Endogenous Rate of Time Preference, Traditional Communities, and Sustainable Forest Management

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Abstract: It is argued that realisation of the difference between natural forests and commercial plantations, and natural capital and human-made capital will suggest the treatment of the rate of time preference as an endogenous factor. A full understanding of the framework of determinants of the rate of time preference will demonstrate that the common understanding of economists that poor people have a high rate of time preference will not withstand the contextual test of forest use by traditional communities. The nature of forest returns, their role in economic and other necessities, specific risk attributes of forest returns, and personal factors examined in the context of forests indicate a lower rate of time preference for returns from forests among traditional communities when compared to returns from forests for industrialized communities. Due to a long time horizon of forest management decisions, the rate of time preference should be treated as a decreasing function of time instead of a constant rate of time preference. The endogenous rate of time preference will have many impacts on sustainable forest management decisions such as forest rotation becoming sensitive to the values of user group, forest management decisions in developing countries becoming independent, to some extent, of international forces, and traditional management systems, based on a low rate of time preference, providing many inputs for designing sustainable forest management practices.

Key **Words:** Agricultural communities, Industrialized communities, Rate of time preference, Socio-economic conditions, Traditional communities.

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Introduction

Policy makers and forestry professionals have responded to large-scale deforestation and environmental concerns by suggesting sustainable forest management (SFM) practices in place of timber management. SFM requires management of forests for ecological, economic, social, and cultural values for present as well as future generations. In developing economies, such as China, India, and Nepal, governments have also responded to these concerns by a shift in management regimes from state or private to community or joint (between community and state) regimes. To effectively address the research questions related to SFM, various issues including linkages between the social, economic, cultural, and ecological systems need to be examined. The rate of time preference is one of the most important economic parameters related to forest management decisions. In this paper, issues related to the endogenous rate of time preference of traditional communities and its implications for SFM are addressed. The paper establishes a relationship between the economic parameter (rate of time preference), social, economic, and cultural values of traditional communities, and SFM.

In the economic analysis of forest resources, future returns are brought to the present by discounting. In a world of perfect certainty and zero inflation, discounting is done at the rate of pure time preference. Fisher (1930, pp. 104-106) postulated that under conditions of a prefect capital market, the rate of time preference would be, at the margin, exactly equal to the real rate of interest. As natural resources are of social value, the appropriate rate of discount for them is the "social rate" of discount (Lind 1982). Hence, the choice of a social rate of discount has been the focus of much forestry literature (Harou 1985, Price 1988). The main emphasis of these discussions has been on the economic viability of financial investments in forestry projects. These discussions have treated the rate of time preference as an exogenous factor determined by the productivity of human-made capital, and have ignored three issues: (i) the distinction between natural forests and

commercial plantations; (ii) the distinction between human-made capital and natural capital; and (iii) the endogenous nature of the rate of time preference.

Non-recognition of these three issues and treatment of the rate of time preference as an exogenous factor led forest planners and managers to prescribe uniform forest management approaches across user groups, irrespective of the role of forests in the economic, social, and cultural necessities of user groups. At the same time, economists argued that poor people have a high rate of time preference, and, therefore, are responsible for deforestation. This argument is one of the main factors leading to the exclusion of local people from forest management But traditional communities throughout the world, have demonstrated their low rate of time preference to returns from forests through a low consumption rate and intergeneration equity based forest management practices. Hence, it is necessary that people's rate of time preference for forests should be examined in the right context, and that sustainable forest management practices should be designed on the basis of the endogenous rate of time preference of the user group. In this paper, we extend the discussion on the determinants of the endogenous rate of time preference, and argue that an individual's rate of time preference for a particular object, such as returns from forests, will depend upon the role of the object in his/her economic necessities. Hence, an individual may not have the same rate of time preference for all objects in his/her utility bundle. We demonstrate that, when examined in the right framework, traditional communities' low rate of time preference for returns from forests is evident. Hence, economists' argument that poor people have a high rate of time preference does not withstand the contextual test.

First, we demonstrate that an understanding of the distinction between natural forests and commercial plantations, and natural capital and human-made capital contributes to the argument of treating the rate of time preference as an endogenous factor. Second, we review the economic literature on rate of time preference, specifically on the endogenous rate of time preference, and argue for refining the framework of determinants of the endogenous rate of time preference. Third, using the refined framework, we demonstrate that traditional communities have a low rate of time preference for returns from forests. Fourth, we illustrate various features of indigenous forest

management systems of traditional communities that provide indirect evidence in support of the low rate of time preference of these communities for forest resources. Finally, we present some policy suggestions for sustainable forest management.

