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Efficiency of Market Behaviour of NTFPs for Households under JFMP: A Case Study in West Bengal

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I

INTRODUCTION

Sustainable community participation in joint forest management programme (JFMP) is possible only if the survival needs of the poor forest-dependent communities have been met beforehand (Mukherjee, 1995). Until and unless the survival needs are met for the poor forest fringe communities participating in the JFMP, participation for forest resource management by these communities would always remain threatened. There are evidences that the only share of timber product (usually one-fourth of the total) to poor forest-dependent communities after every five year-period threatened the existence of forest resources.[1] Forest-dependent communities require continuous and annual flow of forest products for their survival. The rich experience of JFMP in various states of our country suggests that not only the share of timber products to poor forest communities but also the benefit of non-timber forest products (NTFPs) to them are required for the success of this programme (Mukherjee, 2002; Sarker and Das, 2004; Correa, 1999; Naik, 1997). With JFMP, there is a clear tendency to increase the marketing potential of NTFPs and add value to these (Correa, 1999: p.231). This paper, thus, attempts to examine empirically the extent of marketing efficiency and economic efficiency of NTFPs in different markets based on empirical study on some households under joint forest management programme (JFMP) and on some market middlemen related to the business of those NTFPs under Bankura district in the state of West Bengal.

The crucial importance of sustainable forest management was emphasised by the adhoc intergovernmental Panel on Forest at the fourth session of the Eleventh World Forestry Congress held in October 13-22, 1997 (Chandrasekharan, 1998; Mallik, 2000). Such observation does contribute to an emerging consensus on the feasibility of increasing NTFP yields that need to be sustained effectively through participatory

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forest management. In keeping with these objectives, the Joint Forest Management circular in India, issued in 1990, in pursuance of the National Forest Policy, was to set a new policy on 'involvement of village communities and village assemblies in the regeneration of degraded forest land' (Upadhyay, 2003: p.939). It recognised the need to fulfill the requirements of food, fodder, fuel wood, minor forest produce and small timber of rural and tribal people, and emphasised the need to create massive people's movement for protection and development of forest. Although some researchers (e.g., Agarwal, 1986) have questioned the belief that foraging and fuel wood collection by the rural poor is primarily responsible for their shortages, the findings of these studies are ignored by development practitioners (Correa, 1999: p.229). It has been proved that community-based forest protection activities resulted in the rapid regeneration of degraded natural forests and confirmed the best prospects for sustainable forestry (Mathbor and Rodgers, 2002: pp.345-348; World Bank, 2005: pp.223-225). The empirical study suggests that the relative importance of NTFPs in forest-based economies is supreme because in order to maintain their regular consumption needs of the local FPC (forest protection committee)-households, non-timber forest product is the main source of their money income (Sarker and Das, 2004: p.180). The study of Naik (1997) also suggests that if some factors like market development and share of the local people of the forest produces are controllable, it might enhance the chances of success of JFM. Efficient marketing system of NTFPs might increase the income of the collectors of NTFPs by lowering the profit margin of market middlemen and thus helps contribute to better economic condition of the collectors of NTFPs who depend on these forest products for their main source of earning. But there is hardly any empirical study regarding the extent of efficiency of market behaviour of NTFPs based, only, on those households who are the collectors of NTFPs under JFMP. This paper attempts to highlight these issues based on a field survey on Bankura district in the state of West Bengal. The paper is organised as follows: Section II presents survey design and methodology used for this study, Section III covers the findings of the study; and the final section presents the conclusions in the light of our empirical exercise.

II

SURVEY DESIGN AND METHODOLOGY

The data for this study have been collected through an intensive field enquiry covering all the members from three sample female FPCs and three joint FPCs under Bankura district of West Bengal. We have taken all samples under our study from all forest divisions – Bankura North, Bankura South and Panchayat Soil Conservation – under Bankura district, because almost all female FPCs exist in this district only. For the selection of female FPCs, random sampling technique (SRSWOR) is used. First, we have taken three sample female FPCs, taking one from each division of the district with the method of SRSWOR. Second, we have taken all members of each

