HAITI AGROFORESTRY RESEARCH PROJECT

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TIME RATE OF DISCOUNTING AND DECISIONS

OF HAITIAN TREE PLANTERS

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Executive Summary

During previous research on the economics of agroforestry in Haiti, it was noted that some farmers practicing agroforestry tended to hold onto trees for some years. They deferred harvesting them because some tree products, such as planks, increase in value as the trees mature. This study examines the decisions made by rural Haitian tree planters and by urbanites with regard to the amount of time each would defer a benefit that would later have greater value. It examines the time rate of discount, planter planning horizons, and alternative use plans.

Data on the time rate of discount for groups of tree planters and urban service workers are reported. A regression analysis examines the influence of age of farmer and age of tree on such decisions. Respondents expressed very high time rates of discount of future returns. A negative relationship of the discount rate and age of oldest trees was observed, while a positive relationship of the discount rate and the age of the cooperating planters was shown. Political instability influenced farmer's decisions. Greater stability would encourage investment at lower rates of interest because of lower risks of loses. In addition to the use of wood products in building construction and as fuel, potentially profitable opportunities in the Haitian economic for additional uses of wood products are described, including the wood carving industry.

TIME RATE DISCOUNTING AND DECISIONS

OF HAITIAN TREE PLANTERS

"MEZI TAN AK DESIZYON PLANTE PYE BWA

YO NAN AYITI"

REZIME

Nan reshesh ekonomik ki te fet nan zafè plante pyebwa an Ayiti yo te obsevé ke gen kek kiltivatè ki plante pyebwa e ki te kité yo pandan plizye zane. Yo pat koupé pyebwa yo paské yo te rekonet plis pyebwa yo gwo plis yo bay ranman, espesyalman nan zafè fey plansh. Etid sila ap ekzaminé konbyen tan kiltivatè pyebwa epi tou, kek moun nan la vil-la, te dako gadé yon bagay ki te kapab rapoté yo pi plis demen.

Nan etid sila, yon rapo te bay sou valè tan group plantè yo epi tou, moun kap travay en deyo yo te dako kembe yon bagay ki te kapab rapoté yo pi plis demen. Yon analiz (regression) te montré koman laj kiltivatè yo e laj pyebwa yo kap jwe yon grann enpotans nan zafe sila. Resilta-yo montré ki pousantaj tan ke moun yo te vle gadé yon bagay ki kapab bay yo yon pi gwo benefis pi devan ki te byen gran. Li te montré tou, plis pyebwa yo te ajé, mwens abitan-an te genyen interè pou li pat koupé yo, epi tou, moun yo ki te gwoupé an cooperativ te genyen plis tandans pou yo kite pyebwa yo pi lontan. Sitiasyon politik nan peyi-an te jwe yon gran rôl nan desizyon moun yo paske si genyen yon estabilite nan peyi-an moun yo pi dispozé investi a yon to interé ki pi piti paske yo kap genyen mwens chans pou yo pedi kob yo. Etid sila montre tou, an plis bwa te itilizé pou fe kay e pou brilé, yo itilizé'l pou yon bann lot bagay enpotan nan economi peyi d'Ayiti, kom ekzanp, pou fe meb ak bebel an bwa.

Time Rate Of Discounting And Decisions

Of Haitian Tree Planters

by

Donald R. Street

I.   Introduction

Tree planting interventions in Haiti have been in practice for several years. Older trees are now more common than they were in the past. The availability of older trees from planted species is likely to bring about the need to utilize them for ends other than those of charcoal and poles, two of the historical uses of fast-growing tropical hardwoods. This study is designed to deal with some of the questions which tree planters face with respect to their decision making. The primary question examined concerns the farmers' decision to hold trees for appropriate uses. The farmers' time horizon of planning is often extended beyond those of the recent past. Decisions to hold trees for a longer time are in part a function of the farmer's time rate of discount for money. Such decisions additionally require appraisals of various risks. This study deals with explorations of the farmers' decisions to hold trees longer and of their time rate of discount for benefits to be received at some point in the future.

