HAITI AGROFORESTRY RESEARCH PROJECT

South East Consortium for International Development

and

Auburn University

September 1989

This work was performed under USAID Contract
No. 521-0122-C-00-7104-00

TREE PLANTING IN HAITI:

A SOCIO-ECONOMIC APPRAISAL

by

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Resource Economist

ACKNOWLEDGMENTS

The author wishes to thank Larry Harms, Ronald Ruybal and David Atteberry of ADO-USAID for facilitating this phase of the Agroforestry Outreach Project. Richard Pellek, Senior Forestry Advisor, USAID Mission, was generous in supplying literature and suggestions relevant to the project. Rick Scott was of valuable service in organizing the data collection and helping to train interviewers. Fellow team members Steve Goodwin, Gene Hunter, Kent Reid, Pierre Rosseau and Paul Starr made helpful comments on the questionnaire and the content of a previous draft. Greg Sommers and Mary Street of Auburn University assisted with statistics and graphics.

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EXECUTIVE SUMMARY

The purpose of this rapid-reconnaissance study was to augment previous work on tree planting in Haiti by taking advantage of a longer history of woodlot operations and to include socio-economic data on hedgerows, border plantings, and mixed alley cropping systems of trees. Sixty-two respondents were interviewed, 20 in the Northwest, 20 in the Central Plateau, and 22 in the Vialet-Ti Goave regions.

The tree planting operations, in general, provided the farmers with an added means to gain income from under utilized labor and other resources on the farm. There were few conflicts of labor use from the tree operations to other cropping systems employed by the owners. These occurred in peaks of planting and harvesting seasons. There were also few conflicts in the use of tools and animal capital between the tree enterprises and the cropping systems of respondents.

The most frequently mentioned motivation of farmers to plant trees was wood for own use, followed by erosion control-conservation, and increased earnings. When asked the primary reason motivating farmers to plant trees, erosion control was most frequent and was mentioned by 23 of the 62 respondents. Wood for own use, and increased earnings followed in importance as primary reasons to plant trees.

When questioned on their satisfaction with goal attainment in the tree planting operation, 60 of the 62 respondents reported that they were happy with the venture. This result was reinforced by

59 of the 62 expressing a wish to plant more trees. The most frequent reason given for not planting more trees was lack of land and lack of tree availability.

A large proportion of the hedgerow planters reported increased crop production on land involving the hedgerows. With reduced crop yields from borders, mixed alley tree and crop combinations, and woodlots, farmers often volunteered that they made gains from the tree operations which outweighed their reductions in crop harvests.

The farmers were retaining their tree inventories much longer than previous studies had indicated and few had harvested a substantial proportion of their trees, even after five or six years. The addition of standing inventory tree data which are in process of collection will allow a cost and returns analysis.

Recommendations made to grantees and contractors are:

1. Collaborate with cooperators to collect growth data on a sampling basis suitable for cost and returns analyses
2. Train farmers through extension means at an early date to maintain records amenable to cost and returns analysis
3. Devise a set of data to determine kombit costs of work
4. Collect a set of farm-level prices to be used in calculating returns of the tree enterprises
5. Collect physiographic data by tree planting areas to facilitate economic recommendations to farmers
6. Expand the sample size in relevant tree planting areas, and
7. Expand the survey to include additional tree planting areas.

Tree Planting in Haiti:

A Socio-Economic Appraisal

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I. Introduction

In recent years, Haitian farmers have been encouraged to plant fast-growing hardwood trees as a means to increased income and to aid in the solution of some of the country's environmental problems. Tree species in the operation included neem, cassia, lucaena, casuarina, eucalyptus, catalpa, kapab, acacia and others. The Pan American Development Foundation and CARE participated in the arrangement and supervision of the tree planting and in certain accompanying extension programs for the planters.

In response to the need for a broader base on which to make economic decisions on agroforestry operations and to explore additional techniques for further work in Haiti, a rapid-reconnaissance study was designed for three areas of the country. This work was designed for October through December of 1988. The present study was considered to be a pilot survey on which future studies could be based.

Purpose

The purpose of this work is to augment previous work such as done by Grosenick (1986) by taking advantage of a longer history of tree growth and management and by expanding the numerical base

on which growth and production estimates are determined. The tree planting combinations have changed since the last data set was compiled by Grosenick. Woody hedgerows have been added as a tree planting enterprise in the present study. Border plantings and mixed garden plantings of trees are also included in the present study as a complement to the woodlot data previously collected.

Importance of Study

The current status of Haiti's agroforestry system brings out the necessity to augment the country's knowledge on the economics of the system. First, the country is dependent on outside countries for one of its central energy components, petroleum. Petroleum is of such importance that a parametric cutoff by supplying countries or a substantial price increase in petroleum factors could have a devastating impact on wood demand, yielding sizable long-term damage to the country's wellbeing. Attempts to supply even a small part of the petroleum component of energy by substitute energy from trees could foreclose many alternative choices for future operations. Firewood and charcoal have some short-run possibilities to substitute for petroleum, but could not continue to do so for the longer time period. A cutoff of petroleum to the transportation system in Haiti could paralyze commerce completely in the short run, even if substitutes were available in a longer time period.

A second reason for studying the country's agroforestry system is based on the low per capita income level of the populace, especially that of the rural peasant. A vital part of the country's development depends on the peasants improving themselves

economically and socially. A better understanding of tree planting in their operations should allow the proper allocation of their resources to optimize net returns. The resource allocation problem must also be considered within a national context concerning costs and benefits. The country's income generation will not be optimized without allocation concerning benefits and costs including effects external to the individual who makes on-farm decisions. Third-party benefits, and those accruing to society in general, will not be considered by the farmer in his own decisions and must be handled by central government methods to assure optimum investment in the activity.

A third reason for studying the economics of the agro-forestry system is the dwindling supply of trees due to cutting without adequate replacement. The demand for charcoal, poles, lumber, firewood, and related wood products is such that even without expectations of a high population growth for the country, serious pressures are likely to accrue on such supplies.

A fourth reason for the study is the on-farm erosion problem and its related external effects on the economy at large. The almost complete devastation of native forests incited by short-run goals has led to a set of unenviable ecological and environmental conditions. A critical examination of the long-run consequences of the cumulative effects of that action is needed. The downhill-downstream benefits of conservation and erosion control combined with siltation problems demand that every possible effort be made to understand the national implications of this aspect of the agro-forestry economy.

Method and Scope

The study is based on socio-economic interviews at farms in each of the Northwest, the Central Plateau, and the South. The locations of the farms were at Bombardopolis-Des Forges in the Northwest, Mirebalais-Lascahobas-Belladere in the Central Plateau, and Vialet-Ti Goave in the South. Data were obtained on a cross section of farms with respect to elevation, soil types, slope, rainfall, and other physiographic characteristics.