sample female FPC for our study. The number of members of each female FPC has been collected from the records of the respective FPC. However, the total number of members from three sample female FPCs is 120 in number – Brindabanpur (56), Aguya (23), and Malibona (41). To make a comparative study of FPC members between female FPCs and joint FPCs, we take three joint FPCs along with three sample female FPCs for our study. First, each joint FPC has been selected based on the criterion of close proximity (nearest distance in km.) to each sample female FPC. Second, all members of joint FPCs have been selected for our final survey. The total number of members from three joint FPCs works out to 182 in number – Katul-2 (93), Balboni (44), and Baragari (45). However, the total number of members selected for our field study combining two types of FPCs together is 302. It is important to mention that each FPC under our study was formed in the respective village; so FPC/village is synonymous in this study. Although data were collected from both female FPC and joint FPC households, this paper attempts to study the market behaviour of all the households combinedly, irrespective of female FPC and joint FPC households. In addition to 302 FPC members, 87 market middlemen have been purposively selected based, primarily, on the report of FPC members who sell their collection of NTFPs to various types of marketing agents in different markets under our study. Data were collected from 302 FPC members and 87 market middlemen through the scheduled questionnaire.

In order to explain the relative importance of different market middlemen, the variation in prices between different market middlemen, marketing margin and trader's profit, simple proportions, averages, etc., are used. The extent of economic efficiency is measured by the maximum likelihood (ML) estimates of Cobb-Douglas stochastic frontier model; the test for stationary and cointegration are used to examine the spatial price behaviour in two markets under our sample.

Economic efficiency is measured by comparing output and input values. With quantities only technical efficiency can be calculated, while with quantities and prices economic efficiency can be calculated (Lovell, 1993: p.6). Defining and measuring economic efficiency requires the specification of an economic objective and information of market prices (Lovell, 1993: p.14). In order to measure economic efficiency the revenue maximisation problem is solved separately for each household under our study. The constrained maximisation problem of a household who desires to maximize total revenue is subjected to the constraints imposed by fixed inputs supplies in physical terms (Handerson and Quandt, 1980: p.95). But as the units of measurement for both physical inputs and physical outputs of all commodities under our study are not the same (e.g., kg., bundle, number), we use those physical units of inputs in monetary terms for measuring economic efficiency of NTFPs related to sample households under our study. We measure economic efficiency of NTFPs following Aigner *et al.* (1977) and Meeusen and Broeck (1977) under the stochastic frontier production function, which is popularly known as 'composite error' model with cross-sectional data. In order to measure economic efficiency of NTFPs based

on the study of households (collectors of NTFPs) in connection with the marketing transaction of different market middlemen and with the consumers' price of NTFPs in different markets, we consider one independent variable mainly because, basically, there was no production cost of NTFPs for collectors' households under our study. Although for collecting NTFPs from the forest by their collectors, a part of cost component was labour charge, which is more or less the same per unit of collection for collectors' households, all types of cost component were included within the marketing cost. A stochastic frontier model can be written as

$$Y_i = \beta_0 X_i^{\beta_1} e^{(v_i - u_i)}$$

taking logarithm

$$\text{In } Y_i = \text{In } \beta_o + \beta_1 \text{ In } X_i + (v_i - u_i)$$

Y_i = total revenue (in Rs.); X_i = total cost (in Rs.); V_i = a symmetrical random variable and i.i.d.N $(0, \sigma_v^2)$; and U_i = non-negative, one-sided random variable and i.i.d. with a half-normal distribution $[U_i \% |N(0, \sigma_u^2)|]$

Here a producer faces own stochastic frontier $f(X_i, \beta) \exp(V_i)$; a deterministic part $f(X_i, \beta)$ common to all producers and a producer-specific part exp (V_i). Thus, economic efficiency is given by

$$EE_i = \frac{\beta_0 X_i^{\beta_1} e^{(v_i - u_i)}}{\beta_0 X_i^{\beta_1} e^{v_i}} = e^{-u_i} \quad ; \; 0 < EE_i \leq 1$$

