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Transcending Sustainability Beyond CBA: Conceptual Insights from Empirical Study on Shifting Cultivation in Orissa

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Abstract

Conventionally, shifting cultivation (also known as Swidden) has been interpreted as inefficient (economically), destructive (ecologically) and an inflexible static form (institutionally) of agriculture. It is essential not only that the system of production is non-destructive, efficient and adaptive to better changes but also is sustainable. The incidental point emerges out is that whether shifting cultivation is sustainable or not. Therefore, the present paper attempts to verify the criteria of measurement of sustainability in a relatively primitive form of agricultural system and develops some alternative/complimentary ways to look into the factors related to sustainability. Often sustainability of a project or production system is verified through usual cost benefit analysis (CBA). In our study we feel that the essence of understanding the sustainability of shifting cultivation system requires the understanding of factors, which are local in nature that are severely limited by usual CBA. Therefore, we have developed a critique of CBA and alternatively evolved with the land, employment and consumption based analyses in order to evaluate the sustainability of this form of agriculture in the context of Orissa based on primary study.

JEL Classification : *Q01; D61; O13*

Keywords : *Shifting Cultivation, Sustainability, Cost-Benefit Analysis, Carrying Capacity, Orissa*

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1. Introduction

Conventionally, shifting cultivation (also known as Swidden) has been interpreted as an inefficient (economically) and destructive (ecologically) form of agriculture. More recently, shifting cultivation is viewed as an inflexible static system (institutionally) ill-suited for adapting to changes brought about by modernity. This latter view, as illustrated in World Bank (1992), holds that it slows agricultural production and causes ecological degradation. Therefore, it is essential to examine whether shifting cultivation is a destructive, inefficient and inflexible static system of agriculture. It is just not sufficient even if we identify that shifting cultivation is not destructive, not inefficient both from economic and energy use point of view. It is also not enough even if we identify that shifting cultivation is not an inflexible static system. It is essential not only that the system of production is non-destructive, efficient and adaptive to better changes but also is sustainable. The incidental point that emerges is whether shifting cultivation is sustainable or not. The present paper attempts to verify the criteria of measurement of sustainability in a relatively primitive form of agricultural system and develops some alternative/complimentary ways to look into the factors related to sustainability.

The term sustainability has varied meanings in literature. However, in its crudest form it can mean that no one will be worse off, if not better off, over a period of time[1] (for more definitions see Box 1). Often sustainability of a project or production system is verified through the usual cost benefit analysis (CBA). Though, the CBA is a useful tool to understand and evaluate a system of production, due to certain inherent flaws and tendency to ignore some important

[1] Sustainable development as "non-declining utility" is elegantly investigated by John Pezzey in *Economic Analysis of Sustainable Growth and Sustainable Development,* Environment Department Working Paper No. 15, World Bank, 1989. Peezy is critical of other approaches to sustainability because he feels they are non-operational and non-measurable. The relevance of a non-measurable, non-comprehensive definition of sustainable development for policy purposes is thus very questionable. But this does not detract from the powerful insights into the concept of sustainable development that can be derived by adopting the "utility" approach. Economists who advocate the "non-declining utility" definition of sustainable development do this by making environmental quality a factor in the "utility function". That is, utility, or well being, depends on the consumption of goods and services and on environmental quality.

social aspects, it has been criticised by many economists and project planners. In our study we also maintain that understanding the sustainability of shifting cultivation system requires the understanding of factors, which are local in nature. First, it is the capacity of the land to produce for supporting a stream of population over a period of time. In other words, the question is what could be the number of people the system can accommodate and for how many years. Second, not only the capacity of land to support a group of people but also to how many people the system can provide employment opportunity. Often, the population support from the land perspective does not match with that from the employment perspective. Therefore, though the carrying capacity of the land becomes a necessary condition for the use of land resources, its sustainability depends on the size of employment opportunity it creates. The third important factor that gains importance in understanding the sustainability of shifting cultivation system is, how far the system is capable of feeding the people i.e., to what extent the system supports the consumption needs of the population dependent on this system of agriculture.

In this paper we deal with the issues of sustainability in the following manner. In the second section, we develop a critique of CBA, which is widely used as a measurement of sustainability. Third section briefly introduces the study area and database. In the fourth section we shall discuss the issue of sustainability from the point of view of carrying capacity of land, as explained by the land use intensity. The fifth section deals with issues related to employment generated in shifting cultivation system. Employment is a desirable indicator of sustainability, specifically in agrarian sectors of developing economies where off-farm employment opportunities are low. This also implies that in a traditional agricultural system where the opportunity cost of labour is nearly zero, employment could be a better indicator of sustainability. In the sixth section we shall discuss issues concerning sustainability from the point of consumption requirement and how capable is the present system in feeding the population. This is attempted through a complimentary approach, namely consumption based analysis. The last section provides the summary and conclusions.

Box 1: A Few Definitions of Sustainable Development

Annexure of "Blueprint for a Green Economy" by Pearce et al (1997) compiled about twenty-five definitions of sustainable development from different literature. A few of those definitions are as follows;

(a) The next generation should inherit a stock of wealth, comprising man-made assets and environmental assets, no less than the stock inherited by the previous generation. (Pearce et al, 1997)

(b) Lasting satisfaction of human needs and improvement of quality of life (Allen, 1980).

(c) Lasting and secure livelihood that minimise resource depletion, environmental degradation, cultural disruption and social instability. (Barbier, 1987)

(d) Development that meets the needs of present without compromising the ability of the future generations to meet their own needs. (World Commission on Environment and Development, 1986)

(e) Maximising the net benefits of economic development, subject to maintaining the services and quality of natural resources. (Barbier, 1989).