Local interviewers were hired in the three research areas in an effort to get better information than could be acquired by an outsider. The interviewers had the confidence of their respective communities and knew the cooperating animators, coordinators, and monitors of tree-planting programs of the Pan American Development Foundation and CARE. Questionnaires were designed and pre-tested before being used in the field. A copy of the questionnaire, abbreviated to save space, is given in Appendix A.

The need to get a quick overview of the socio-economic phases of the tree planting operations in Haiti accomplished by CARE and the Pan American Development Foundation imposed certain limitations on this part of the work which should be resolvable with time. A quick overview of the project could be used as a tool-sharpening exercise for the remainder of the project and would be a useful planning device in elaborating study designs for future projects concerned with the more complete analysis of agro-forestry operations in Haiti.

Time was the most severe restraint on the present study. Since most of the tree planters had harvested little and had

standing inventories as a part of their income in wealth accrual, measurements had to be made to evaluate these standing inventories. This part of the measurement will be carried out in a later phase of the study. Some field work was also delayed by political problems which precluded any travel in the countryside. The samples in the study areas were also biased to some extent in that they were made up only of tree planters. These tree farmers may not be representative of peasant farmers in general who might be capable of planting trees but were not in fact planting trees. Other baseline data being collected on non-tree planters may ameliorate this difficulty in the future.

The remainder of the study begins with a discussion of various social characteristics of the tree-planting participants, their types of operations, labor availability and use, and other factors. These data help to better understand tree planters' potential for increased income and economic welfare.

II. Results

Overview

In peasant agriculture the household and the farm firm are an integrated whole which cannot be separated. This entity is both a producing and a consuming unit. Essential labor and other factors of production are likely to originate on the farm itself in a peasant economy of this type. The household structure is important in understanding the economic viability of the operation within its socio-cultural setting.

The integrated goals of the tree planters were of interest to the research team, and an attempt was made to appraise the attainment of these goals. One might assume that increased cash income is the principal goal of tree planters. It is known, however, that many other goals may have a prominent place in the tree planter's decision making. For example, a higher income which is unstable will be sacrificed for a lower income which is more stable if the farmer is near the margin of survival. The riskier but less certain added dollar of income, if in fact added, will help the farmer less than the loss of a dollar will hurt him and his family if such a decline takes place. He and his family may starve if a higher-income, high-risk option fails.

The question of quick returns versus long-term returns is also relevant. The farmer, if he is able to, may choose to participate in certain erosion control projects which may not yield immediate returns, but which greatly increase future returns through conservation and improved productivity. A tree farming operation may also be viewed as a means of saving to the landowner in a

peasant economy. The present study attempts to shed light on the different types of motivation of the planters.

Socio-Economic Characteristics

This part of the study included a total of 62 respondents, 20 in the Northwest (NW), 20 in the Central Plateau (CP), and 22 in the Vialet-Ti Goave (VTG) areas. The mean age of the landowner respondents was 46 years for the total group, Table 1. There was a wide variation in ages in each of the respective groups with ranges of 47, 49, and 48 years in the respective areas of the NW, CP, and VTG, Figure 1. There was not a significant difference in ages overall for the three areas as determined by analysis of variance ($P = .120$), but the Northwest age did differ significantly from that of the Vialet-Ti Goave area ($P = .041$). The tests were probably too conservative due to non normality. A Kolmogorov-Smirnov analysis showed that the data were significantly different from normal ($P < .01$). A Kruskal-Wallis one-way test was used and showed significant differences overall at a ten-percent level ($P = .082$). Fifty-seven of the participants were males and 5 were females, Table 2.

The owners had been on the land for an average of 23.6 years, with mean values of 22, 26, and 23 in the NW, CP, and VTG, respectively, Table 3. The overall means were not significantly different ($P = .749$), and the difference between the central plateau and the mean of the other two areas combined was not significant ($P = .475$). Twenty-three of the 62 respondents had work experience away from the farm, Table 4. Four in the NW had an average of 6 years of off-farm work, eleven in the CP had a mean

Table 1. Age of Tree Planters in Selected Areas of Haiti, 1988

Measure	Area			
	NW (years)	CP (years)	VTG (years)	Total (years)
Minimum	33	24	22	22
Maximum	80	73	70	80
Range	47	49	48	58
Mean	51.2	46.0	42.2	46.4
Standard Deviation	12.8	14.4	14.5	14.2

Table 2. Tree Planting Respondents by Sex For Selected Areas of Haiti, 1988

Sex	Area			
	NW (numbers)	CP (numbers)	VTG (numbers)	Total (numbers)
Male	16	20	21	57
Female	4	0	1	5
Totals	20	20	22	62