We also examine the test of market integration for sal-leaves only based on time-series data of this product, because reliable data of prices[2] for sal-leaves were available for fourteen years (1993-2006) from two markets Bishnupur and Pirorgari. It is worth mentioning that all the markets except Bishnupur and Pirorgari have been established very recently – two or three years ago. Before establishing the market in other areas, market middlemen of Bishnupur and Pirorgari purchased NTFPs from their local agents most of whom do not execute their business at present. However, an attempt has been made to find out whether the market prices of NTFPs are integrated that might indicate a long run stable relationship among the price series that are integrated of the same order of integration. To test the order of integration of a time series an appropriate test have been developed by Dickey and Fuller (1979). Cointegration between two non-stationary time series is a necessary condition for the market efficiency (Fortenbery and Zapata, 1993 cited in Naik and Jain, 2001: p.186). In order to investigate the existence of any cointegration relationship between price series, we employ the *bound testing procedure* within an auto-regressive distributed lag (ARDL) modeling approach developed by Pesaran and Shin (1999). The bound test has an important advantage over the residual-based methods of cointegration

such as the Engle and Granger (1987) method as well as other popular alternatives, such as, the Johanson (1988) method as the former has better small sample properties. A recent study (Narayan and Smyth, 2003) also suggests that the estimates using either the Engle and Granger (1987) or the Johanson (1988) methods of co-integration are not robust for small sample size such as those employed in the present study (price series of two markets for fourteen years only). We use Microfit 4.0 to perform our computations.

III

FINDINGS OF THE STUDY

At the very outset, we examine some characteristics of our sample FPCs (Table 1). First, almost all members of FPCs – both female and joint – belong to either scheduled caste (SC) or scheduled tribe (ST). They belong to lower social class in rural Indian society. Second, the natural forests in this area are basically sal (*shorea robusta*) forests. The maturity period of sal in this area is usually a period of 10 years. In the case of planting forest the main species planted in the forest is also sal. Third, more than 70 per cent households in each sample FPC live below poverty line.[3] Fourth, the share of FPC from timber income is 25 per cent, which is usually paid to FPC members usually after five years by the forest department, but the forest department does not take any share from NTFPs. Finally, a little less than 50 per cent of the total money income (in Rs.) of households below poverty line in all FPCs except one (Baragari) is yielded from non-timber forest products. NTFP is the main source of forest income for considerable majority of households below poverty line in every FPC except Baragari. It is important to mention that sal-leaves is the main non-timber product of this area because sal leaves are more available in quantity in relation to other NTFPs and the major part of households' NTFPs income is earned from it. Sal-leaves is the regular source of income as it yields money income to its collectors for about ten months in a year. Similarly, fuel wood is also a regular source of money income of its collectors since it begets income for the whole year to its collectors. Sal-leaves in this locality are used for two purposes: (a) plain sal-leaves is used mainly for packing of goods and distribution of sweet in sweetshops. On an average ten single sal leaves are stitched to make a complete sal-leaves in round form and then it is usually sold in the market; b) sal-leaves' *plate* produced by sal-leaves with the help of processing machine is used as plate. It has a high demand within and outside West Bengal. It is regularly exported to other states in India mainly by market wholesalers who purchase sal plate directly from the marketing agents other than collectors and export it outside West Bengal.