Objectives

The specific objectives of this study were:

1. To determine the time rate of discount of money for selected rural Haitian tree planters and urban dwellers;

2. To determine the planning horizon pattern of Haitian tree planters with respect to holding tree inventories; and

3. To determine alternate use plans for trees held for longer time periods.

Background and Method

Several previous experimental and empirical studies on the time preference for money have dealt with much shorter time periods than those in the horizon for tree-planting farmers. Different populations have been examined by researchers studying this problem. Different studies have examined the attitudes and conduct of children, college-age students, adults, and even animals (Grosch and Neuringer 1981). There seems to be a general consensus that there is a hyperbolic time rate of discount for money (Ainslie 1975, Lowenstein and Thaler 1989). Holcomb and Nelson (1989) explain this phenomenon in terms of a near payoff being discounted at a higher rate than the same payoff deeper into the future. They use several examples to fortify their arguments. Previous empirical work shows that the time preference for money manifests interest rates that are anywhere from negative to a positive value of several hundred percent (Lowenstein and Thaler 1989).

In the present study, tree planters and certain urban dwellers were questioned on their time rate of discount for the receipt, with certainty, of two different amounts of money, either $20 today or X amount at the end of one year. The $20 amount was arbitrarily chosen by the researchers. That amount is, however, about six percent of the mean per capita income estimated for Haiti in 1986 (UNICEF 1989). Holcomb and Nelson (1989) and others (Lowenstein and Thaler 1989) have data indicating that the size of the money base negatively affects the time rate of discount for future returns. No options were included to test for a hyperbolic time rate of discount. Certain difficulties are inherent in attempting to convince peasants that any payoff in the future can be absolutely secure. Holcomb and Nelson (1989) also have pointed out that there can be confusion over the hyperbolic time rate of discount, if a future payment will actually be made.

In the hypothetical setting of the present study, respondents were to assume that there was no risk with respect to the payment one year in the future. This process had the advantage of improving the credibility of the answers. Results from previous studies using such an approach provide results showing responses that agree with the respondents' choices involving the actual payment of money to the subjects of the experiments (Lowenstein and Thaler 1989, Holcomb and Nelson 1989).

Haitian peasants have been conditioned by experience to have doubts about any money payment that might be paid in the future. Changing political situations, devious individuals, and personal

disasters of debtors have contributed to this conditioning to risk aversion. At the same time, the holder of a stock of trees runs considerable risks of loss of assets when holding them over time. There can be storms that blow the trees away or break them. Such storms can render the trees useless for some purposes and glut the market for such tree products as fuel wood and charcoal. Trees are also subject to disease, dying, animal damage and theft (Street 1989). The longer the trees are held, the more likely is some natural phenomenon to damage them. These hazards are different only in detail and degree, however, from the risks incurred in maintaining livestock or in maintaining field crops. Livestock can die, be stolen, or become diseased, thereby limiting or reducing their returns, possibly to zero.

Trees are now important in context with the other assets as a manner of savings. According to Smucker (1983:12) "Animals such as cattle, pigs, and goats constitute the peasant bank. The key animal in this regard is the pig. The current wholesale slaughter of Haitian pigs is causing a serious financial crisis in peasant households throughout the country. Pigs reproduce quickly and fetch a good price on the market. They are easily sold for cash and readily serve as an investment of harvest surpluses with the hope of interest in the form of offspring. Ideally, animals serve as the primary source of cash exchange for sudden consumption needs such as food shortages, illness, school costs or a death in the family."

The slaughter of the pigs to control the African swine disease created a serious problem for the Haitian farmers. The pigs could be drawn upon as a precautionary fund for such contingencies as an illness, a death, a crop loss, or any other financial emergency. After the extermination of the pigs, trees seemed to replace this mobile savings account in the form of near-liquid property that could be turned into poles, charcoal or other products on short notice.

Trees were not alone as a replacement savings account. Smucker (1983: 12) reported that "In somewhat drier areas where bitter manioc is planted, the manioc is kept in the ground for as long as five years and harvested as needed for consumption or sale." He later stated (1988:13) that "The tin roofs of peasant homes constitute a form of savings. In a financial crisis, the tin can be stripped from the roof and sold for cash."