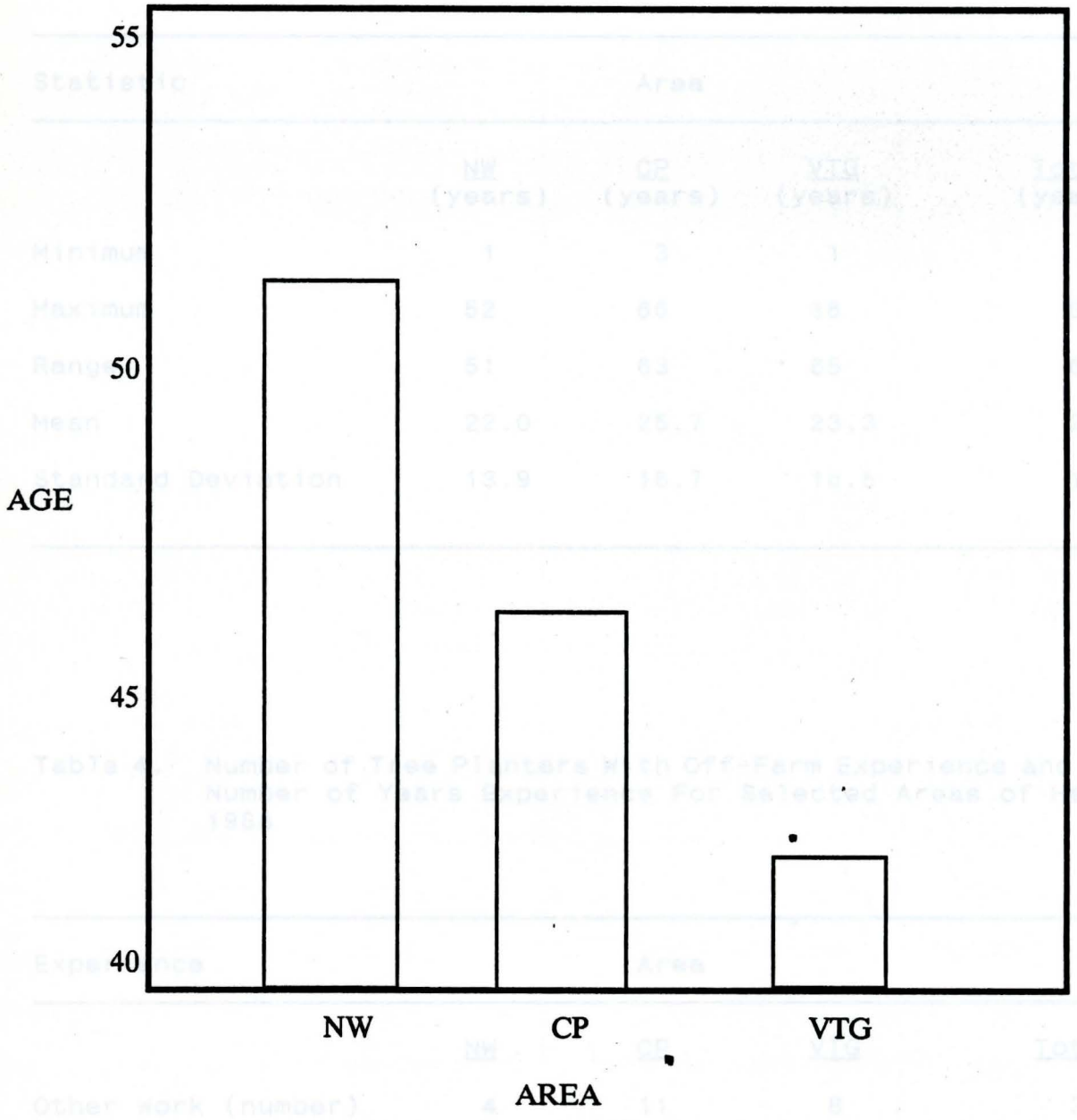

Figure 1. Age of Tree Planters in Selected Areas of Haiti, 1988

Table 3. Number of Years on Farms For Tree Planters in Selected Areas of Haiti, 1988

Statistic	Area			
	NW (years)	CP (years)	VTG (years)	Total (years)
Minimum	1	3	1	1
Maximum	52	66	66	66
Range	51	63	65	65
Mean	22.0	25.7	23.3	23.6
Standard Deviation	13.9	16.7	16.5	15.6

Table 4. Number of Tree Planters With Off-Farm Experience and Mean Number of Years Experience For Selected Areas of Haiti, 1988

Experience	Area			
	NW	CP	VTG	Total
Other Work (number)	4	11	8	23
Mean Years	6	10	10	9.3*

* Weighted Mean

of 10 years of work off the farm, and eight had a mean of 10 years of off-farm experience in the VTG area. There was a significant relationship of other work and no other work patterns among the regions by Chi-square at the ten-percent level (P = .072). No concentration of activities was noted in off-farm work, but activities included jobs such as nursery manager, cooperative worker, cobbler, extension animator, state employee, cement factory worker, carpenter, preacher, land surveyor, tailor, and cabinet maker.

The overall mean level of formal education was 4.7 years of schooling, with values of 3.5, 5.9, and 4.8 in the respective regions of the NW, CP, and VTG. These figures are a bit deceptive, however, because of the distribution of the education among the participants. Nine in the NW had no formal education, 4 in the CP had none, and 7 in the VTG area had none. The overall mean for those with schooling was 7.0 years for the total group, while it was 6.4 in the NW, 7.4 in the CP, and 8.2 in the VTG, Table 5 and Figure 2. There was not a significant difference in the means of this variable by a Kruskal-Wallis analysis of variance (P=.154).

The marital status of the respondents is shown in Table 6 and demands some explanation. Marital status is a rather nebulous concept unless studied in great detail as portrayed by Lowenthal (1984) and others. These distinctions by type of arrangement are of less importance than the household composition of family members and non family members. The marriage incidence in the strict or "certificate" sense is shown in Table 6 as 36 married and 26 unmarried. If classified, however, by certificate (<u>maryaj</u> in

Table 5. Formal Education Levels and Incidence of Education For Tree Planters For Selected Areas of Haiti, 1988

Education	Area			
	NW	CP	VTG	Total
No Formal Education (number)	9	4	7	20
Formal Education (number)	11	16	15	42
Mean Years Overall	3.5	5.9	4.8	4.7
Mean Years for Formally Educated	6.4	7.4	8.2	7.0

Table 6. Marital Status of Tree Planters For Selected Areas of Haiti, 1988

Marital Status	Area			
	NW (number)	CP (number)	VTG (number)	Total (number)
Certificate Marriage	16	11	9	36
Unmarried	4	9	13	26
Totals	20	20	22	62
Certificate Marriage Plus Common Law	16	15	18	49
Unmarried Less Common Law	4	5	4	13
Totals	20	20	22	62