TABLE 1. SOME BASIC CHARACTERISTICS OF SAMPLE FPCS UNDER BANKURA DISTRICT IN WEST BENGAL

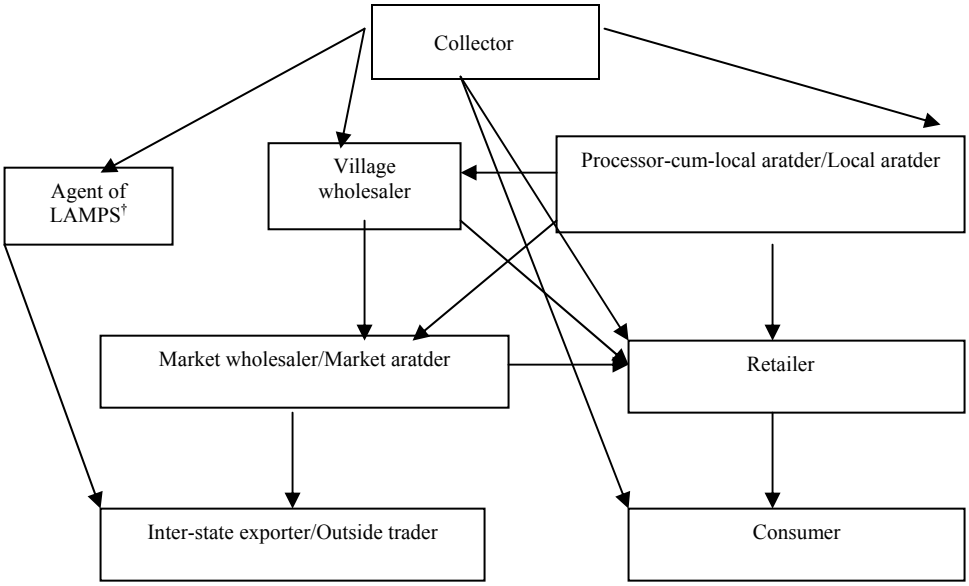
Division	Name of FPC and year of formation	Area under forest (ha.)	No. of members	Per cent of NTFPs' income out of total income for households under BPL	SC member {ST member}	Distance from forest (km.)	Type of forest	Share of NTFPs to FPC member* (per cent)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Bankura	Aguya	13.75	23	47.15	21	0.75	Planting	100
North	Mohila 1993		<100>	(54.85)	[0]			
	Balboni 1993	70	44	44.78	44	1.00	Planting	100
			<100>	(51.16)	[0]			
Bankura	Malibona	70	41	47.20	4	0.20	Natural	100
South	Mohila 1996		<95.12>	(53.45)	[37]			
	Baragari	70	45	17.48	1	0.10	Natural	100
	1996		<77.78>	(24.66)	[4]			
Panchet	Brindabanpur	56	56	45.99	56	0.50	Natural	100
Soil	Mohila 1991		<80.36>	(56.69)	[0]			
conservation	Katul-2	180	93	44.89	93	0.20	Natural	100
	1990		<84.95>	(54.21)	[0]			

Notes: Figures within < >, ( ) and [ ] represent percentage of households living below poverty line (BPL), percentage of NTFPs' income out of total forest income, ST members and female members respectively.

*Share of timber forest products for FPC members in every FPC is 25 per cent of government's timber income.

The prevalent marketing channels under our sample are portrayed in Figure1. It shows that there are twelve marketing channels in the area we surveyed. This study concentrates on those marketing agents who are directly related to sample collectors' households for their marketing transactions, mainly, on five important local markets – Joypur, Pirorgari, Bishnupur, Baliatore and Boletala – under our study. Apart from this, this paper also attempts to study the last marketing channel (Channel 12) which is related to marketing transactions of some selected NTFPs (like kendu leaves and sal seeds) that are not transacted in the local markets under our study; rather, the business of these products is controlled by some particular persons [agents of Large Adivasi Multipurpose Society (LAMPS)] in some particular place within each FPC selected by LAMPS which is only empowered by the state forest department for their market transactions, purchasing those selected NTFPs from their collectors.[4] Among all types of marketed NTFPs offered for sale by the collectors under our study, two types of NTFPs (kendu leaves and sal seeds) are under the control of LAMPS; kendu leaves is the most valuable NTFP per unit (in Rs.) in our study area. But whatever amount of kendu leaves the collectors desire to sell in the market, they are obliged to sell it legally to the agents of LAMPS, who usually pay considerably low price for the products they purchase from their collectors in relation to its market price. Table 2 shows that the net profit per kg of kendu leaves for the agents of LAMPS is about hundred per cent of the collector's price. Similarly, net profit per kg of sal seeds is more than hundred per cent of the collector's price. This situation is more or less similar with Jharkhand state, very close to West Bengal state. In Jharkhand, Jharkhand State Forest Development Corporation (JSFDC), licensed traders operating

on behalf of the state, controls kendu leaves marketing in the state, where villagers are little more than collectors operating as pure price takers in a monopsony market, with no bargaining position and no incentives to improve quality above minimum standards (World Bank, 2006: p.46).



Marketing Channels

1) Collector → Processor-cum-aratder/local aratder → Village wholesaler → Retailer → Consumer;
2) Collector → Processor-cum-aratder/local aratder → Village wholesaler → Market wholesaler → Retailer → Consumer;
3) Collector → Processor-cum-aratder/local aratder → Village wholesaler → Market wholesaler → Outside trader;
4) Collector → Processor-cum-aratder/local aratder → Retailer → Consumer;
5) Collector → Processor-cum-aratder/local aratder → Market wholesaler/Market aratder → Retailer → Consumer;
6) Collector → Processor-cum-aratder/local aratder → Market wholesaler → Outside trader;
7) Collector → Village wholesaler → Retailer → Consumer;
8) Collector → Village wholesaler → Market wholesaler → Retailer → Consumer;
9) Collector → Village wholesaler → Market wholesaler → Outside trader;
10) Collector → Retailer → Consumer;
11) Collector → Consumer;
12) Collector → Agent of LAMPS → Outside trader.