II. Results

Urban Time Rate of Discount

In preparation for conducting the survey with rural tree planters, a small sample survey was conducted to determine the time rate of discount of urban-dwelling domestic workers. The workers were located in the area of Petionville, a suburb near Port-au-Prince. The respondents in this hypothetical setting were to assume that there was no risk with respect to a possible payment in one year of X amount of money, with that choice offered against

a payment of $20 today. All of the respondents were acquainted with the interviewer and no credibility problems were encountered. Results of the time rate of discount are shown in Table 1.

Table 1. Time Rate of Discount on $20 For One Year For Ten Service Employees in Port-au-Prince Suburbs, 1990

Respondent	Time Rate of Discount (Percent)
A	15
B	650
C	15
D	1
E	25
F	100
G	40
H	5
I	555
J	95

There was a very wide range of discount rates (649 percentage points) for the respondents for their one-year wait. The minimum value was one percent with a maximum of 650 percent. The small sample used was not intended to represent a specific population, but the respondents' time rate of discount for money falls within parameters noted in the extensive literature on the subject. The low per capita income considered along with a hypothesized high marginal utility of income for the poor would suggest higher discount rates for them than for the populace in developed areas. The discount rates reported by the Haitian urban dwellers were in line with interest rates charged by various lenders in Haiti in the past (Smucker 1983).

The arithmetic mean time rate of discount for the ten respondents was 150.1 percent. The median was 32.5 percent and may be a better average, since it is not influenced by extreme values. In an effort to avoid confusing respondents, no question was asked about inflation. The current inflation rate is, however, in the 17- to 20-percent range, rendering the real rate of interest to a negative value for four of the ten respondents. These results are still consistent with studies done in other areas (Lowenstein and Thaler 1989).

Rural Tree Planter Time Rate of Discount

A total of eighteen tree planters in the Pan American Development Foundation area in the South near Maniche and in the CARE region of the North were interviewed to gain information about their characteristics and their tree planning work. Table 2 shows the time rate of discount for 14 cooperators who could give a personal value of this variable. Two of the respondents, one relatively young and one relatively old, indicated that there was essentially no rate in the realm of practice that could induce them to wait a year for $20. The mean time-rate of discount for the fourteen was 234.3 percent. For regression purposes, the two with no practical rate for a delay were assigned an arbitrary rate of 2,000 percent as a time-rate of discount. The median rate for the sixteen time-rates of discount was 75 percent. This value is not influenced by extreme values as is the arithmetic mean. The mean

age of the eighteen tree-planting cooperators was 48.9 years. The youngest respondent was thirty three and the oldest one was seventy. The mean years of schooling was 4.3 years and ranged from zero to twelve.

A cross section of the age of oldest trees of the cooperators showed a mean of 14 years. Among the eighteen cooperators spoken with, the youngest tree was three and the oldest was thirty five. All but two of the cooperators planned to keep their trees longer. Only twelve could estimate how much longer they planned to hold their trees. The additional planned holding time had a mean of 3.8 years for the group.

A discount rate is equivalent to the interest rate a person is willing to accept not being paid until some future date. Discount rates for individuals can be and are influenced by many different variables. These include, but are not limited to, age of the individual, income level, amount of wealth held, interest rates on borrowing, level of political stability, and the perceived riskiness of waiting until some future time. Each of these variables shows some theoretical effect on personal discount rates as indicated below.

Table 2. Time Rate of Discount for Selected Tree Planters
in Haiti, 1990

Respondent	Time Rate of Discount (Percent)
A	100
B	45
C	50
D	650
E	895
F	900
G	50
H	50
I	20
J	45
K	5
L	280
M	145
N	45

The age of an individual, interest rates on borrowing, and
perceived riskiness is positively related to the discount rate.
Intuition tells us that as the age of an individual increases, his
or her discount rate will increase. This relationship holds
because as we become older, other things being constant, we have
a shorter time span over which to spend future income. Income is
therefore less valuable to us in the future than it is today. As
interest rates rise, borrowing money becomes more expensive. Such
an increase makes the opportunity cost of payments in the future
higher today. This increase in turn raises the amount of interest

a person requires to forego income. Also, as the risk against receiving a benefit in the future increases, the amount of money required to get someone to wait for a payment increases.