(f) Agricultural sustainability is defined as the ability to maintain the productivity, whether of a field or farm or nation, in the face of stress or shock. (Conway and Barbier, 1988)

(g) Sustainable society is one that lives within the self –perpetuating limits of its environment. That society is not a 'no-growth' society. It is, rather, a society that recognises the limit of growth and looks for alternative ways of growing. (Coomer, 1979)

(h) A primary goal of sustainable development is to achieve a reasonable and equitably distributed level of economic well being that can be perpetuated continually for many human generations. (Goodland and Ledoc, 1987)

(i) …activities should be considered that would be aimed at maintaining over time a constant effective natural resource base. The concept was proposed by Page (1977) and implies not an unchanging resource base but a set of resource reserves, technologies, and policy controls that maintain or expand the production possibilities of future generations. (Howe, 1979)

(j) Sustainability might be redefined in terms of a requirement that the use of resources today should not reduce real incomes in the future. (Markandya and Pearce, 1988)

(k) Norgaard (1988) gives five comprehensive definitions, which address the sustainability of changing interactions between people and their environment over time. First, whether a region's agricultural and industrial practices can continue indefinitely. Second, whether the region is dependent upon non-renewable inputs, both energy and materials, from beyond its boundaries, or, beyond its boundaries which are not being managed in a sustainable manner. Third, whether the region is in some sense culturally sustainable, whether it contributing as much to the knowledge and institutional bases of other regions as it is culturally dependent on others. Fourth, the extent to which the region is contributing to global climatic change, forcing other regions to change their behaviour, as well as whether it has options available to adapt to the climatic change imposed upon it by others. Fifth, the cultural stability of all the regions in combination evolving along mutually compatible paths or not.

(l) World commission on Environment and Development (1987) emphasises on two points while defining sustainability. First, even the narrow notion of physical sustainability implies a concern for social equity between two generations, a concern that must logically be extended to equity within each generation. Second, living standards that go beyond the basic minimum are sustainable only if consumption standards everywhere have regard for long-term sustainability.

2. Issues Pertaining to Measuring Sustainability: A Critique of CBA

Sustainable use of natural resources has gained increasing importance in the literature on development economics during the last few decades. The neo classical perspective is ideologically specific with its focus on market and prices. CBA is a part of this neo classical tradition and is currently the dominant approach on decision making in the public domain. This approach seeks an identification of all kinds of impact connected with the alternative courses of action considered and a systematic comparison of these impacts, using money as the 'common denominator'. The analyst aims at one value for each alternative; for instance, a net present value, suggesting the relative 'efficiency' of that alternative. The idea behind the CBA is that all impacts can be traded against each other in monetary terms, and also the analyst can refer to the 'correct' price of each impact for purposes of societal evaluation. When there is no actual market, a reference is made to an imagined or 'shadow market'. The use of CBA acknowledges a number of limitations. The criticisms offered at this level in turn would be a starting premise for the elaboration of alternative approaches to societal decision-making. It is argued that the limits to CBA get accentuated in relation to environmental issues. Soderbaum (1998) identifies a number of reasons for which CBA would not be a good choice, specifically for environmental problems, which are multidimensional, multifactorial and complex. First, to make an attempt to deal with multidimensional impacts in uni-dimensional terms may not be the best strategy. It is true that such analysis invariably involves some simplification, but higher degree of simplification may imply a loss in its relevance. Second, if information about the impact is uncertain and fragmentary, then an attempt to express all aspects in one-dimensional terms becomes even more daunting. Third, in case of irreversible environmental impacts, the references to present consumers and their monetary valuation may not be a useful indicator, since the impact concerns largely to the future generation. Assuming that the CBA framework can indicate specific prices in these cases, the relevance of such prices and estimated present values to citizens and decision makers becomes nebulous. And fourth, assuming that the analyst is able to suggest a price in monetary terms for each impact, according to the rules of CBA, these rules will then necessarily represent a specific ideology or, more precisely, market ideology. What are perceived as public issues, are reduced to private issues of willingness to pay for real and imagined commodities. A person, therefore, can essentially be reduced to a consumer of each impact that can be traded against other impacts, in monetary terms.

However, the criterion followed for measuring sustainability in a typical CBA framework has not gone beyond internalising the externality of environmental degradation in monetary terms. For the past three decades CBA has been considered the method of land use choice (Taylor, 2001). There have been

considerable reforms in recent years towards appreciating CBA. Nevertheless, the main criticism against it still holds, as it is essentially a market-oriented approach, which has not developed comprehensively in most developing countries. In the CBA approach, the net income/benefit streams discounted from the future are measured, and one tends to conclude that discounting the future will take care of the ecological aspects of the resource. Here, attention may be drawn to two important points while evaluating the land use choice, mainly in a developing country context. First, a specific type of land use is chosen, because it ensures certain segment of labour use in the economy. This has to be understood in the backdrop of opportunity cost of labour, specifically in a developing economy context, where opportunity cost of labour is nearly zero. Second, in a poor economy, land use choice is also guided by the factors related to the consumption needs. Therefore, any evaluation of land use choice with CBA per se, without considering the employment and consumption factors, would be partial and unsustainable. Conventional CBA gives no indication of who benefits from the economic activity and how the consumption needs are derived. Developing regions are subject to high degree of income inequality and capital flight (Todaro, 1994). Thus, it is quite possible that significant monetary benefits of a development project will not accrue to a broad base of regional habitants. Contrarily, in a similar subsistence economy, where product and factor markets are distorted[2], direct consumption would ensure a better standard of living, than indirect consumption via a distorted market. As we will discuss in subsequent sections, a point which holds for both employment based analysis (EBA) and consumption based analysis (CoBA) is on population support. Besides, these methods, to a large extent ensure equity. However, land based or carrying capacity analysis is a necessary condition without which evolving a sustainable criterion is difficult. Therefore, we are discussing the issue of carrying capacity of land, the primary condition to be fulfilled before attempting any other criterion of an activity evaluation. An understanding of the study area and the database would be useful before getting into the analysis.

