SHADE CLOTH 100' X 24' - 73% SHADE	$ 331.00 /ROLL
GREENHOUSE PLASTIC 150' X 28'	$ 270.50 /ROLL
FERTILIZER 20-20-20 - 25 LB. BAG	$ 21.00 /BAG
FIBERGLASS ROD	$ 38.50 /ROD
ROOTRAINER DEEP 5 - 2500 CELLS/CASE	$153.00 /CASE
ANCHORS	$ 2.50 /EACH
UNASSEMBLED BALE OF BOXES - 50 BOXES/BALE (150)	$ 28.50 /BALE