An individual's income level, wealth, and perception of political stability are negatively related to their time rate of discount. As income, wealth and perceived stability rise, their discount rate falls. When income and wealth are higher, future income may be more important than income today, which makes it more likely that people have a lower discount rate. Political stability will increase people's confidence in future investments, therefore making the investments seem less risky, decreasing discount rates.

Most people include property in their wealth portfolio, which makes that property negatively related to their discount rates. The more trees and the more valuable the trees of an individual, the more likely one is to allow young trees to grow to maturity. In theory, it is anticipated that Haitians would not allow trees to reach maturity. This result would occur because of low incomes, low wealth, and political instability. But ironically, as farmers plant more trees, tree owners should be more willing to allow the trees to mature. In this study, a limited survey was conducted to see if the theory described above is valid.

The tree planters were asked questions on their time rate of discount, including age of oldest trees and the amount of money required in a year in order to forego a payment of twenty dollars today. These preliminary data do confirm that, in general, the people in the survey have a negative relationship between their

discount rate and their wealth holdings. (Wealth holdings are being proxied by the relative age of the oldest trees that they held). Input data for a regression analysis can be seen in Table 3.

Table 3. Time Rate of Discount on Twenty Dollars For One Year and Ages of Their Oldest Trees For Sixteen Haitian Farmers

Respondent	Age	Age of Oldest Tree	Discount Rate
02	56	21	2000*
03	45	14	100
04	42	14	45
06	50	15	50
07	56	13	650
08	47	8	895
09	53	14	900
10	54	35	50
11	46	15	50
12	63	35	20
13	45	15	45
14	42	7	5
15	34	5	2000*
16	38	5	280
17	46	3	145
18	33	4	45

*Two individuals indicated that no amount of money was high enough to get them to wait one year instead of a twenty dollar payment today. For these two, an ad hoc discount rate of 2000 was chosen.

A regression was run with the time rate of discount (DISC) as the dependent variable and age of owner (AGE) and age of the oldest trees (AOT) as independent variables. Since it makes no sense for an innate discount rate to exist if one's wealth and age are zero, the regression was forced through the origin. The findings from these preliminary data were:

$$DISC = 15.76(AGE) - 20.03(AOT)$$

These data yielded an adjusted R-square of .35. The results of the regression of the preliminary data agree with the theory in that wealth and the discount rate are negatively related. The age of the owner and the discount rate are positively related.

The discount rates of the farmers as well as those of the small sample of rates of the urban dwellers are exceedingly high in relation to those which one would expect in a developed country. For development to occur, capital expenditures must be made so that an infrastructure can be built. Since it is extremely unlikely that rates of return from any kind of investment will even approach the average discount rates of the typical farmer, it is unlikely that development in this sphere will progress with any momentum. Given the negative relationship between age of trees and the discount rate, however, it is possible that supplying enough trees to the farmers will make a sizable reduction in their discount rates. Such a supply level would encourage them to increase their investment.

Other information that could be useful in studying tree characteristics and discount rates of Haitian farmers are individual borrowing rates, total land and tree holdings, expected dollar value of trees related to age of trees, individual incomes, and the next best alternative to using land for tree production.

Alternate Uses of Trees

Two of the most prevalent uses of trees in Haiti have been for charcoal and pole production. The longer time horizon for planted trees now allows for a consideration of alternate uses of wood

products in the market and for the consideration of the market value of by-products of trees.

As a part of the wood utilization study of Haitian tree planters, the wood-carving industry in Port-au-Prince was also examined. The market near the wharf was visited; interviews were conducted on wood supply characteristics. The largest seller of solid wood carvings was also visited and interviewed in downtown Port-au-Prince.

In the wharf area of Port-au-Prince the hundreds of small wood carvers are supplied wood through various middlemen and retailers. Three concentration points in the market handle the majority of the wood that goes through the market at the wharf area. These three wholesalers purchase through individuals who make contact with selling farmers and wood-lot owners in the countryside. Wood is collected in the country and brought into the wharf area to be dispensed to retailers, other wholesalers, and to several large-scale processors who sell in domestic and export markets.