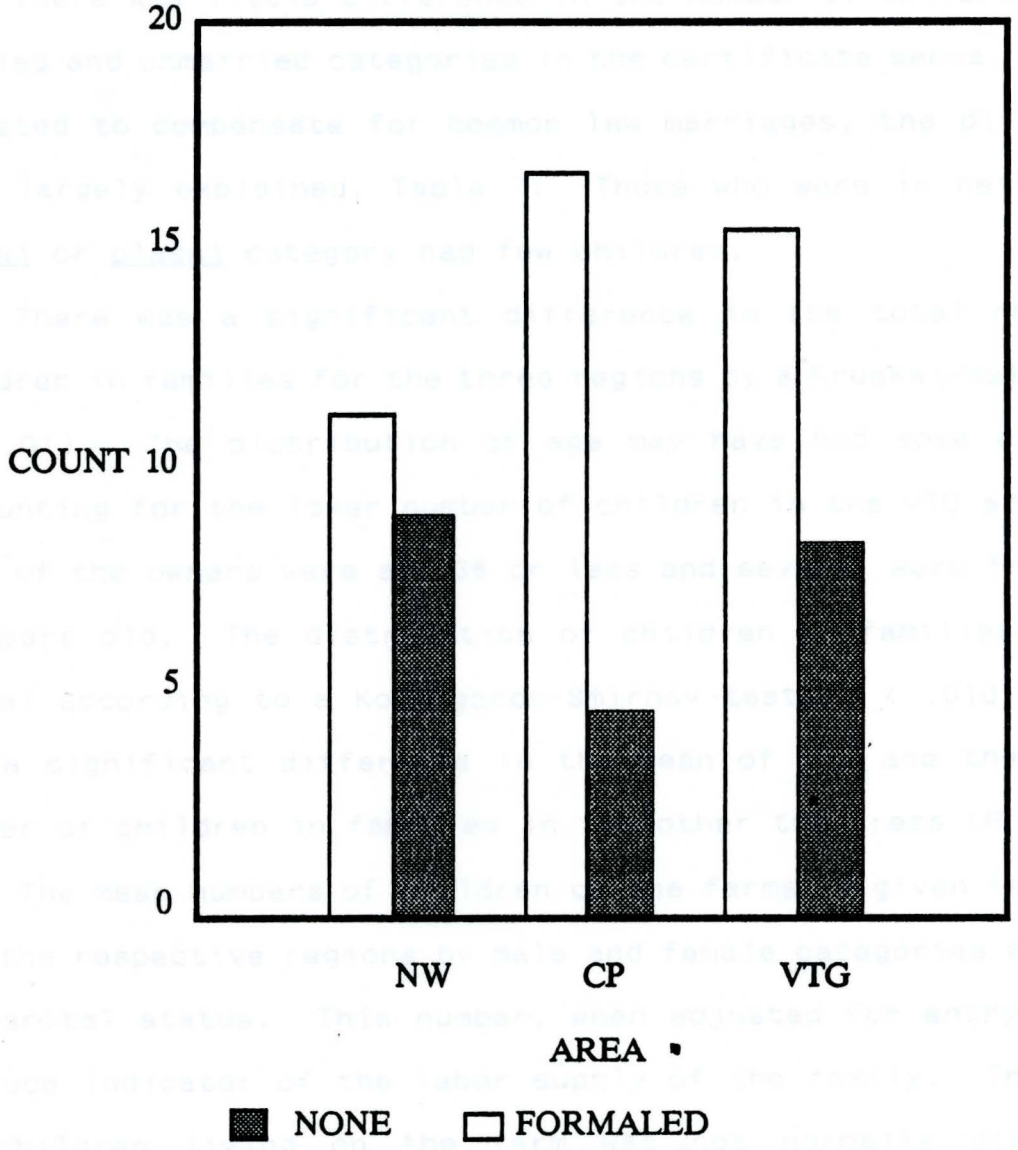

Figure 2. Education of Tree Planters in Selected Areas of Haiti by Numbers With and Without Formal Education, 1988

Lowenthal's terms) plus common law (plasaj in Lowenthal's terms) types the proportion changes to 49 married and 13 unmarried among the respondents.

There was little difference in the number of children to the married and unmarried categories in the certificate sense, but when adjusted to compensate for common law marriages, the differences were largely explained, Table 7. Those who were in neither the maryaj or plasaj category had few children.

There was a significant difference in the total number of children in families for the three regions by a Kruskal-Wallis test ($P < .01$). The distribution of age may have had some effect in accounting for the lower number of children in the VTG area since half of the owners were age 36 or less and several were from 22 to 28 years old. The distribution of children of families was not normal according to a Kolmogorov-Smirnov test ($P < .010$). There was a significant difference in the mean of VTG and the average number of children in families in the other two areas ($P < .01$).

The mean numbers of children on the farms is given in Table 8 for the respective regions by male and female categories according to marital status. This number, when adjusted for entry age, is a crude indicator of the labor supply of the family. The number of children living on the farm was not normally distributed according to a Kolmogorov-Smirnov test ($P < .01$) and the areas showed a significant difference according to a Kruskal-Wallis test ($P = .001$) for those families with children. Off-farm work opportunities may have influenced the numbers to be reduced in the CP and VTG areas since they are more accessible to a large city.

Table 7. Mean Number of Children by Marital Status of Tree Planters For Selected Areas of Haiti, 1988

Marital Status	Area			
	NW (mean)	CP (mean)	VTG (mean)	Total (mean)
Certificate Marriage	6.3	5.6	3.2	4.9
Unmarried	4.0	4.6	1.9	3.3
Totals	5.8	5.2	2.6	4.5
Certificate Marriage Plus Common Law	6.3	5.8	3.0	5.0
Unmarried Less Common Law	4.0	3.2	.8	2.7
Totals	5.8	5.2	2.6	4.5

Table 8. Numbers of Children by Sex in Tree Planters' Households For Selected Areas of Haiti, 1988

Number of Children	Area			
	NW (number)	CP (number)	VTG (number)	Total (number)
Overall Mean	4.4	2.9	1.6	2.9
Mean Number Males	2.4	1.5	1.0	1.6
Mean Number Females	2.0	1.4	.6	1.3

Another crude indicator of labor, to be discussed below, is the non-family members and other extended family members, such as fathers, mothers, and sisters-in-law, who make up the complete household. Table 9 shows the activities of the farm children on the owners' holdings. Approximately half of the children work on the farm either part-time or on a more extended basis. Fifty-two out of 180 children listed went to school only.

Table 10 shows the number of non-members of the family, living in the household, by sex for the respective regions. A Kolmogorov-Smirnov test showed that this distribution was not normal (P = .01) and a Kruskal-Wallis test showed that the differences in numbers were significant (P=.001) for the three areas. A comparison of Tables 8 and 10 shows that there is roughly an inverse relationship in the numbers of children living in the farm household and the number of non family members living there. The non family member activities related to the farm are shown in Table 11. More than half of these household members work in some capacity on the farm. Age and health conditions assure that some of the residents will not participate in the labor force of the enterprise.

The minimum age at which children are allowed to work on the farm has an influence on the labor force. The mean minimum age at which children began work was 7.3 years for the entire group of participants, but had a range of 12 years, Table 12. The range limits were from 3 to 15 for the entire group of participants. Some children began to carry water to the home and to water plants as early as three years of age.

Table 9. Activities of Children Living on Tree Farms for Selected Areas of Haiti, 1988

Activity	Area			
	NW (number)	CP (number)	VTG (number)	Total (number)
School Only	12	25	15	52
School and Part-time work	53	15	0	68
Off-Farm Work	5	0	0	5
Work on Farm Only	8	3	12	23
No Farm Activity	10	14	8	32
Totals	88	57	35	180

Table 10. Non Family Members by Sex in Tree Planter Households for Selected Areas of Haiti, 1988

Household Members	Area			
	NW (number)	CP (number)	VTG (number)	Total (number)
Overall Number	13	24	43	80
Mean Number	0.6	1.2	2.0	1.3
Males	4	9	13	26
Females	9	15	30	54

Table 11. Activities of Non Family Members In Households of Tree Planters For Selected Areas of Haiti, 1988

Activity	Area			
	NW (number)	CP (number)	VTG (number)	Total (number)
School Only	0	1	2	3
School and Part-time Work	3	2	4	9
Off-Farm Work	0	4	14	18
Work on Farm Only	9	13	19	41
No Farm Activity	1	4	4	9
Totals	13	24	43	80

Table 12. Minimum Age At Which Children Begin Work on Tree Farms In Selected Areas of Haiti, 1988

Age of Children	Area			
	NW (years)	CP (years)	VTG (years)	Total (years)
Minimum	3	5	3	3
Maximum	10	15	6	15
Range	7	10	3	12
Mean	8.0	9.0	5.1	7.3
Standard Deviation	1.9	3.0	1.0	2.7

The respondents were questioned on their seasonal workload in an effort to better understand their employment situation. Underemployment or unemployment was described as a "deficiency" of work in the different months; no problem of employment was described as a "balanced" work load; and a work load that was too heavy for the tree farmer and his family was described as "excessive," Table 13. The seasonal patterns showed excessive work loads by area in times of crop planting and harvest time. Deficiencies of work tended to cluster in November, December, January, and February. Excessive work loads tended to cluster around March, April, May, and June, but varied somewhat by region, Table 14.