Natural forests and commercial plantations, and natural capital and human-made capital

Commercial plantations are, normally, plantations of a single fast growing species and produce timber only. These plantations are intensively managed to get quick returns. The production process of these plantations, specifically in tropical countries, involves a shorter period (10 to 20 years) as well as high labour and capital inputs. The main objective behind these plantations is commercial, and are raised to supply raw material for forest based industries. Hence, the production process of commercial plantations is similar to an industrial production process. It seems, therefore, appropriate to use standard practices of discounting for these plantations[1]. However, the production process of natural forests involves a very long time (in the range of 60 to 150 years or more) with very small amounts of labour and capital input[2]. The natural forest also provides many other products, known as non-timber forest products (NTFPs), in addition to timber, to the nearby communities[3]. Many of these NTFPs are available continuously over the entire period of rotation while timber is available only at the end of rotation. The composition of returns from forests will depend upon forest types, but all products provided by natural forests may not be of value to the user group. Hence, the composition of returns, to be considered for the evaluation of forest management decisions, from forests will vary with the social, economic, and cultural values of the user group[4]. Hence, for natural forests, the use of standard practices of discounting will not be appropriate. An appropriate rate of discount for natural forest should account for the composition and nature of returns from the forest and social, economic, and cultural conditions of the user group.

Similarly, in the discussions of discount rate, no distinction is made between natural and human-made capital; an implicit, but fundamental, assumption is that human-made capital and natural capital are prefect substitutes. Costanza and Daly (1992) point out that: i) human-made capital is derived from natural capital; and, ii) if both capitals are perfect substitutes, why develop human-

made capital. In fact, human-made capital and natural capital are complementary and not substitutes for each other. The realisation of complementarity will indicate that the rate of interest earned on human-made capital cannot be an appropriate measure for discounting natural capital[5]. Hence, the actual rate of time preference of the user group of the resource will be an appropriate discounting rate for determining the present value of returns from natural forests[6].

Economic literature and the rate of time preference

Rates of time preference are almost taken as exogenous, at least since Samueleon's (1937) discounted utility model, despite the fact that endogenous nature has been recognised in the economic literature. Classical economists recognised that people are not equally patient, and that patience seems to be associated with income and development. Bohm-Bawerk (1914, pp. 394) observed " the intensity of the preference (for present gratification) varies widely from person to person, as is attested by that famous scale which ranges from the American Indian who will sell the ancestaral hunting grounds for a dram of firewater to the sober, provident and educated scion of Europe's cultured peoples". Bohm-Bawerk (1891, p.257) also recognised that impatience would "manifest in extremely different degrees in different individuals, and even in the same individual at different times". Similar elements of the endogenous nature of rate of time preference are observed in the writings of Jevons (1931). Fisher (1930, p.81) suggested six personal factors (foresight, self-control, habit, expectation of life, concern for the lives of others, and fashion) in addition to the size, time shape, composition, and degree of risk of the income stream as determinants of an individual's rate of time preference, but emphasized the contribution of income (Fisher 1930, p.72): "Poverty bears down heavily on all portions of a man's expected life. But it increases the want for immediate income even more than it increases the want for future income." Fisher (1930, p.81) also argued: "In the case of primitive races, children, and other uninstructed groups in society, the future is seldom considered in its true proportions." Becker and Mulligan (1997) argue for the endogenous nature of time preference, and distinguish between an endowed discount factor and an actual discount factor affected by such resources as schooling, news paper reading, and time spent with old-age people, put into improving one's ability to imagine the future. Hence, Becker and Mulligan attempted to explain the variation of the rate of time preference among members of

industrialized western society.

Another dimension of discussion has been the relationship between the rate of time preference and that of economic development. Fisher's (1930) conjecture was that, at the early stage of economic development, a nation often exhibits a low-saving rate preferring instead current consumption, which might reflect a high rate of time preference for the nation. On the contrary, Uzawa (1968) argues that the rate of time preference rises as the consumer's consumption level increases. Fukao and Hamada (1991) argue that as a nation accumulates wealth, the time preference rate declines to a certain point and increases thereafter. A departure from conventional thinking is offered by Oberhofer (1989) who suggested the concept of the cultural discount rate (CDR), and argues that the earlier a society is in its development and the stronger its command over its entire environment, both absolutely and relatively, the more likely it is to discount its future using a low cultural discount rate. Oberhofer (1989) demonstrates that in recent decades in the United States the increase in the CDR is evident as a result of the United States' willingness to incur substantial increases in debt, to let indebtness to foreigners grow, to abandon the saving ethic, and to live with lagging worker productivity.