Chenn and mahogany are the predominant wood types utilized in the carving of artifacts. The wholesalers were concerned with the disappearance of sources of high-quality wood and especially of large trees of exotic wood. The wharf area utilized largely local wood in its marketing channels. Complaints were voiced concerning confiscation of accumulated supplies of wood by government officials. The confiscations added a great deal of instability to the market in the summer of 1990. An artificial shortage was encountered.

The primary supplier of high-quality mahogany carved and fabricated products in the country imported almost all his wood from foreign sources. He reported that reliable supplies had disappeared in Haiti and that the trees were now cut when they were too small for quality wood. He also reported that it was getting more difficult to find large trees even in such countries as Brazil, his main source of supply.

Neem trees give an opportunity to produce insecticides for an added income from a byproduct. To be operational, this enterprise entails extensive market planning as well as commitment of suppliers. As with other investment opportunities, to be successful, political stability is a prerequisite. Such stability would encourage cooperators to make investments at lower rates, thereby adding to efficiency-improving capital accumulations.

Various fodder growing operations are available in Haiti as a means to animal feeding. Experiments need to be established to determine productivity of trees for each purpose in order to find the economic benefits to cooperators. Use of leaves and other residual matter as green manure poses the same problem. Further work is required to know the conversion rate of green manure to productivity gains of crops. This data would permit us to determine financial and economic benefits of the tree by-products. The survey of the eighteen cooperators revealed no new uses of trees in addition to those that have been reported in other studies.

The longer growing horizon for planted trees will provide options in the future to produce lumber and building beams. These products can replace supplies that came from natural growth before deforestation intensified. Extensive data are needed on the physical productivity to determine the feasibility of waiting for future returns. It is important that CARE and the Pan American Development Foundation provide these physical data for use in future financial and economic analyses.

The use of tree products for medicines, herbs and condiments has not been fully exploited. It is incumbent on grantee organizations to begin efforts to account for all possible benefits of this type and to expand the markets for such products.

III. Conclusions and Recommendations

Conclusions

1. Some urban dwellers and some rural tree planters have extremely high time rates of discount of future returns.

2. There was a negative relationship of the discount rate and the age of oldest trees owned by cooperating tree planters.

3. There was a positive relationship of the discount rate and age of the cooperating tree planters.

4. Economic development would be encouraged by increases in political stability that would promote investment at lower rates of interest because of lower risks of losses.

5. The wood carving industry in Port-au-Prince is facing a decreasing supply of locally provided high-quality wood.

Recommendations:

1. Other information should be collected on tree planters' time
    rates of discount including individual borrowing rates, total
    land holdings, tree holdings and individual incomes.

2. Other information should be collected on the differences in
    value of older trees when used for different products as the
    size of the wood increases.

3. Other information should be collected to show the additional
    net income to be attained by incremental years of holding
    older trees of different species.

4. Growth data should be attained for different species of trees
    to provide physical returns to be useful in economic analysis.

REFERENCES

Ainslie, George. (1975). "Specious Reward: A Behavioral Theory of Impulsiveness and Impulse Control," Psychological Bulletin, Volume 82, No. 4, pp. 463-496.

Grosch, James and Allen Neuringer. (1981). "Self-Control in Pigeons Under the Mischel Paradigm," Journal of the Experimental Analysis of Behavior, Volume 35, No. 1, pp. 3-21.

Holcomb, James H. and Paul S. Nelson. (1989). "An Experimental Investigation of Individual Time Preference," Unpublished manuscript.

Loewenstein, George and Richard H. Thaler. (1989). "Anomalies: Intertemporal Choice," Journal of Economic Perspectives, Volume 3, No. 4, pp. 181-193.

Smucker, Glenn. (1983). "Supplies of Credit Among Haitian Peasants," Prepared for the Strengthening Rural Credit Services Project. Washington, D.C.: Development Alternatives, Inc.

Street, Donald R. (1989). "Tree Planting in Haiti: A Socio-Economic Appraisal," South East Consortium for International Development and Auburn University.

UNICEF. (1989). The State of the World's Children. New York: Oxford University Press.