In an effort to better understand the impact of the tree enterprise on the other farm work of the owner, respondents were asked if the tree operation conflicted with the other cropping activities, by month. In the NW there were only 4 conflicts in the month of March, with an additional 4 conflicts in September for the 20 respondents. In the other 10 months there were no conflicts of the tree operation with the cropping system. In the CP area only two conflicts occurred, one in April and one in May. The VTG area showed conflicts of one in March, one in April, 3 in May, 2 in June, 2 in July, one in August, one in September, and one in November, Table 15. These results support the belief that the tree operation is flexible enough within time constraints that it has little negative impact on the other agricultural activities of the tree farmers in an opportunity cost context.

Table 13. Employment Workload of Haitian Tree Planters by Region and Month, 1988

Month	Area								
	NW			CP			VTG		
	Work Load			Work Load			Work Load		
	Def.	Bal.	Exc.	Def.	Bal.	Exc.	Def.	Bal.	Exc.
January	16	3	1	1	19	0	1	21	0
February	14	5	1	1	19	0	1	18	3
March	1	11	8	1	11	8	0	10	12
April	0	4	16	1	2	17	0	0	22
May	0	0	20	0	3	17	0	5	17
June	1	16	3	0	7	13	0	16	6
July	3	16	1	0	16	4	0	21	1
August	1	7	12	2	18	0	0	21	1
September	0	0	20	5	14	1	0	22	0
October	0	9	11	8	10	2	19	2	1
November	5	9	6	12	6	2	18	2	2
December	14	5	1	7	12	1	5	16	1

*Def. = deficiency; Bal. = balanced; and Exc. = excessive

Table 14. Comparative Employment Workload of Haitian Tree Planters by Region and Month, 1988

Month	Workload								
	Deficient			Balanced			Excessive		
	Area			Area			Area		
	NW	CP	VTG	NW	CP	VTG	NW	CP	VTG
January	16	1	1	3	19	21	1	0	0
February	14	1	1	5	19	18	1	0	3
March	1	1	0	11	11	10	8	8	12
April	0	1	0	4	2	0	16	17	22
May	0	0	0	0	3	5	20	17	17
June	1	0	0	16	7	16	3	13	6
July	3	0	0	16	16	21	1	4	1
August	1	2	0	7	18	21	12	0	1
September	0	5	0	0	14	22	20	1	0
October	0	8	19	9	10	2	11	2	1
November	5	12	18	9	6	2	6	2	2
December	14	7	5	5	12	16	1	1	1

Table 15. Conflicts of Tree Work with Other Farm Work in Haiti by Region and Month, 1988

Month	Area							
	NW		CP		Vialet		Total	
	Conflict		Conflict		Conflict		Conflict	
	No	Yes	No	Yes	No	Yes	No	Yes
January	20	0	20	0	22	0	62	0
February	20	0	20	0	22	0	62	0
March	20	0	20	0	21	1	61	1
April	20	0	19	1	21	1	60	2
May	16	4	19	1	19	3	54	8
June	20	0	20	0	20	2	60	2
July	20	0	20	0	20	2	60	2
August	20	0	20	0	21	1	61	1
September	16	4	20	0	21	1	57	5
October	20	0	20	0	22	0	62	0
November	20	0	20	0	21	1	61	1
December	20	0	20	0	22	0	62	0
Totals	232	8	238	2	262	12	722	22

The above results on workload balance and potential conflicts of tree work with cropping activities are supported by the paucity of hired labor used for working with the tree operation. The few days of hired labor in this activity were concentrated in the March, April, May planting time, Table 16.

The different combinations of tree planting operations are shown in Table 17. These were made up of hedgerows, a rather new pattern as a popular system, border plantings, a mixed system of trees interspersed at random or in rows among the crop system, and woodlots. The most popular single systems among the respondents were the mixed arrangements and the border plantings. Woodlots occurred in operations of a little over ten percent of the respondent farms.

The majority of the tree planters had been in the operation for four years or less, Table 18. This fact was a hindrance to a complete economic analysis for the group because of a lack of harvests and a lack of data. Forty-four of the respondents had a history of 3 or 4 years of the tree operation. Even with five or six years of operation, the tree planters generally had not harvested a substantial part of their inventory. This result casts doubt on the assumptions of a 4- or 5-year harvest cycle which is made for economic analyses in other studies. This finding is encouraging, however, by showing that the farmers were actually preserving the trees and not cutting them down prematurely.

The respondents were questioned on the types of tools and animal capital used on their farms. The results are shown in Table 19. The most common tools used were the machete, the pick-

Table 16. Number of Farmers Hiring Help for Working With Trees or Hedgerows by Months, 1988

Month	Area			
	NW (n=20)	CP (n=20)	VTG (n=22)	Total (n=62)
January	0	0	0	0
February	0	0	2	2
March	0	1	8	9
April	0	1	10	11
May	4	10	7	21
June	0	0	1	1
July	0	1	0	1
August	0	3	2	5
September	3	3	0	6
October	0	1	1	2
November	0	0	0	0
December	0	0	0	0
Totals	7	20	31	58

Table 17. Tree Planting Arrangements in Haiti by Region, 1988

Tree Combination	Area			
	NW	CP	VTG	Total
Hedgerow Only	3	1	0	4
Hedgerow-Border	0	2	0	2
Hedgerow-Border-Woodlot	0	0	0	0
Hedgerow-Border-Woodlot-Mixed	1	0	0	1
Hedgerow-Border-Mixed	0	2	0	2
Hedgerow-Woodlot	1	0	0	1
Hedgerow-Woodlot-Mixed	0	0	0	0
Hedgerow-Mixed	2	1	0	3
Border Only	1	8	8	17
Border-Woodlot	0	0	1	1
Border-Woodlot-Mixed	0	0	0	0
Border-Mixed	1	3	0	4
Woodlot Only	4	0	2	6
Woodlot-Mixed	2	0	0	2
Mixed Only	5	3	11	19
Total	20	20	22	62

Table 18. Years of Operation of Haitian Tree Farms by Area, 1988

Years of Operation	Area			
	NW (number)	CP (number)	VTG (number)	Total (number)
1	1	0	1	2
2	1	1	0	2
3	2	7	6	15
4	5	10	14	29
5	8	0	0	8
6	3	2	0	5
Not Reported	0	0	1	1
Totals	20	20	22	62

Table 19. Incidence of Tools and Work Animals For Selected Haitian Tree Planters by Area, 1988

Tools or Work Animal	Area			
	NW (number)	CP (number)	VTG (number)	Total (number)
01 Machete	19	17	21	57
02 Hoe	19	19	11	49
03 Ax	4	2	1	7
04 Pick-Mattock	18	19	15	52
05 Horse	5	8	1	14
06 Steer	0	1	0	1
07 Donkey	16	1	1	17
08 Sickle	0	5	7	12
09 Mule	8	8	0	16
10 Tree Dibble	9	1	5	15
11 Bicycle	0	0	1	1
12 Shovel	0	0	1	1

mattock, and the hoe. The donkey was the most common work animal.