The economic theory of a rational and consistent choice also suggests that an individual's time preference should be constant[7] across situations as well as for different time horizons[8], otherwise it will result in dynamic inconsistency[9]. However, empirical research shows that rate of time preference depends on the magnitude and the sign of reward and on the time horizon (Loewenstein and Thaler 1989, Thaler 1981).

Hence, the endogenous nature of the rate of time preference has been both recognised in the economic literature and empirically observed, but discussions relating to forest management and planning have totally ignored it. The common understanding of economists is that poor people have a high rate of time preference when compared to rich people; this understanding is based on an incomplete framework of the determinants of rate of time preference. Three missing features of this framework are: (i) an individual may have different rates of time preference for different objects of

his/her utility bundle; (ii) the rate of time preference for an object will depend upon the role of the object in the economic and other necessities of the individual; and (iii) the influence of individual's personal factors on the rate of time preference will be object and context specific.

The utility bundle of an individual may comprise objects with diverse features, such as private and public goods, resources that provide single-period and multi-periods returns, and goods from privately managed resources and community management resources. An individual may derive different types of utility from each object. Some of the goods of a utility bundle may be substitutes while others may be complementary. Some goods may be essential while others may be luxury goods. Some goods may be important for immediate consumption while others may be for future consumption. Hence, rates of time preference for different objects of the utility bundle need not to be the same. Similarly, the rate of time preference for the returns from forests will not only depend upon the features of a total income stream and personal factors, but will also depend upon the type of role played by the forest in the economic necessities of the community. In addition, even the influence of personal factors has to be examined in the context of the relationship between forests and individuals. Keeping these facts in view, we examine the rates of time preference of traditional communities vis-a-vis those of industrialized communities for forest resources.

Traditional communities and their rate of time preference

In the light of the arguments mentioned above, we divide the determinants of the rate of time preference for returns from forests into three broad categories: (i) individual necessities and forest resources; (ii) forest resources and personal factors; and (iii) a time horizon of returns from forests.

Individual's necessities and forest resources

The two important issues of necessities are an individual's priorities for life and the risk factors involved in meeting those priorities. The role of returns from forests is discussed for these two issues separately.

Individual's priorities and returns from forests

The common economic argument that poor people have a high rate of time preference neglects the fact that poor people's priorities include much more than just income and consumption. Chambers et al., (1989, p. 13) suggest that poor people have a hierarchy of three priorities: survival (based on stable subsistence); security (based on assets and rights); and self- respect (based on independence and choice). These priorities have links with income but are additional and different from it. One dimension of survival and subsistence is adequate and stable flows of income and consumption throughout the year.

In economic terms, traditional communities depend upon the forest not only for timber products but also for non-timber forest products (NTFPs), such as fruits, flowers, roots, and leaves. In many traditional communities, returns from non-timber forest products represent a substantial part of the total income of these societies (Kant 1996, Kant et al. 19%). The specific feature of these returns is that timber products are obtained only at the rotation period while NTFPs are available almost continuously. Industrialised communities depend on forests mainly for timber products, and non-timber returns to these societies are in the form of recreational services, which are enjoyed occasionally. Hence, returns from the forest to traditional communities are significant, continuous, and provide a stable flow of income and consumption items[10]. Returns from forests to industrialised communities are not significant, mainly one time, and are of luxury nature.

Rates of time preference for a one-time return and a sequence of returns can be quite different. The work on time preference has been mainly focused on the one time return. As soon as an inter-temporal trade-off is embedded in the context of two alternative sequences of outcomes, the psychological perspective, or "frame" shifts, and individuals become more far sighted, usually wishing to postpone the better outcome to the end (Loewenstein and Prelec 1991). Loewenstein and Sicherman (1991) found that a majority of museum visitors prefer increasing wage profiles over those that are flat or decline over time (holding total value constant). Varey and Kahneman (1990) find that subjects strongly preferred brief sequences of decreasing discomfort, even at the cost of experiencing overall greater discomfort, while Ross and Simonson (1990) showed that people prefer sequences that end on a good note. Hence, due to the continuous nature and significant