3. The Study Area

The issues pertaining to shifting cultivation being of ecological, economic and institutional importance, the criteria for selecting the field research area had to be guided by a few conditions. We identified varying shifting cycles, communities practising shifting cultivation system, ecological and agro-climatic zones along with different types of land-use practices in Orissa. Central and southern part of

[2] Market distortion in developing economies is widely discussed in many literature. In Jyotishi (2003) we have discussed about the market distortion existing in the present study region.

Orissa was preferred for the availability of these conditions. Further, we decided to study a complete village or hamlet domain for a better understanding of the functioning and linkages of micro-institutions as well as the ecological aspects of land-use management and crop management in its totality. Based on the study by the Anthropological Survey of India (Bose, 1991) all the blocks under shifting cultivation were identified. Accordingly, shifting cultivation in Orissa was divided into three zones, namely, north, central and south zones. Among these zones, as the central zone has the highest extent of shifting cultivation as well as diverse conditions of topography, this zone was selected for the study. Within the central zone, data related to slope, altitude, rainfall, accessibility to road, population density and communities practising shifting cultivation were available. Most of these variables were further divided into three scores. For example, slope was categorised into flat, moderate and high. Similarly, rainfall was categorised as high, medium and low and, altitude into low, medium and high. We were also careful about selecting different communities and the diversity of agricultural practices associated with shifting cultivation in order to select the blocks where most of the scores were represented. Accordingly, four blocks were chosen for the study, namely, Kashipur, Muniguda, Bissamcuttack and Raigada. Five villages from these blocks were considered for primary survey. Interestingly, these blocks also fall into three ecologically important zones, such as, Bafalamali, Niyamgiri and Mahendragiri; the first two regions were from Rayagada district and the third from Gajapati district. One village (Brhamarjodi) was chosen from the Bafalamali hill range, whereas two each from Niyamgiri (Sakota and Gandli) and Mahendragiri (Badamasingh and Kalinga) were chosen. The villages chosen had varying shifting cycles ranging from 6 to 12 years with different cropping pattern, institutional set-ups, indigenous communities, mode of production, proximity and linkages with market with differing complimentary land-use systems like horticulture, plantation, terrace cultivation, root crops and fruit growing farms, etc. Topographically also, the blocks, under which the villages fall, have different slopes and altitudes and different ranges of average rainfall. Besides, the population density as well as accessibility to roads (which can be considered as a proxy for accessibility to market) of the regions is also different.

Qualitative and quantitative information were collected from the five sample villages. A total of 125 households in these villages formed the unit of study in most cases. In these villages the main source of livelihood was shifting cultivation. Besides, the villagers engaged themselves in other forms of agricultural practice and collection of various non-timber forest produces. It is evident from Table 1 that the availability of plain land in all the five villages was very low. Therefore, most of the agricultural practices depended on the higher slopes.

Shifting cultivation is performed on the land termed as 'wasteland' in the village revenue records. It was evident during the fieldwork that there was no land right issued by the state for cultivating these lands. However, the communities had claimed *de facto* right over these lands and they continued cultivation in this terrain. The term wasteland is an oversimplification, as on the village site one would identify various types of vegetation covers. These include swidden land under current cultivation, fallow land at different stages of re-growth, plantations like cashew, plantain, pineapple, fruit bearing trees like jackfruit, tamarind, mango etc., and bushy forest as well as forest with substantial wood growth. These villages are surrounded by forests, often under reserve forest category.

Table 1: Village-wise Indicators

Village	Brhamarjodi	Sakota	Gandli	Badamasingh	Kalinga
1. Community	Paroja	*Dongria Kondh*	*Dongria Kondh*	*Saura*	*Saura*
2. Total Households	29	21	26	32	17
3. Population	136	84	116	148	77
4. Total Geographical Area (in acres)	420.84	560.07	866.49	358.275	234.41
5. Plain land (in acres)	58.5	66.92	15.06	11.4425	20.155
6. Wasteland (in acres)	333.75	470.07	825.01	268.2425	107
7. 5 as per cent of 4	13.90	11.95	1.74	3.19	8.60
8. 6 as per cent of 4	79.31	83.93	95.21	74.87	45.65
9. Shifting cycle (in years)	8	10	7	6	6
10.Land use intensity 'R'	25.00	20.00	28.57	33.33	33.33

Notes: 'R' value is the land use intensity as described by Ruthenberg i.e. **R = (t′/t″) x 100,** where, **t** is the years in the cropping-and-fallow cycle. While, **t=1** is the year of initial clearing and first year of cropping, where **t′** is the final year of cropping; and **t″** is the final year of fallow of the crop-fallow cycle (Ruthenberg, 1976).

Source: Based on the land records of each village from the Revenue Department

4. Sustainable Carrying Capacity or Land Based Analysis

One of the important dimensions of sustainability of the shifting cultivation system is its *carrying capacity.* Carrying capacity is generally defined as the human-land balance, which is maintained by the native populations practising simple food producing methods. In other words, it refers to the number of individuals that can be supported in a given area, the level of consumption they are to be supported by and the time required for the area to be capable of providing the support.