† LAMPS: Large Adivasi Multipurpose Society.

Figure 1. Marketing Channels (Twelve Types)

TABLE 2. VARIATION IN PRICE OF SOME VALUABLE NTFPS THE COLLECTORS' SELL TO THE AGENTS OF LAMPS

(*Rs. per kg*)

	Mid-Value And Range*			
Name of NTFPs	Collectors' price	Processing, transport and other costs	Market price	Profit⊙
(1)	(2)	(3)	(4)	(5)
Kendu leaves	20±5	13±4	52±4.50	19±4.50
Sal seeds	0.75±0.50	1.50±0.70	4.00±0.60	1.75±0.60

*The method is suggested by Rudra (1992: 63).

⊙Column 5 = [4 – (2 + 3)].

Based on the market study of five important local markets in the area we surveyed, we first examine the relative importance of marketing agents on different NTFPs that are offered for sale by their collectors under our study. As may be seen in Table 3A, the prevalent marketing agents of sal-leaves consists of the following three: processor-cum-local aratder/local aratder, village wholesaler and retailer. Indeed, the village wholesaler serves as the most important marketing agent for majority of the collectors' households, followed by processor-cum-local aratder, whereas the role of retailer seems to be less important compared with other marketing agents. It is important to mention that the processor-cum-local aratder purchases sal-leaves from the collectors to prepare sal-leaves plate with the help of processing machine, and fuel wood is almost collected by female members of our sample households in different FPCs under our study. Table 3B indicates that in the case of other non-timber products (fuel wood and mushroom) village wholesaler also serves as the most important marketing agent for majority of our sample collectors' households, which usually sell their NTFPs in excess of their own consumption. The market study, however, suggest that village wholesaler acts as the most important marketing agent for majority of the sample collectors' households for all types of marketed NTFPs.

TABLE 3A. PROPORTION OF FPC HOUSEHOLDS WHERE DIFFERENT MARKETING AGENTS OCCUR WITH DIFFERENT DEGREES OF IMPORTANCE FOR THE SELLERS' CATEGORY RELATING TO SAL-LEAVES

Marketing agent	No. of households (n= 302)	Percentage of households where agent serves			
		Most important	Second most important	Less important	Total
(1)	(2)	(3)	(4)	(5)	(6)
Processor-cum-local aratder	93	58.50	15.00	5.00	79.00
Village wholesaler	170	65.20	14.30	10.50	90.00
Retailer	39	25.70	56.00	10.10	91.80

TABLE 3B. PROPORTION OF FPC HOUSEHOLDS WHERE DIFFERENT MARKETING AGENTS OCCUR WITH DIFFERENT DEGREES OF IMPORTANCE FOR THE SELLERS' CATEGORY RELATING TO FUEL WOOD AND MUSHROOM

Marketing agent	No. of households (n= 302)	Percentage of households where agent serves			Total
		Most important	Second most important	Less important	
(1)	(2)	(3)	(4)	(5)	(6)
Processor-cum-local aratder	105	63.55	-	-	63.55
Village wholesaler	148	86.20	-	-	86.20
Retailer	49	44.89	20.41	-	65.30

The phenomenon whether prices vary across different markets and over different marketing agents (or market middlemen) in a way which is different from uniformity during lean and peak seasons of the year surveyed by the authors are given in Tables 4A and 4B. Following Rudra (1992), we calculated price opread over different markets and over different marketing agents in our study. An analysis of Table 4A shows that the range of price variation under different markets and within the same period is far from uniformity in any particular marketing agent and inter-marketing agents for fuel wood and mushroom. Table 4B shows that the inter-market (and intra market) price variation for sal-leaves is not so far from uniformity in any particular marketing agent and inter-marketing agents for the same period except Priorgari market, where prices are very low compared with other markets. Although the price structure of sal-leaves in Pirorgari market is very low compared to other markets, the range of price variation in all seasons paid by different market middlemen is not so far from uniformity. Further, the village wholesalers are paying higher prices to their sellers, followed by processor-cum-local aratder and retailer respectively. These results, thus, do not bear upon the uniformity of prices for all NTFPs except sal-leaves. For sal-leaves, in the major income gathering (in Rs.) non-timber product of forest communities under our sample, there exist some uniformity of prices in most of the markets for the same period.