contribution of returns from forests to traditional communities, the argument of a high rate of time preference due to the low income of members of these communities will not hold. The top priority of these communities is survival and subsistence, and, in achieving this priority, stable and continuous flow of returns from the forest play an important role. Hence, the attitude of these communities towards the forests will be similar to the attitude of the groups studied by Loewenstein and Prelec, 1991; Loewenstein and Sicherman, 1991; Varey and Kahneman, 1990; and Ross and Simonson, 1990. Even if total income of traditional communities is very low when compared to that of industrial communities, the rate of time preference of traditional communities for returns from the forest will be low when compared to that of industrialized communities. In addition to economic returns, many traditional communities also depend on forests for religious and spiritual values, and these are derived from the non-destruction and conservation of forests. In such communities, the rate of time preference for economic returns from forests will be further reduced, and, in some cases, may become zero or even positive.

Risk factors

Traditional communities are known to hedge themselves against natural calamities and other risk factors through the use of ecologically diversified production systems, resource-regulating local institutions, dense and complex economic and social networks, and location-specific environmental knowledge (Kibreab, 1997). Hence, in general, the risk component in the rate of time preference of traditional communities will normally be lower compared when compared to that of industrialized communities that are characterized by the absence of social networks, market economies, specialization, and individualistic behaviour.

With reference to specific returns, risk and the rate of return on public investments draws upon the literature of modern finance, primarily the capital asset pricing model (CAPM) (Lind 1982, p.59). According to the CAPM model, the riskiness of an asset depends on how the asset affects the variability of a total portfolio. This variability will, in general, depend both on the variance of the return of the asset and on the covariance of its return with the return to the total portfolio. Under the idealized conditions specified in the CAPM, the expected risk-adjusted rate of return on a stock

in an efficient market will be: $R^* = r + b_{im}(R_m - r)$; where R_i is the expected rate of return on a stock in question, r is a risk free rate of return, b_{im} = Covariance$(R_i - r, R_m - r)$/variance$(R_m - r)$ is a measure of risk, and R_m is the expected rate of return on a portfolio consisting of all stocks in the market (Sharp 1978). Hence, if the covariance is positive, the asset increases the risk; if the covariance is negative the asset reduces the risk, and if the covariance is zero the risk is unchanged.

Even though the CAPM is based on capital assets as a reference, its principles can be used for any combination of assets that need not be a mix of capital assets only. Every person behaves as if he/she is a manager of a mix of assets. The total portfolio of traditional communities is a mixture of agricultural crops, forest products, animal husbandry, and other natural resources, such as fish. In contrast, the total portfolio of industrial communities rarely includes any of these assets. In traditional communities, returns from agriculture are subject to weather uncertainties, while returns from forests are not. In many livelihood strategies of these communities, returns from forests have a counter-seasonal element (Chambers and Longhurst 1986). Forest related activities, such as the collection of fruits, seeds and leaves, can be season specific. The seasons when these commodities become available may or may not coincide with agricultural labour peaks. Other related activities, such as the collection and sale of fuelwood, are less time and season bound, and can be stored for the slack season (Chambers et al., 1989, p. 19). Fodder from the forest is also available during dry seasons when grasses usually dry up and become less palatable and less nutritious. Hence, forests support livestock strategies in which animals can remain in the same place instead of having to migrate (Chamber et al., 1989, p. 19). Therefore, in general, returns from forests have a negative covariance with the total portfolio of these communities. Forests are also used by these communities as savings banks in order to meet contingencies (Chambers and Leach 1987). These contingencies may be occasions when wood itself is needed, as for marriage feasts or funeral pyres (Vidyarthi 1984), or, more significantly, for the needs of social obligations such as a daughter's marriage or a child's education (Chamber et al. 1989, p. 20). In contrast, in the case of industrialised communities, the forest is not an important part of the total portfolio. Generally, the covariance between returns from forests and the total portfolio will be zero. Hence, in the case of traditional communities, specific features of returns from forests, with respect to the riskiness of

returns, induces the lower risk free rate of time preference.

Next, we examine the impact of personal factors on the rate of time preference for forest resources.

Forest resources and personal factors

The same individual behaves as a husband to his wife, as a father to his son and daughter, and as a son or daughter to parents. Similarly, he behaves differendy to his friends and to his colleagues. Hence, the discussion of the impact of personal factors on the rate of time preference will be meaningful only when done in the relevant context. We agree with the personal factors suggested by Fisher (1930, p.81), and, hence, we discuss the impact of those factors in the context of returns from forest resources; however, our inferences are not similar to those of Fisher.