Carrying capacity can be classified by the time horizon of the estimate, yielding two categories, namely *instantaneous* and *sustainable.* The definition can be further broken up according to whether they are static or dynamic; deterministic or stochastic; based on single limiting factor or several possible limiting factors or a combination of measures representing the contributions of several factors (Marten and Saltman, 1990). Some human carrying capacity estimation techniques determine when the capacity has been exceeded by some behavioural change in the population. Such behavioural changes indicate that the capacity of the production system being unsatisfactory by the population's own culturally defined standards. These methods work only for the populations observed during the period when the instantaneous carrying capacity is exceeded, or when separate sub-population can be observed at the same time displaying differing behaviours at different densities. Examples include a study in Nigeria by Vermeer (1970), where a shortening of the fallow period among shifting cultivators at high population densities indicated that the instantaneous carrying capacity had been reached. In this study, some broad indications can be deduced related to sustainable carrying capacity. To the extent, for example, the ten – year minimum fallow period traditionally in use in the sparsely populated areas appears to be sustainable, whereas the two – year fallow in the densely populated areas results in visible environmental degradation.

The information provided by instantaneous carrying capacity estimates as discussed above, when coupled with information from other studies concerning changes in soils, yields and vegetation under different fallowing regimes, can lead to useful conclusions about sustainable population levels with appropriate assumptions about technology and consumption. However, this may occur if the technology of production is stagnant. If the swiddeners are adaptable to the technological mix, then there is all possibility that they will go for different type of land usage to enhance its carrying capacity without any visible impact on the environment. Therefore, it is essential to observe the dynamics of land use management, instead of observing shifting cultivation in isolation. Many studies, including the present one, have the avowed intention of producing sustainable carrying capacity estimates that would be more accurately categorised as instantaneous.

The basic definition of sustainable carrying capacity is patterned after Allan's (1949) pioneering work on estimating carrying capacity for shifting cultivators in Zambia. He defines carrying capacity as "the maximum numbers of persons that can be supported in perpetuity on an area, with a given technology and set of consumptive habits, without causing environmental degradation". Later many researchers tried to formulate carrying capacity. These formulae for calculating carrying capacity under systems of shifting cultivation can be reduced algebraically to a common form (Faechem, 1973). Faechem reduces the results

into an expression indicating that the ratio of what he terms “theoretical population” to the current population is equal to the ratio of the land available to the land in use.

The concepts of carrying capacity have been attacked by Brush (1975) and Hayden (1975). Brush considers that the principal empirical weakness of the concept of carrying capacity lies in the fact that the theory of homeostasis inherent to the concept is neither testable nor refutable. The “theory of homeostasis” here refers especially to a group’s equilibrium-maintaining behavioural adjustments, which have been ascribed by the investigators to the change in population density relative to the carrying capacity. The key issue here is the use made of carrying capacity estimates rather than the validity of the estimates per se. When carrying capacity is used as an explanatory tool for observed changes in cultural patterns and technological advancement, plausible mechanism must be identified by which the population’s approach or passing of carrying capacity feeds back to the culture, both on the level of short-term adjustments and on the level of long-term cultural evolutionary changes. Hayden (1975) believes that the practical problems involved in measuring and using ‘carrying capacity’ have proven the concept to be deficient in theory, unrealistic in implementation, and impossible to measure. He prefers calling the term as *resource over-exploitation rate,* rather than carrying capacity. This rate is seen as a function of three variables: 1) the potential resource use intensity, occurrence and frequencies; 2) the technological potential; and, 3) the population density. Hayden argues that the frequency, duration and severity of resource shortages will be key factors affecting the response of the population in question.

There may be odds against carrying capacity analysis. However, with the given data and forecasting possibility of land use and technological change, it gives the values necessary from a policy point of view. Looking at the actual and the carrying capacity figures one can emphasise the need for technological enhancement for the betterment of land use or provision of more and better off-farm employment to ease the pressure on land. The carrying capacities were calculated for all the five studied villages using Faechem’s formula (given below) and the results are given in Table 2.

$$W = a / (C\ L)$$

where;

W= carrying capacity = maximum theoretical population.
A= cultivable area of land (ha)
C= cultivation factor = number of garden areas required to complete a cycle of cultivation and regeneration = (fallow time + cultivation time)/ cultivation time
L= mean area presently cultivated per capita (ha/capita)

Source: Faechem, 1973 cited in Fearnside, 1986.

Table 2: Carrying Capacity, Actual Population and Population Growth of the Study Villages

Villages	A	C*L	W	Actual	~W & Actual	G
Brhamarjodi	420.84	2.36	178	135	43	0.02
Gandli	866.49	1.76	492	116	376	0.03
Badamasingh	358.28	0.76	472	149	323	0.07
Sakota	560.07	1.37	408	84	324	-0.04
Kalinga	234.41	1.97	119	77	42	-0.01

Notes: Actual = Actual population of each village in the year 2000.
G = growth rate of population from 1991 to 2000. 1991 data is collected from the census of India. The data for the year 2000 is collected by the researcher through primary survey.