The respondents were also asked questions on whether there was a conflict of their use of tools and or animals from the tree operation to the farm cropping operation. Only two respondents in the NW reported any conflict of this type, while three in the CP reported conflicts, and three in the VTG reported such conflicts. The conflicts involved only a few tools and were of trivial importance out of the total possibilities of opportunity cost in the enterprises.

The respondents were questioned on their reasons and motivation for entering the tree planting operation. They were also asked to identify the primary reason for their choosing the tree planting enterprise. There were several interrelated reasons for their choices. Wood for own use was the most frequently occurring motivation overall, followed by erosion control-conservation, increased income, protection of other plants and as windbreak, as a means of saving, and an excess of available land, Table 20. The most prominent motivation of the tree planters as the primary reason was erosion control-conservation which occurred 23 times out of the sixty firms reporting. Wood for own use was second in importance, followed by increased income, as a means of saving, and to protect other plants and windbreak.

It should be recognized that the above goals are not mutually exclusive in an economic sense. Saving comes in part from increased income and is a key to future income, and erosion control-conservation is a means to increased income in the future. Wood for one's own use is also income in that it prevents the

Table 20. Incidence of Motivation For Planting Trees in Selected Areas and Primary Reason for Planting, 1988

Motivation	Area							
	NW		CP		VTG		Total	
	Reason (number)	Primary Reason (number)	Reason (number)	Primary Reason (number)	Reason (number)	Primary Reason (number)	Reason (number)	Primary Reason (number)
Excess of Land	0	0	0	0	1	0	1	0
Means of Saving	12	3	6	1	3	2	21	6
Erosion Control-Conservation	18	14	9	3	13	6	40	23
Protect Other Plants and Windbreak	12	0	8	0	4	1	24	1
Increase Income	9	0	16	9	8	3	33	12
Wood for Own Use	19	3	20	7	14	8	53	18
No Report	0	0	0	0	2	2	2	2
Totals	70	20	59	20	45	22	174	62

farmer making a cash outlay for the needed products, such as lumber, firewood, charcoal, and poles, which he uses in his own household and on his farm.

The most important part of the operation revolves around whether the tree planter realized his economic goals in the enterprise. There was a very favorable response to the question of farmer satisfaction with the tree planting. Sixty out of the total of 62 expressed satisfaction with the venture, Table 21. One who was unhappy with the venture indicated that he was misled by the animator concerning the type of tree species he would get. Overall, the operation was extremely successful in terms of the tree planters' own estimates.

In response to a question on whether the respondents wished to plant more trees, a total of 59 out of 62 reported in the affirmative, Table 22. This was another positive reinforcement of the motivation results above.

When questioned on the reasons which prevented the farmers from planting more trees, seven reasons were given. Overall, the most common reason was lack of land, followed by lack of trees, lack of investment funds, and untimely weather, Table 23. The most prominent primary reason for not planting more trees was lack of land, followed by lack of trees and lack of funds to invest. Seven of the farmers listed no reason preventing them from planting more trees.

It was mentioned above that lack of harvests of trees was an impediment to collection of data useful for a complete economic analysis of the tree planting operation. Many farmers also could

Table 21. Satisfaction of Tree Planters In Selected Areas of Haiti, 1988

Satisfied with Goal Attainment	Area			
	NW (number)	CP (number)	VTG (number)	Total (number)
Yes	19	20	21	60
No	1	0	1	2
Totals	20	20	22	62

Table 22. Tree Planters' Wishes With Respect to Planting More Trees in the Future in Haiti by Area, 1988

Plant More Trees	Area			
	NW (number)	CP (number)	VTG (number)	Total (number)
Yes	19	20	20	59
No	1	0	2	3
Totals	20	20	22	62

Table 23. Factors Preventing Tree Farmers From Planting More Trees in Haiti by Selected Area by Primary Preventive Factor, 1988

Factors Preventing More Tree Planting	Area							
	NW		CP		VTG		Total	
	Prev. Factor (no.)	Prim. Prev. Factor (no.)	Prev. Factor (no.)	Prim. Prev. Factor (no.)	Prev. Factor (no.)	Prim. Prev. Factor (no.)	Prev. Factor (no.)	Prim. Prev. Factor (no.)
Lack of Land	12	11	8	7	10	8	30	26
Lack of Funds to Invest	0	0	2	1	5	5	7	6
Lack of Trees	0	0	7	5	11	8	18	13
Has Sufficient Trees	1	1	2	0	0	0	3	1
Wrong Tree Species Available	2	0	2	1	0	0	4	1
Poor Health	1	1	1	1	0	0	2	2
Distance from Land	0	0	0	0	2	1	2	1
Untimely Weather	5	7	0	0	0	0	5	7
No Presentation Reason	5	7	0	0	0	0	5	7
Total	21	20	27	20	28	22	76	62

not estimate the impact of the tree enterprise on their other cropping systems in terms of losses (or gains) in an opportunity cost sense. Forty out of the 62 respondents reported on changes in crop yields induced by the trees. Some could tell the direction of the change, but could not tell the amount of the change in the potentially competitive crop. In cases where the farmers reported on crop changes, such as harvests of millet, beans, manioc, corn, and other crops, these changes were converted to percentages. Follow-up work of measurements by field personnel will allow a check on values of this type.

The hedgerow operations, with eight respondents reporting, showed large gains in adjoining crop production on the average, sometimes in a very short time period, Table 24. Six of the eight showed gains with an average increase of 60 percent for those producing crops in the area before the installation of the hedgerows. While these results seem surprising, they agree essentially with results found by Andy White (1989) in a study conducted by Save The Children. White's work, based on a sample of 30 simple straw ramps in the Central Plateau, showed 50 percent gains in productivity of crops with the installation. White cautioned that his data were preliminary and that further work was needed in this method of ramp installation. Forming a hedgerow by planting a row of seeds (often lucaena) with close spacing on the contour holds soil, adds fertility of its own, and thereby aids current crops and stores up future productivity in the land. This fact probably accounts for the higher productivity gains in the present study over that with the ramps in White's work. This work

is yet to be substantiated by our actual measurement and needs to be tested with larger numbers of observations.

Only one farmer reported a crop loss from a hedgerow operation, and one showed no change in his other crop production as a result of this intervention. One farmer reported that he had salvaged previously unproductive land and had begun to receive good crop harvests after only two years of the hedgerow installation. The one farmer showing a loss from the hedgerow reported that he was happy with the overall results of the change. The addition of forage, green manure, conservation materials, and other wood products supply benefits at the same time the crops usually give increased production. There is apparently a free lunch from this recombination of resources which exploits elements of complementarity among cropping combinations and hedgerow combinations of tree species. Further work must be done to enhance the productivity information in this area. The opportunity cost of the treeplanting operation must be examined in a new context when the change to trees "adds to" instead of "taking from" the potentially competitive crops.