Habit and self-control

Fisher (1930, p.83) distinguishes between habit and self-control, but we do not think these two factors are markedly distinguishable. Habit formation depends upon both the familial and social environment as well as on the individual. While the social environment has a major influence on an individual, a highly self-controlled person can negate the impact of the environment to a great extent. The way in which various communities put preferences on present and future use of natural resources, such as forests, will depend upon their perception and experience with respect to resource use. Societies that perceive their resource base as infinite, and ever-expanding, by virtue of technological developments, will be less likely to observe any resource use restraints, and, hence, will put more value on the present. Societies that perceive resource a base as well-demarcated, finite, and sensitive to resource-use patterns, will most likely put resource-use constraints (Gadgil and Berkes, 1991) and will put almost the same value on present and future returns. In traditional communities, the human attitude towards nature is one of obedience and not one of manipulation. Nature is seen as a "hard mother". The members of traditional communities believe that to maintain a subsistence economy, they should avoid anything that may invite punishment from the hands of nature (Toulmin 1975). Hence, members of traditional communities exercise self-control with respect to forest use". In general, the habits of the next generation will

depend upon the habits of the previous generation. Traditional communities live in close cohesion, and the habits and knowledge of elders are passed onto members of the next generation. In this way, the habits, which allow individuals to live in the natural setting, are continued. These habits induce a low rate of time preference among members of traditional communities compared to members of industrialised communities. Following Fisher's argument (1930 p. 103), a person born into the highly consumptive society of the industrialised world will put a higher value on the present as compared when compared to the future, while the person born into a subsistence society of a traditional community will put almost the same valuation on the present and future.

Expectation of life and concern for the lives of other persons

Shortness and uncertainty of life tend to increase impatience, while solicitude for the welfare of one's heirs tends to decrease impatience. Probably the most powerful cause of low impatience level is the love of one's children and the desire to provide for their needs (Fisher 1930, p. 85). Hence, the overall impact of these two opposite factors will depend upon the dominant factor. In industrialised communities, children often start living away from their parents in their teenage years, and parents do not have even a few hours to share with their children. It seems that the concern for one's heirs is less than the concern for oneself. In such a situation, expectations of one's own life dominate the individuals thought patterns leading to a higher rate of time preference. In traditional communities, parents are not only concerned about their children's childhood but also try to make arrangements for the whole life of their children. Hence, the concern for the lives of children dominates. This expanded concern leads to a lower rate of time preference among members of traditional communities.

Another factor in the concern for the lives of other persons is the number of offspring. An increase in the number of offspring adds to a concern over future needs rather than a concern over immediate needs; it operates, like a descending income stream, to diminish impatience (Fisher 1930, p. 87). The higher number of offspring per family in traditional communities, as compared to the number of offspring in industrialised communities, also leads to a low rate of time preference in traditional communities as compared to the rate of time preference in industrialised communities.

Fashion

Fashion acts, on the one hand, to stimulate saving and become rich, and, on the other hand, to stimulate the rich to live in an ostentatious manner (Fisher 1930, p.88). As Rae (1905, p. 245) puts it:

> The first principle of fashion is vanity, which means mere desire of superiority over others without any reference to the merit of that superiority. Vanity seems most readily to apply to those things to which the use or consumption is most apparent, and of which the effects are most difficult to discriminate. Articles of which the consumption is not conspicuous, are incapable of gratifying this passion. The vanity of no person derives satisfaction from the sort of timber used in the construction of the house he occupies, because the wood is usually concealed by paint or something else.

Kant et al. (1996) demonstrated that non-timber forest products are inferior articles, and, therefore, are in that category of consumption articles that cannot satisfy the passion of vanity. Typically, fashion is a feature of rich people not of the poor whose top priority is survival. Hence, fashion will not affect the rate of time preference for forests among members of traditional communities. However, in industrialised communities, due to their never-ending consumptive nature, fashion may increase, to some extent, the rate of time preference for the forest.

Foresight

Generally, the greater the foresight, the less the rate of time preference, and vice versa. The important issue in the topic of foresight is an understanding of the capabilities of different communities. Fisher (1930, p.81) argues that, in the case of primitive races, children, and other uninstructed groups in society, the future is seldom considered in its true proportions. On the other hand, the sagacious businessperson represents the other extreme; he or she is constantly forecasting. In the present context, Fisher's argument seems to be misleading. The issue of forecasting should be looked at in a contextual framework. In the case of natural resources such as the forest, traditional communities have an in-depth knowledge of the ecosystem. Members of these communities can forecast a good year of flowering and fruiting of different plants while, on the other hand, modern communities, with all their sophisticated forecasting techniques, cannot match

the accuracy of traditional communities which is based on the intergenerational transfer of native knowledge[12]. An understanding of the ecosystem and an ability to look into the future are the main reasons for the continuous existence of these communities on a sustained basis, while the short-sighted forecasting by modern scientists have lead us to the point where everyone feels threatened due to environmental hazards. This contention is supported by an increased CDR hypothesis of Oberhofer (1989). Hence, due to inherent forecasting capabilities regarding natural resources, traditional communities will have a lower rate of time preference when compared to that as industrialized communities.