The results given in Table 2 show that except for the two villages, Brhamarjodi and Kalinga, the actual population is much lower than the carrying capacity population. In this case, however, we assume that the land use will continue in the present form. Due to technological changes or through introduction of more intensive forms of land use, the present area of the village can hold even more population. However, sustainability of such changes may be questionable. In villages Sakota and Kalinga, the population has declined since 1991. Since, the population data has been collected at only two points of time such decline may not be considered as a trend. However, the present level of population in these two villages is crucial. Of the two however, the situation in Brhamarjodi is more of a matter of concern, as the village has adopted all possible ways of land use practice in all possible topography of the village area. This village has wet rice cultivation in the plains, home garden and fallow system in the moderately sloped land and swidden in the higher slopes. Therefore, further increase in population will have additional pressure on land and as a result, it will lead to a reduction in the shifting cycle, if off-farm employment opportunities do not come up or, out-migration does not occur. However, in case of Kalinga, the land use is largely primitive and, hence, there is a possibility of further intensification of land use in selective topography, which can withstand further pressure on the shifting cycle.

5. Employment Based Analysis (EBA)

An EBA evaluates economic activity on the basis of employment generated or population supported by each activity or development path, using a given amount of underlying resources (Taylor, 2001). Comparing swidden with modern logging, Dove (cited in Banerjee, 1995) concludes that not only are net returns higher in the former, shifting cultivation also supports more than three times as many people. For a developing economy, larger subsistence support would be an important criterion for choice of land use. Hence, the basic notion of EBA is to count the number of jobs that an economic activity provides or the number of people it supports over a given period of time. In other words, while quantifying

the level of employment, the objective of EBA is to provide numerical measures of *sustainable employment*[3].

Traditional shifting cultivation centres around a diverse production system on a rotational basis. Fields are usually used for a period of 2-3 years, then allowed to regrow into forests. It is said that, historically, the rotation period regarding the shifting cultivation system was 16-25 years, leading to sufficient sustainable productivity. However, it is claimed that, recent population increases combined with conversion of large areas for permanent cultivation as the primary factors for shortening of rotation period to 4-8 years, leading to decreased productivity, increased labour requirement and poor nutrition of the shifting cultivation dependent families. Population support (as opposed to jobs) as an unit of measurement can be arrived by considering average family size, number of families in a micro-unit (say a village or settlement), with the requirement of swidden land per year, rotational cycles (current or the ideal one whichever is appropriate), land requirement for other agricultural and non-agricultural purposes. Using the total cultivable area of the micro-unit, we can arrive at the number of people supported per unit area as we have shown in the previous section. Population support can be a precondition, but employment definitely addresses the equity issue more prominently.

Estimating the number of jobs a given activity or path will provide over a period (20 years, for example), explicitly incorporates sustainability by measuring the degrees to which the workers or families will have means of support into the foreseeable future. The degree to which 'having means of support' equates to *non-declining welfare* (required for sustainability by the definition employed here) is foremost dependent on the way 'a job' is defined. It is assumed that a job only counts if it does not involve a decline in the current acceptable standard of living. A similar point holds for population support. It is important to note that EBA purposefully gives no extra weight to jobs that may provide substantially more pay or welfare; this prevents the improvement of one subgroup from masking (in terms of accounting) declines in welfare in another.

If an activity provides high 'up-front' employment, but is based on unsustainable activities, that will decline within a foreseeable time. A time horizon in terms of EBA can be chosen for such activities, which will capture the trend, and the activity or path will look less attractive. The use of discounting is both problematic and unnecessary in the context of EBA. Technically, it might be possible to

[3] The main competing type of definition of sustainability centres on the maintenance of human and natural capital stock. Employment, which ensures income flow and consumption and in the process ensures standard of leaving of human capital stock, are important indicators of sustainability.

conceive of discounting job-years or population support to present values. For example, job gains in the future could be devalued to reflect the time preference of current economic agents in the same way as it is done with net income in CBA. But 'jobs' are not a store of purchasing power; they cannot practically be 'banked' upon or directly reinvested in and indirect reinvestment would seem to require serious methodological convolutions. It would serve little purpose to try to transfer jobs, say, from the current generation to future generations in the interest of sustainability. For an activity that targets a given group of population at a given location, discounting and/or transferring jobs over a time line or across generations is contrary to the general notion and purpose of sustainable development. Furthermore, the intergenerational equity that is inherent in sustainability is better captured without the use of discounting[4].

There are additional reasons beyond the need to incorporate sustainability into activity analysis for considering EBA as a complement, if not a substitute for CBA. Employment itself matters significantly in the development process and measuring employment as a part of activity evaluation in developing countries also can be seen as a means of addressing the equity issue. The desirability of employment in the context of developing countries may be due mainly to its redistributional impact. Redistribution via employment is less likely to be marred by corruption than direct subsidisation of income (Taylor, 2001). EBA is also consistent with ideas and propositions forwarded by some of the harsher critics of standard neoclassical development theory. Trainer (1990), for example, argues that the conventional approach to development that relies on market forces and growth maximisation has not only widened the inequality among the people, but has also been responsible for serious negative environmental impacts. Appropriate and ecologically sustainable development requires, amongst other things, a focus on local economic self-sufficiency and independence from global economic forces. The use of EBA does not guarantee such a focus, but the emphasis on employment over income is more consistent and it emphasises the equity aspect more than the simple income growth.

Externalities can pose a challenge for EBA. Externalities such as those related to environmental degradation tend to be thought of in terms of monetary cost/benefits. Local employment externalities (direct and indirect job losses and gains to people not directly involved in the project or activity under analysis) may require significant amount of information regarding long-term impacts. Even if the

[4] As without discounting we are giving equal preference to both present as well as future as against giving more emphasis to present. Therefore, the notion of sustainability is inherent and stronger in case of EBA. Employment or population support counts the same whether it is at the beginning or the end of the time period. The analysis of benefits is thus blind to which generation is receiving the benefits.

negative externalities such as environmental degradation is not initially in the form of jobs, but they will usually lead within the time period used in the EBA, to employment effects. However, by emphasising employment, equity and, most importantly, sustainability over the maximisation of monetary net benefits, EBA can be a part of the cultural shift inherent in the 'methodological pluralism', that is arguably necessary for ecological economics (Taylor, 2001).