Among the thirteen respondents reporting on border plantings, less than half, or six firms, showed losses, two showed gains, and five showed no change in adjoining crops, Table 25. Two of the respondents showing losses volunteered information that they were pleased with the overall change to trees which had reduced yields from other crops. Overall, the opportunity cost of the border tree operations were small or zero. Due to the smallness of numbers in these data, one must be cautious in their interpretation.

Table 24. Hedgerow Plantings in Selected Areas of Haiti by Percentage Effect on Adjoining Crops and by Number of Years Planting Trees, 1988*

Area	Years of Operation	Gain	Percent Gain	Loss	Percent Loss	No Change
NW	6			x	12	
NW	1	x	40			
NW	5	x	87			
NW	2	x	∞**			
NW	5	x	75			
NW	4	x	40			
CP	4					x
CP	4	x	unknown			

* Only eight respondents reported on this variable.
** Land was abandoned due to lack of fertility but has now recovered to productivity.

Table 25. Border Plantings in Selected Areas of Haiti by Percentage Effect on Adjoining Crops and by Number of Years Planting Trees, 1988*

Area	Years of Operation	Gain	Percent Gain	Loss	Percent Loss	No Change
NW	4	x	50			
NW	4			x	33	
CP	3			x	17	
CP	4			x	unknown	
CP	3					x
CP	3					x
CP	4			x	unknown	
CP	4					x
VTG	4					x
VTG	4			x	50	
VTG	1	x	25			
VTG	3					x
VTG	3			x	25	

* Only 13 respondents reported on this variable.

The mixed tree plantings in crops, either with alleys of crops between rows of trees or random plantings of trees among crops, showed a varied pattern of productivity change. Twenty-four respondents reported on this variable (one showed a loss in one crop and a gain in another, giving 25 responses). Losses in crop yield appeared in 13 of the 25 reports from mixed garden tree plantings in the three areas, Table 26. The losses for these 13 ranged from 16 to 100 percent where crops were abandoned and the operation functioned essentially as a woodlot. Six of the reports showed an improvement in crop yield, either from moisture retention, windbreak protection, or some other complementary effect. Another six of the reports showed no change in adjoining crop yield due to the tree planting operation. Five of the respondents with crop losses volunteered that they were happy with the change to trees because they considered the gain from the trees to be more valuable than crops lost.

There were few woodlots in the study and only five reported on the effect of the plantings on crops. It would be expected that eventually all crop production would be eliminated as the shading effect increased. Grosenick (1986) showed crop production continuing for a couple of years in his woodlot case study, then cessation of other crop production. One of the respondents in the present study showed no change in crops after 3 years, one showed a 60 perceent crop reduction in 3 years, and one showed a 100 percent crop reduction in 3 years, Table 27. Two of the respondents reporting losses volunteered that they were happy with the changes, in spite of the losses of crops.

Table 26. Mixed Garden Tree Plantings In Selected Areas of Haiti by Percentage Effect on Adjoining Crops and by Number of Years Planting Trees, 1988*

Area	Years of Operation	Gain	Percent Gain	Loss	Percent Loss	No Change
NW	6			x	33	
NW	5	x	40			
NW	5			x	40	
NW	4			x	37	
NW	6			x	45	
NW	5	x	30			
NW	6	x	402			
NW	4	x	15			
NW	4			x	50	
NW	3			x	56	
CP	3	x	550**			
CP	3					x
CP	3			x	75	
CP	3			x	62	
CP	3					x
CP	3					x
CP	4			x	100	
CP	4					x
CP	4			x	96	
VTG	4	x	40***			
VTG	4			x	16***	
VTG	4					x
VTG	4					x
VTG	3			x	100	
VTG	4			x	25	

* Twenty four firms reported on this variable.
** The farmer reported that the land was too hot and dry before planting trees and that it now held moisture well to enhance productivity.
*** The same farmer showed increases in one adjoining crop and decreases in another one.

Table 27. Woodlot Plantings in Selected Areas of Haiti by Percentage Effect on Crops and by Number of Years Planting Trees, 1988*

Area	Years of Operation	Loss	Percent	No Change
NW	5	x	unknown	
NW	5	x	unknown	
NW	3			x
VTG	3	x	60	
VTG	3	x	100	

* Only five respondents reported on this variable.

The researcher must guard against the tendency to overevaluate the opportunity cost of losses due to crops foregone on the farm when planting trees. Some of the land put in trees was previously fallow, and represented no loss of crops for that time period. The trees are usually planted on land which is much less valuable than that which is planted to field or garden crops. Farmers with woodlots, on the average, reported that the land planted to trees would have commanded about 47 percent of the rent which their crop land would be worth. This pattern of selecting poorer land for trees than for crops was also found in the Buffim and King (1985) study.

The annual money cost expenditures were very modest for the tree planters. In the Northwest, twelve of the twenty-three tree planters with two to six years of operation reported that they had no paid expenses in a year's time from mid 1987 to mid 1988. In the Central Plateau, ten out of twenty planters showed that they had no paid expenses for the time period. Those with no expenses had from two to six years of operation. In the Vialet-Ti Goave area eleven out of the twenty-two planters, with one to four years of experience, had no paid expenses in operating during the past year.

One of the worst problems farmers had in managing their tree operations was theft of their products. Land located away from the household presented surveillance difficulties. Problems were also encountered with respect to neighbors' goats and other livestock damaging trees.

Continuation of Work

The present phase of the study is to be followed by a detailed measurement of tree samples for determining standing inventory values. This work will entail pricing and cost analyses for end products of the trees. The impact of hedgerows is being studied by measuring soil savings and devising relevant methods to determine changes in productivity of crops.

III. Summary and Conclusions

Summary of Results

The study of 62 tree planters in three regions of the country and four types of tree planting methods is encouraging from the owners' estimates. Sixty of the 62 respondents reported satisfaction with respect to their goal attainment in planting trees. The respondents had been involved with tree planting from one to six years and had made observations on the tree enterprises as they affected other farm endeavors.

The tree planters had an excess of family labor available in general, and the tree operation had little adverse effect on the farmers' other enterprises. Conflicts were few and were concentrated in planting and harvest times. Few tree planters hired any labor and this expense was incurred only during those two peak seasons. Tools and animal capital were generally the same as used in the other farming operations and showed little conflict of use between enterprises.

Wood for own use was the most frequently occurring motivation for farmers to plant trees, followed by the interrelated reasons of erosion control-conservation, and added income. The most frequently occurring primary reason for planting trees was erosion control-conservation, which was mentioned by 23 of the sixty-two farmers.