Hence, personal factors contribute to a low rate of time preference for forest returns by traditional communities when compared to that of industrialized communities. Next, we examine the impact of the time horizon on the rate of time preference.

The time horizon and the rate of time preference

In forestry, the time-span of one timber harvesting (forest rotation) is the minimum time to be considered for any economic decision. The rotation period for the natural forest may vary from forty years for some species of trees in the tropics to 150 years for some tree species of the temperate region. The rate of time preference may not be constant over a long time horizon. As indicated earlier in this paper, Bohm-Bawerk (1891) and Strotz (1955-56) speculate that people act as if their rates of time preference vary with the length of time to be waited. Thaler (1981) concludes that a discount function is non-exponential, and the rate of time preference appears to decline as the time necessary to wait increases. He argues that the psychophysics of time suggests that the difference between today and tomorrow will seem greater than the difference between a year from now and a year plus one day; yet an exponential discount rate requires that these differences be perceived as equal. Cropper et al., (1992), in the measurement of rates of time preference for saving lives, find that people do not discount at a constant exponential rate. Discount rates are much higher for short horizons than for long horizons; they also find that, in the beginning, the rate of time preference falls very steeply and later on the discount rate function becomes flatter, with the discount rate reaching zero for a 122 years time horizon. Given this

difference, it is likely that the annual discount rate follows a negatively sloped, convex pattern. Many other studies (Horowitz 1988, Benzion et al. 1989) confirm the Bohm-Bawerk speculation. Hence, due to long time horizons, the use of a constant rate of time preference in forest planning and in management decisions will not represent the real state of affairs; therefore, the rate of time preference should be treated as a decreasing function of a time horizon. Now, since the traditional communities, in general, have a lower rate of time preference for forest resources when compared to that of industrialized communities, even if the rate of time preference decreases at the same rate, the rate of time preference of traditional communities will always be lower than that of industrialized communities. But, due to the inherent nature of inter-generation equity among traditional communities, we think that the rate of time preference of these communities will decrease at a faster rate when compared to that of industrialized communities. Hence, with a long time horizon, the difference between the rate of time preference of traditional and industrialized communities may even increase.

Our discussion demonstrates that the specific role of forest resources in economic necessities, the negative co-variance of forest returns with other returns of portfolio, and the personal factors in the community and resource specific environments lead to a low rate of time preference by traditional communities for forest resources. In the next section, we give some examples from forest resource use and management practices by traditional communities that provide indirect evidence of the low rate of time preference of traditional communities.

Evidences consistent with a low rate of time preference of traditional communities

We are unable to find a study on the direct measurement of the rate of time preference of traditional communities, either in general or specifically, for returns from forests. However, in indigenous forest management systems, it is common to observe that people do not look only for immediate returns but put a higher priority on conserving the forests for future returns that may be economic, social, or cultural and for inter-generation equity. In many villages in Orissa, India, indigenous management systems allow village members to collect forest produce for their own consumption on an annual basis, but members cannot sell the collected produce in the market. Villagers of

Vejibolua (Orissa) decided that a person who sells forest produce will have to pay a fine five times the price of the produce (Kant et al., 1991, p.27). These people also have restrictions on harvesting of forest produce by: (i) type and quantity; (ii) area; (iii) time; and (iv) agency (Kant et al., 1991, p.28). Similarly, in traditional forest management systems in Nepal, local people restrict harvesting and use of forest products by: (i) product and species; (ii) condition of product; and (iii) amount of product. The amount of product to be harvested and used is restricted by time, quantity, harvesting tool, area, and agency of collection (men, women, children etc.) (Arnold and Campbell 1996). These indigenous rules indicate that these people are not concerned about the present only, but that they put almost the same value on future returns from forests as they put on present returns.