Table 3: Employment Characteristics of the Villages

HH and Village Characteristics	Kalinga	Sakota	Badamasingh	Gandli	Brhamarjodi	Combined
No. of Households	17	21	32	26	17	113
Total population	77	84	149	116	135	561
Average Family size	4.53	4	4.66	4.46	7.94	4.96
Land under annual system (in acres)*	21.5	15.45	51.88	48.37	17.6	154.8
Land under annual Swidden (in acres)*	20.5	20	20.4	44.5	77	182.4
Shifting cycle	6	10	6	7	9	7
Per Household swidden land available*	1.21	0.95	0.64	1.71	4.53	1.61
Employment of total days from swidden land**	3688	2611	5243	3675	3583	18800
Employment per person**	47.90	31.08	35.19	31.68	26.54	33.51
Employment per family**	216.94	124.33	163.84	134.65	210.76	166.37
Employment per adult**	73.76	53.29	67.22	76.56	61.78	66.43
Employment per acre of swidden**	179.90	130.55	257.01	82.58	46.53	103.01
Employment per acre of swidden and fallow**	31.12	18.20	43.73	24.19	14.11	23.86

Note: * Area in acres; ** Employment in number of days per annum

From Table 3 we can identify the current number of days of employment in all feasible ways. It is obvious that a substantial part of employment comes from shifting cultivation. About four to seven months job is generated by shifting cultivation for each family, whereas it is about two months per adult[5] of a family. One interesting observation is that employment per acre of swidden land is less where diversified land use activities are taken (e.g., Brhamarjodi and Gandli).

[5] We have considered anybody within the age group of 15 to 50. This means we have excluded the old and young ones who also work in the field for activities like weeding and collections.

6. Consumption Based Analysis (CoBA)

A CoBA evaluates economic activity on the basis of consumption needs that can be generated from a given land use. Like employment, consumption based analysis provides information regarding how much self-sufficient the communities are in terms of what they produce. In other words, a CoBA can be a good indicator of sustainability, if the communities are able to feed themselves adequately without depending much on external sources. In fact, local availability of resources with least dependency on the outside world is one of the components of sustainability (Ramakrishnan, 1992). The CoBA takes into consideration the production and consumption at the local level. Once it is understood that markets are distorted in the region (specifically for product markets) consumption via market will lead to weaker bargaining power for the population depending on shifting cultivation and associated forms of agriculture. In such cases, CoBA directly provides information regarding the adequacy of food supply, which is not determined by price. In other words, the CoBA enervates the role of price in economic behaviour of decision-making. This assumption would, however, be more realistic in a situation where the dependency on the market is less and, hence, the degree of monetisation. However, market based analysis depends on a price making market structure, which largely ignores the factor that how the price is determined or who determines the price. In Jyotishi (2003) while discussing about market, we identified that various types of markets operate (specifically for product markets) in our study area. Among these, monopsony type of market is dominant and covers most of the commodities. Given such a situation, price is always determined by the monopsonist buyer. Such price is not at all competitive. Therefore, deciding land use activity, which depends largely on market (specifically where market is distorted and price fluctuation is erratic), would not be sustainable. CoBA provides the situation on consumption based on local production system, as well as via a price making market system. CoBA takes two components into account. First, if the degree of monetisation is unfavourable towards understanding an economic phenomenon through a market based study, then CoBA provides a better alternative and insightful information on a land use activity analysis. Second, it also takes care of the food security aspect of the local population, depending upon if the local production is sufficient to take care of the consumption or not.

Another important advantage of CoBA over the CBA is it gives emphasis to present generation over future generation in terms of sustainable food production and local availability of it. Therefore, CoBA emphasises on the present generation's food requirement and availability from the undergoing land use activities. If this generation's land use activities substantially do not take care of the food needs, then this may result in a shift in the activity, which may not take

care of ecological aspects. Secondly, the consumption based land use activities are always need based and, hence, do not enter into the activities which are inflated (or distorted) by the market mechanism. Here one thing is clear that market cannot always provide the sustainability of an activity, specifically, when it has not developed into a comprehensive form of exchange at a bargained rate. Implicitly, CoBA takes care of the future generation's needs to make use of the land use activity, provided that market develops into a comprehensive form and the technology ensures the sustainable use of the resource. Therefore, overemphasis on the options available for the future generation implicitly takes care of it without worsening the situation of the present generation. Yet more advantage of CoBA over the CBA is its emphasis on local specificities. The CBA on the one hand, generalises the benefit aspect and hence neglects the equity share of the benefit flows. On the other hand, looking into the consumption needs of the local community, CoBA takes care of the equity aspect to an extent.

Though markets exist in the study area, it has never taken a comprehensive form of exchange at a bargained rate[6]. In a substantive economy, like the one we are dealing with, often the production enters directly into the consumption stream. In the study area, the presence of market (though in distorted form) is not due to surplus generation. It is mostly because certain commodities, which are suitable for this type of topographic and climatic conditions, are produced in the region, which are never consumed by the local communities. These include spices likes ginger and turmeric, a few varieties of oilseeds like mustard and niger. However, the sustenance of a market based economic structure depends on the requirement of money, profitability, price stability, the nature of market and degree of monetisation.