TABLE 4A. INTER(INTRA) MARKET, INTER(INTRA) MARKETING AGENTS' VARIATION IN PEAK SEASON AND LEAN SEASON PRICES OF FUELWOOD AND MUSHROOM OFFERED FOR SAMPLE COLLECTORS' HOUSEHOLDS DURING 2006

(*Rs. per kg.*)
Mid-value and range

Local market	Fuelwood				Mushroom			
	Peak season price offered by		Lean season price offered by		Peak season price offered by		Lean season price offered by	
	Retailer	Village wholesaler	Retailer	Village wholesaler	Retailer	Village wholesaler	Retailer	Village wholesaler
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Joypur	1.35±0.50	1.40±0.50	1.70±0.50	1.90±0.10	50±12	60±10	80±15	90±20
Pirorgari	1.30±0.40	1.35±0.25	1.70±0.75	1.85±1.00	45±10	50±08	60±10	75±10
Bishnupur	1.50±0.50	1.60±0.25	2.00±1.00	2.25±0.75	65±15	70±10	85±17	90±18
Baliatore	1.40±0.25	1.50±0.40	1.75±0.50	2.00±0.50	40±18	50±12	60±12	70±14
Boletala	-	1.50±0.75	-	2.00±0.10	-	35±15	-	60±20

TABLE 4B. INTER(INTRA) MARKET, INTER(INTRA) MARKETING AGENTS' VARIATION IN PEAK SEASON AND LEAN SEASON PRICES OF SAL-LEAVES OFFERED FOR SAMPLE COLLECTORS' HOUSEHOLDS DURING 2006

Rs. per bundle (100 pieces)
Mid-value and range

Local market	Peak season price offered by			Lean season price offered by		
	Retailer	Village wholesaler	Processor cum local aratder	Retailer	Village wholesaler	Processor cum local aratder
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Joypur	7.50±0.50	8.00±1.00	7.75±0.50	8.50±1.00	9.00±1.00	8.50±0.50
Pirorgari	4.50±0.50	4.75±0.50	4.75±0.25	4.50±0.50	4.75±0.50	4.75±0.75
Bishnupur	7.00±1.00	7.25±0.50	7.00±0.25	8.00±0.50	8.50±0.50	8.00±0.25
Baliatore	6.85±0.50	7.00±0.50	7.00±0.50	7.75±1.00	8.25±0.75	8.00±1.00
Boletala	7.00±0.50	7.50±0.75	7.50±0.75	8.50±1.00	8.75±1.00	8.50±1.00

We now examine the average price spread and marketing margin of NTFPs for one marketing channel relating to each product in order to look into the extent of marketing margin of different market middlemen, relative importance of cost components of marketing, producers'/collectors' share in consumers' price and the index of marketing efficiency based on the market study of five important local markets in the area we surveyed. The average price spread and marketing margin of *plain* sal-leaves of marketing Channel-10 and of sal-leaves *plate* of marketing Channel-1 are shown in Tables 5A and 5B respectively. Similarly, the average price spread and marketing margin of fuel wood and mushroom of Channel-4 are portrayed

TABLE 5A. AVERAGE PRICE SPREAD AND AVERAGE MARKETING MARGIN OF *SAL-LEAVES* IN CHANNEL-10

(Rs. per bundle)

Marketing costs and Marketing margin	Joypur	Pirorgari	Bishnupur	Baliatore	Boletala
(1)	(2)	(2)	(3)	(4)	(5)
1) Collector's (Producer's) level					
a) Cost of production (labour charge)	1.80	1.55	1.75	1.65	1.75
b) Profits	4.02	1.48	3.78	3.53	3.85
c) Price received	5.82	3.03	5.53	5.18	5.60
2) Retailer's level					
a) Cost of marketing	1.12	0.90	1.11	1.17	1.16
i) Packaging	0.33	0.24	0.30	0.33	0.32
ii) Labour	0.39	0.40	0.42	0.48	0.46
iii) Transports	0.20	0.12	0.18	0.19	0.21
iv) Storage & maintenance	0.11	0.06	0.14	0.10	0.10
v) Marketing tax & other	0.09	0.08	0.07	0.07	0.07
b) Profits	1.56	1.07	1.11	1.25	1.39
c) Price received	8.50	5.00	7.75	7.60	8.15
3) Price paid by consumer	8.50	5.00	7.75	7.60	8.15
4) Marketing + Production costs	2.92	2.45	2.86	2.82	2.91
5) Marketing margin	1.56	1.07	1.11	1.25	1.39
6) Price spread*	2.68	1.97	2.22	2.42	2.55