The management of forests by taboo and religious sanctions is common among traditional communities. Among traditional societies of India, the Philippines, and Thailand, preservation of small patches of forest as "scared groves" for the abode of local spirits or deities is common. In these forests, the collection of medicinal plants, leaf litter, and dead wood has been gradually accepted, but removal of live wood is not normally allowed (Mol and Wiersum, 1993). Subedi et al., (1991) report that in one Terai village in Nepal, some trees on common land have been set aside, as a result of a village group decision, exclusively for use by treeless and landless poor people for Hindu funeral pyres. In Africa, use of the authority of God for the welfare of living beings is common. For example, the Aouan of the Cote d' Ivoire believe that over-exploitation of the forest would call forth Assie, a female matrilineal deity who is dangerous to humans (van den Breemer 1989); Kikuyu of Kenya believe in natural calamities due to over harvetsing of forests (Brokensha and Castro 1988). In these cases, decisions are guided by religious factors, but the associated actions of not harvesting forest products for immediate economic returns indicate a low rate of time preference for these communities.

Traditional communities of Mexico believe that the real owners of the land and forest are divine beings and spirits; and, hence, the earth is a member of the larger community. The community has an obligation to treat the earth and all other community members with respect and concern for the continued well being of every member (Brisefio Guerrero 1994). In the Totonac and Huastec

communities of Mexico, a belief in witchcraft provides strong social sanctions against the non-conservation use of forest resources. In these communities, ecologically sound land use is enforced by cultural values and ethical commitments. Similarly, Purepechan culture supports values placed on the conservative use of resources, economic equity, and the protection of natural values. Equitable distribution of the communities' resources among individual families prevents overuse by any one family, while community based values and institutions maintain resource use within acceptable bounds (Alcorn and Toledo 1995). Hence, in these communities, people's preferences for the future are reflected in the conservative use of forest resources, the economic equity of present and future generations, and the protection of natural values. Similar time preferences for the future are also evident from the different categories of restraints imposed by these communities on the use of other natural resources. For example, the Sami reindeer herders of northern Norway divide and regroup herds several times a year, a practice known as ***slida*** that helps limit reindeer numbers to the pasture's carrying capacity, apparently before overgrazing occurs (Bjorklund 1990). The imposition of such limits or quotas implies that harvest is halted at resource densities greater than those at which individuals would find the net gains too low to continue harvest. As a corollary, these quotas are likely to enhance total yields on a long-term basis, at the sacrifice of some immediate returns (Gadgil and Berkes, 1995)[13].

Conclusions

In summary, traditional and industrialised communities can be characterised as being Oikonomia and Chrematistics, respectively. An Oikonomia community differs from Chrematistic community in three ways: first, it takes the long-run rather than the short-run view; second, it considers the cost and benefit to the whole community, not just to the parties to the transaction; and third, it focuses on concrete use value and the limited accumulation thereof, rather than on an abstract exchange value and its impetus toward unlimited accumulation (Daly and Cobb 1989, p. 139). Due to these general features of traditional communities and specific features of forest returns such as nature, role in economic necessities, and specific risk attributes, the rate of time preference for forest resources is lower among traditional communities than it is when compared to industrialised communities; this feature of traditional communities is also evident from their forest management

practices. Due to a long horizon of natural forest management decisions, the rate of time preference will be a decreasing function of time, instead of a constant rate of time preference, and this will further increase the difference between the rate of time preference between traditional communities and that of industrialized communities.

The endogenous nature of the rate of time preference and the lower rate of time preference of traditional communities will have many important implications for sustainable forest management decisions. First, forest management decisions, such as forest rotation depends, on the choice of the rate of time preference. In the case of an endogenous rate of time preference, these decisions will incorporate the choices of user groups that seem necessary for the success of such new community based forest management systems as Joint Forest Management in India and Community Forest Management in Nepal. Second, the returns on capital in developing countries are highly subject to international monetary agencies such as the International Monetary Fund and the World Bank. Also, due to international linkages in the capital market, returns on capital in the developing world are subject to the monetary and exchange policies of developed countries. Hence, in the case of the exogenous rate of time preference, developed countries and international organisations will indirectly influence forest management decisions in developing countries for their own gains. Conversion of large natural forests to commercial plantations to get higher financial rate of returns in developing countries is one example of dominance of the view of developed world. The use of an endogenous rate of time preference will provide a hedging effect to forest management decisions in developing countries from international influences. Finally, use of an endogenous rate of time preference and the recognition of the low rate of time preference by traditional communities will contribute towards sustainable forest management practices. Even though there is no common understanding on the subject of SFM but its essential components are management of forests as ecosystems, simultaneous provision of ecological, economical, and social values, and inter-generation equity. The endogenous rate of time preference incorporates the community's preferences for economic, social, and ecological values as well as preferences for future generations. The low rate of time preference by traditional communities contributes towards inter-generation equity, non-destructive resource use practices, management regimes based on non-