Degree of monetisation among all the above-discussed features better explains the nature of the economy, albeit it is an under-explored area of economic explanation[7]. An economy may be designated as a *non-monetised economy* where the exchanges through a market form are absent or negligible. This implies that an economy where the producer produces the means of subsistence and raw material for most part, which she herself consumes. In other words, the dominant aim of production remains one of self-consumption with a minimum of commodity production. Alternatively, a *monetised economy* or credit economy is one where commodity production takes place through the presence of market

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6 For a comprehensive understanding of market system in a substantive economy where reciprocity, redistribution and exchange are three forms of markets; and exchange is further classified into set rates and bargained rate see Polanyi (1977). For the analysis of market situation in the study area see Jyotishi (2003).

7 This part of the discussion heavily relies on R S Rao's work on "A note on an Aspect of the Indian Economy" (1995).

(whatever may be the form of the market), suggesting thereby the exchange of goods and services, and the associated division of labour in production.

To characterise an economy as non-monetised sounds unscientific, as the classification is purely on the basis of a mode of exchange, while scientific classification is based on the mode of production. Non-monetised economy by its very nature belongs to a pre-capitalist period. However, the peculiarity of mode of exchange in the economy of swidden agricultural system identifies the correspondence between natural economy and pre-capitalism; at the same time, it shows the interface of capitalism through a peculiar form of exchange relation.

Monetisation is a conventional index of showing the extent of cash transactions made out of the total transactions of the economy, giving it as a ratio of one to the other. The agricultural sector specifically comprises of both the components of *non-monetised economy* and *monetised economy* whereas non-agricultural sector belongs to only monetised economy. The growth of monetised sector therefore should be (i) mere transactions between the non-agricultural sector and (ii) growing transactions between the non-agricultural sector and agricultural sector.

To understand the process of consumption and the interrelation between the local community and the wider society among the shifting cultivator communities we sought explanation from the field. The results found provide interesting explanation on the economic operation in general and the production-consumption relationship, in particular. Table 4 shows the agricultural production details of each study village. All the agricultural products are divided into four categories namely, cereals, pulses, oilseeds and others. The 'others' category includes products like ginger, turmeric, plantain, pineapple, jackfruits etc. Oilseeds and pulses to a large extent are produced for the market whereas, cereals are mostly used for self-consumption and 'others' are specifically for the market only. From the data given in Table 4 we find that, even with insufficient cereal production for sustenance, pulses and oilseeds etc., are produced that largely caters to the market. By this, the producer enters into a circular relation of exchange economy. However, one should bear in mind that a substantial part of the cereal need is satisfied by Public Distribution System (PDS), where people below poverty line get 10 kgs of rice for Rs. 2 and another 10 kgs of rice at Rs. 4 per month[8]. Therefore, a substantial part of cereal need is met through a subsidised scheme of the state, specifically for the villages like Gandli and Sakota.

[8] This price has been changed by the present government of Orissa in the year 2001. However, the data collected was in the year 2000 and therefore, we refer to that price only.

Table 4: Production Characteristics of the Villages

Villages	Cereal	Pulse	Oilseed	Others
Brhamarjodi	24772	4646	2201	--
Per household	1457.18	273.29	129.47	
Per person	183.50	34.42	16.30	
Gandli	7330	1544	1707	57950*
Per household	281.92	59.39	65.65	2228.85
Per person	63.19	13.31	14.72	499.57
Badamasingh	31255	388	--	4840
Per household	1008.23	12.52		156.13
Per person	209.77	2.60		32.48
Sakota	3364	182	290	3850*
Per household	186.89	10.11	16.11	213.89
Per person	40.05	2.17	3.45	45.83
Kalinga	9335	948	--	--
Per household	549.12	55.76		
Per person	121.23	12.21		

Note: All the figures are in Kg. except the * marked ones. * Figures are in Rupees.

Production of cereals (largely produced for self-consumption) in two villages namely Gandli and Sakota is very less. This implies that they depend on other means for their sustenance. However, both the villages have other means of marketable products to compensate for their consumption requirements. In case of Gandli, they produce horticultural products like jackfruit, pineapple and plantains and spices like ginger and turmeric, whereas in Sakota their dependency on firewood collection for selling in the local market compensates their subsistence needs (figures of amount of firewood collection has not been entered in the Table 4). Though, cereal production in Kalinga is better than the above mentioned two villages but the absence of any compensatory marketable product puts them in a vulnerable situation. In such cases, they depend largely on off-farm activities like construction and road building work as and when available. However, due to the presence of diversified agricultural practice in both Brhamarjodi and Badamasingh the production level is matched with the requirements.

When we observe the consumption dependency on market from Table 5, we find that the degree of monetisation for consumption needs is very low. A few factors explain such a low degree of monetisation. First, this degree of monetisation is carried out for consumption only. Therefore, it does not explain the extent of relationship with the market through other processes. Since the food habit of these communities is such that dependency on market becomes almost insignificant except for a few items like grocery needs[9] and dry fish. Second, a substantial part of food requirement is fulfilled by the PDS at a subsidised price.

[9] Since, the food habit among these communities does not require much oil or spices, therefore, grocery items form an insignificant part of total consumption requirements.

And thirdly, a good number of items like varieties of roots, fruits and various other forest products are not considered for calculating the consumption requirements. Therefore, monetisation for consumption requirement is often due to shortfall in production of food items. This is also obvious from Table 5, where we find that for the village Brhamarjodi the degree of monetisation is very low as compared to other villages. Since the land utilisation pattern in this village is nearly optimal and most of the households produce sufficiently for their food requirement, the dependence on market for consumption needs is less as compared to other villages. One observation that can be strongly made from these results is that, the economy among the shifting cultivation communities has not entered into the fold of commodification of products and, hence, the resultant changes in the division of labour and specialisation in producing certain commodities. Rather, the economy is more substantive in nature where they produce whatever is feasible ecologically, and to their needs.