Fifty-nine of the 62 respondents wished to plant more trees in the future, which tends to reinforce the expression of farmer satisfaction with the tree planting venture. The most frequently occurring reason for not planting more trees was lack of land,

followed by lack of trees and lack of funds to invest.

Owners of hedgerows generally received increased production from other crops planted in association with the installation. The hedgerows held soil and added fertility of their own when composed of leguminous trees. They also provide wood, green manure, and animal fodder.

With respect to border plantings, mixed tree plantings and woodlots, farmers often volunteered that when they received reduced yields of contiguous crops, they were happy with the results. The gain of wood and related products was thought to outweigh the losses, improving their economic welfare.

Limitations of the Study

The study was limited by the relatively small areas of the country which were contained in the survey. It was also limited by the smallness of numbers of observations in each category. Cross classification of variables is especially limited when only a few occurrences appear in dichotomous or continuous variables. The study was somewhat limited by the fact that little tree harvesting had been done by the farmers, restricting the analyses in costs and returns calculations. The fact that farmers had not been forced to cut trees, even when they had grown for five or six years, was encouraging, however. When economic returns had occurred to farmers, it was difficult to get them to release such information, a common occurrence in surveys, especially in the Third World. Farmers also had trouble in reporting kombit costs, those of a cooperative work unit, which were sometimes paid in food and rum.

Many farmers were unable to tell the effects of adjacent or interplanted trees on the production of their cultivated crops. More experience with trees in this capacity over time should improve the cooperators' predictive ability. Delays in measurement of tree growth prevented an evaluation of standing inventories during the time of the study.

Recommendations

While this study brought together a useful set of descriptions of tree planters in Haiti and simple analyses, it should be viewed as a pilot investigation to be improved on in the future. Recommendations for the continuing work with grantees are as follows:

1. Collaborate with cooperators to collect growth data on a sampling basis suitable for economic cost and returns analyses
2. Train farmers through extension means at an early date to maintain records which are amenable to cost and returns analysis by the different years of participation
3. Devise a set of data amenable to determine kombit costs of work
4. Collect a set of farm-level prices to be used in calculating returns of the tree enterprises
5. Collect physiographic data by tree planting areas to facilitate economic recommendations to farmers
6. Expand the sample size in relevant tree planting areas, and
7. Expand the survey to include additional tree planting areas.

REFERENCES

Buffim, William and Wendy King, 1985. Small Farmer Decision Making in Tree Planting: Agroforestry Extension Recommendations. Agroforestry Outreach Project.

Grosnick, Gerold, 1986. Final Report: An Economic Analysis of Agroforestry Systems in Haiti. University of Maine.

Lowenthal, Ira P. 1984. "Labor, Sexuality and the Conjugal Contract in Rural Haiti" in Charles R. Foster and Albert Valdman, Eds. Haiti -- Today and Tomorrow. University Press of America.

White, Andy (Personnel interview), January 27, 1989.

APPENDIX

Interview Schedule
Economic Analysis

Name of Interviewer _____

Commune/Locality _____
Farmer Name _____

Questionnaire

1. Scientific ID _____

2. Social ID:

   A. Age of farmer: _____
   B. Sex: Male _____ Female _____
   C. Length of time on farm: (years)
   D. Years of other work: _____
   E. Type of other work: _____
   F. Years of education: _____

3. Married 01 No ____ 02 Yes ____

4. Number of children in family: _____

5. Children by Age and Type of Work on Farm:

	Age	Male	Female	Type of Work on Farm
1.				
2.				

6. Other household members living on farm:

	Relation	Age	Male	Female	Type of Work on Farm
1.					
2.					

7. What is the youngest age at which your children begin working on your farm? _____

8. During the year are there times when you have too much work and are there times when you do not have enough work?

   Too much J F M A M J J A S O N D
   Not enough J F M A M J J A S O N D

9. When you work with trees and hedgerows, does it interfere with other work you need to do? Yes _____ No _____

If yes, which months have the biggest conflict?

J F M A M J J A S O N D

Explain conflicts: _____

10. How many days would you say that you hire people to work with trees or hedgerows each year? _____

10A. In which months do you hire people to work with trees?

J F M A M J J A S O N D

11. How much do you pay people per day to work for you on either of these activities? _____

12. How many hours per day would a person normally work for you in either of these activities? _____

13. Do you work in a Kombit? 01 No _____ 02 Yes _____

If yes, number of men in it? _____

Days per year you work in a Kombit for trees and hedgerows? _____

Days per year you work in a Kombit for other farm activities? _____

Explain: _____

14. How much is the annual rental value of a carreau of land that you have trees planted on? _____

15. How much is the annual rental value of a carreau of land that you have crops planted on? _____

16. When you plant trees or hedgerows on land that you used to grow crops, is there any change in your yield from doing this:

	Hedgerows	Border	Woodlot	Mixed
Lost yield	from _____	from _____	from _____	from _____
	to _____	to _____	to _____	to _____
Gained yield	from _____	from _____	from _____	from _____
	to _____	to _____	to _____	to _____
No Change	_____	_____	_____	_____
Don't know	_____	_____	_____	_____

17. Which tools/animals do you use on the farm?
    Machete _____
    Hoe _____
    Axe _____
    Mule _____
    Horse _____
    Ox _____
    Donkey _____
    Sickle _____
    Pick-Mattock _____
    Other _____

18. When you use any of the above with trees or hedgerows, would you say that it interferes with your use of it for other farm work? 01 No ____ 02 Yes ____

19. Why did you begin planting trees:
    1. excess land _____
    2. way to save for hard times _____
    3. erosion control/conservation _____
    4. windbreak _____
    5. protection for other crops _____
    6. make money _____
    7. wood for own use (poles, lumber, fodder, firewood)
    8. other reasons _____
    What is the most important reason: _____

20. Are you satisfied with the treeplanting or hedgerows on your land? Yes ____ No ____

21. Do you plan to plant more trees? Yes ____ No ____

22. What keeps you from planting more trees or hedgerows?
    Lack of land _____
    Lack of time (labor) for you and your family _____
    Lack of money to invest in this activity _____
    Other crops are more profitable for current land _____
    Limited tree availability _____
    Have all the trees I need _____
    Other (explain) _____

23. What other expenses did you have from mid 1987 to mid 1988?
    _____

Hedge, Border, Woodlot, Mixed Trees Harvested by Use and Value

Products Generally Sold

	Amount Sold	Unit Price	Total Value	Amount Used on Farm*	Estimated Total
	Mid 87 - Mid 88				Value Sold 85-86 86-87
Type of Planting ( )					
Poles					
Planks					
Firewood					
Charcoal					
Logs					
Other					

* Explain uses for each

Products Not Generally Sold

Green Manure
Explain Amounts & Use _____
Fodder
Explain Amounts & Use _____
Erosion Control
Explain Amounts & Use _____
Other:
Explain Amounts & Use _____

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