disturbance of natural processes. In other words, in traditional communities, ecological sustainability is obtained through the restrictive use of natural resources and treating natural resources as a part of community, social sustainability through risk-hedging social mechanisms, economic sustainability through the wise use of natural resources, and inter-generation equity by giving equal importance to past and future generations. In all these values, mechanisms, and activities, the low rate of time preference of these communities plays a direct or indirect role. Hence, for sustainable forest management, it seems necessary that we change our view, from what Gadgil and Berkes (1995) called, "dominance over nature" to "community of beings". In this regard, traditional management systems will provide important inputs in designing SFM practices.

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In the case of commercial plantations, man made capital is invested to produce material for forest industries, and an expectation of returns at least equal to the market rate of returns is logical. Hence, the use of conventional methods of discounting seems reasonable.

[2] Since the amount of man made capital used in the production of natural forests is negligible, the logic used for the purpose of discounting the returns from commercial plantations does not hold for the returns from natural forests.

[3] Sow and Anderson (1996) from a study in Mali indicate that of about 110 species in the forest, 67 species are used for pharmaceutical products, 53 species for beverages, and 50 species for fuelwood. Nearly 50 species are reported to be used for multipurpose.

[4] In the case of government or private management of forests, most of these NTFPs are excluded from the economic evaluation of forest management decisions. But, in the case of community or joint management regimes, all forest products that are of economic value to the community should be included in the economic evaluation.

[5] Ciriacy-Wantrup (1963) also suggests that due to imperfections in physical assets market, labour market, and capital market, planning agents of flow resources, such as forests, take their own "time-preference rates" rather than market interest rates as a basis for conservation decisions.

[6] In the absence of perfect markets of products, labour, and capital; and in the presence of complementarity between human-made and natural capital, an argument of inefficient allocation due to use of different rates of discount will not hold. In fact the use of same rate of discount, in the presence of these two features, may lead to socially inefficient allocation.

[7] Life-cycle hypothesis suggests that people will have different rates of time preference at different ages, but for a given age, it also suggests the same rate of time preference across situations and constant rate of time preference for different time horizons.

[8] In the existing forest planning and management models, the treatment of the rate of time preference is in consistency with this approach of economics.

[9] However, economists at least since the time of Bohm-Bawerk have been sceptical. Both Bohm-Bawerk (1891) and Strotz (1955-56) have speculated that people act as if their discount rates vary with the length of waiting time. Strotz (1955-56, p. 177) states:

Special attention should be given, I feel, to a discount function... which differs from a logarithmically linear one in that "over values" the more proximate satisfaction relative to the more distant ones.

This discount function leads to Strotz's famous dynamic inconsistency. Thaler (1981) illustrates with the following example:
(A) Choose between: (A.l) One orange today

(A.2) Two oranges tomorrow
(B) Choose between: (B.l) One orange in one year
(B.2) Two oranges in one year plus one day

In this set of choices, some people may be tempted to select (A.l), but no one would select B.l. In the case of constant rate of time preference, choices should be identical. Dynamic inconsistency arises if B.2 is selected now and when the choice is reconsidered in 364 days (B.l) is selected.

[10] Kant (1996) demonstrates that in a sample of four villages from West Bengal and three villages from Gujarat states of India, the contribution of forest to average annual household income in West Bengal and Gujarat is 43% and 37%, respectively. Among all the sources of income, such as agriculture, forest, and labour, the percentage contribution of forests to the annual household income is highest during 9 months in West Bengal and 11 months in Gujarat.

[11] There is evidence of many traditions promoting restraint in the use of forest and other natural resources among the traditional communities of India. The restraints were imposed in the form of quantitative quotas, closed seasons, protected life history stages, protection to individual species, and protection to entire communities in specific localities (Gadgil and Iyer 1989; Kant et al. 1991)

[12] Ruby Dunstan of the Nl'aka'pamux people of the Stein Valley in Alberta, Canada has remarked "We knew about all the plants and animals, when to pick, when to hunt. We knew because we were taught every day. It's like we were pruning every day Colchester 1996.

13 Interested readers may refer Gadgil and Berkes (1995) for other examples of restricted natural resource use by tradtional communities.