Table 5: Consumption Characteristics of the Villages

(in Rupees)

Villages	Consumption Expenditure	Monetised Expenditure	Degree of Monetisation (in percentage)
Brhamarjodi	469791.5	69084.5	14.7
Per Household	26734.8	4063.8	
Per Person	3479.9	511.7	
Gandli	311071.25	81895	26.3
Per Household	11964.3	3149.8	
Per Person	2681.6	706	
Badamasingh	431521.5	128955	29.88
Per Household	13485	4029.8	
Per Person	2896.1	865.5	
Sakota	269278.75	70175	26.06
Per Household	12822.8	3341.7	
Per Person	3205.7	835.4	
Kalinga	209418.75	60215	28.75
Per Household	12318.8	3542.1	
Per Person	2719.7	782	

To seek further explanation on the aspect of factors influencing the monetised expenditure in these swidden economies, we ran a simple linear regression considering family size, total yearly consumption and total land holding as independent variables. The results obtained give interesting explanations. Descriptive statistics of each variable is given in the Table 6 and the regression results are given in Table 7.

Table 6: Descriptive Statistics of the Variables Used in the Model

Variables	Mean	Standard Deviation
Monetised expenditure (in Rs.)	3631.19	1709.71
Family size	4.96	3.04
Total consumption (in Rs.)	14965.32	10932.23
Size of holding (in acres)	8.89	6.55

Notes: Number of Observations = 113
Monetised expenditure: Consumption expenditure processed through money economy

Table 7: Factors Determining Monetised Expenditure on Consumption

	Unstandardised Coefficients		Standardized Coefficients	t- values
	β	Standard Error of β		
Constant	1714.7	164.78		10.41*
Family size	233.61	79.78	0.416	2.93*
Total consumption (in Rs.)	0.09	0.02	0.60	4.13*
Size of holding (in acres)	-72.02	14.37	- 0.28	-5.01*

Note: Dependent Variable: Monetised expenditure per annum;
Adjusted R^2 = 0.765; * = significant at 1 percent level

The model has adjusted R^2 value of 0.77, and family size and total consumption have positive β coefficient significant at one-percent level. The size of holding negatively influences the monetised expenditure. This implies that as the size of holding increases, monetised expenditure for consumption declines. This is obvious as with the increase in land size production of food items increases, which in turn leads to less dependency on the market. This also implies that economies dependent on swidden agricultural system have a greater tendency towards the non-monetised economy. In other words, this shows, the predominance of the pre-capitalist nature of economy over the monetised economy. However, an increase in the total consumption leads to a higher consumption in monetary units. Since total consumption includes non-food items, an increase in total consumption largely leads to consumption of non-food items, leading to more consumption in monetary units. Besides, family size also plays a significant role in the process of monetisation. Larger the family size, higher is the consumption demands and, therefore, there is higher dependency on market for consumption needs.

Availability and utilisation of resources at the local level are another important factors to determine the livelihood sustainability in an economic system. Therefore, the CoBA explains that swidden agricultural systems would be able to carry the present production pattern to the extent land and labour availability do not pose any constraint. Another important point that emerges from the above analysis is that any changes towards a market based (monetised) economic

system will be unsustainable, if the institutions, both external to the production system (i.e. market and easy availability of inputs) as well as internal to the system (tendency and attitudes towards a money economy), are not corrected. Therefore, any policy towards changing the agricultural system among swiddeners requires a change in the institutional structures, which can enhance the money requirements for commodity production.

7. Summary and Conclusion

Use of three different criteria of measuring sustainability, gives a clearer view on sustainability issues in each of the five villages under study. Whereas the land based (carrying capacity) analysis shows that Kalinga and Brhamarjodi are at the threshold of optimum possible land utilisation, the EBA indicates that employment generation is shrinking in case of Brhamarjodi in spite of diversified land use activities. CoBA, on the other hand, not only clarifies the self-sufficiency question in production and consumption but also gives the nature and direction of the economies concerned. Gandli and Sakota are two villages where cereal production is low but in Kalinga the situation seems vulnerable due to lack of compensatory income generation activities. Degree of monetisation further tells about the nature of the economies. The low degree of monetisation in all the five villages implies the dominance of pre-capitalist mode of production. However, the interesting result found is that the degree of monetisation declines with the increasing size of the holding. In other words, the economy does not only have low degree of monetisation, it has a tendency towards pre-capitalist mode of production with increasing land use activities.

Considering these results in the backdrop of technological changes undergone, the size and growth of population and nature of economy (degree of monetisation) we can broadly conclude that, different policy thrusts are required for each village. In Kalinga, development of land (specifically the land where fallow system is followed) can increase their productivity in a sustainable manner. Besides, off-farm activities in Gandli and Brhamarjodi will allow the people to continue their land activities in the present form for a longer time period. The same is true for Kalinga. From overall sustainability point of view Kalinga looks more vulnerable, whereas Gandli and Brhamarjodi would fall into this stage if proper institutional reforms were not undertaken. Badamasingh and Sakota are presently in a more sustainable form and will continue to be so. But in the case of Badamasingh, technological changes have taken place in terms of land use activities, Sakota still remains primitive. Broadly, if market distortions are removed with adequate institutional reforms, all the villages will be better off and the ensuing development in true sense can be considered sustainable.

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