* Price spread is the difference between price paid by consumer minus price received by collector.

TABLE 5B. AVERAGE PRICE SPREAD AND AVERAGE MARKETING MARGIN OF SAL-LEAVES PLATE IN CHANNEL - 1

(Rs. per bundle)

Marketing costs and Marketing margin (1)	Joypur (2)	Pirorgari (3)	Bishnupur (4)	Baliatore (5)	Boletala (6)
1) Collector's (Producer's) level					
(a) Cost of production (labour charge)	1.80	1.55	1.75	1.65	1.75
(b) Profits	4.02	1.48	3.78	3.53	3.85
(c) Price received	5.82	3.03	5.53	5.18	5.60
2) Producer-cum-local aratder's level					
a) Cost of marketing	4.22	4.16	4.72	4.45	5.00
(i) Packaging and processing	1.78	2.08	2.52	2.09	2.63
(ii) Labour	0.91	0.78	0.88	0.82	0.86
(iii) Transports	0.74	0.62	0.67	0.73	0.76
(iv) Storage and maintenance	0.66	0.55	0.53	0.68	0.61
(v) Marketing tax and other	0.13	0.13	0.12	0.13	0.14
b) Profits	3.96	2.99	3.20	2.86	3.23
c) Price received	14.00	10.18	13.45	12.49	13.83
3) Village wholesaler's level					
a) Cost of marketing	3.01	2.44	2.62	2.73	2.90
(i) Packaging	0.85	0.60	0.73	0.74	0.77
(ii) Labour	0.89	0.64	0.69	0.75	0.79
(iii) Transports	0.77	0.60	0.65	0.67	0.72
(iv) Storage and maintenance	0.58	0.57	0.53	0.55	0.61
(v) Marketing tax and other	0.02	0.03	0.02	0.02	0.01
(b) Profits	3.65	2.95	3.02	2.60	3.05
(c) Price received	20.66	15.57	19.09	17.82	19.78
4) Retailer's level					
(a) Cost of marketing	2.65	2.32	2.45	2.61	2.82
(i) Packaging	0.74	0.61	0.60	0.70	0.71
(ii) Labour	0.79	0.63	0.63	0.71	0.74
(iii) Transports	0.68	0.57	0.60	0.64	0.70
(iv) Storage and maintenance	0.53	0.49	0.60	0.53	0.66
(v) Marketing tax and other	0.01	0.02	0.02	0.03	0.01
(b) Profits	4.19	3.11	3.46	3.07	3.90
(c) Price received	27.50	21.00	25.00	23.50	26.50
5) Price paid by consumer	27.50	21.00	25.00	23.50	26.50
6) Marketing + Production costs	11.98	10.77	11.69	11.54	12.62
7) Marketing margin	11.80	9.05	9.68	8.53	10.18
8) Price spread	21.68	17.97	19.47	18.32	20.90

in Tables 5C and 5D respectively. More importantly, while selecting the marketing channel of each NTFP related to sample collectors' households, we consider those types of marketing agents who have higher marketing transactions (both real and monetary terms) with the non-timber collectors' households under our study. As regards different components of marketing costs of all NTFPs in our study, the labour cost is the most important marketing cost among all cost components, followed by packaging cost and transport cost. Further, among the market middlemen the highest percentage of profit is appropriated by retailer followed by processor cum local aratdar (local aratdar) and village wholesaler respectively.

TABLE 5C. AVERAGE PRICE SPREAD AND AVERAGE MARKETING MARGIN OF FUEL WOOD IN CHANNEL - 4

(Rs. per bundle[15 kg])

Marketing costs and marketing margin (1)	Joypur (2)	Pirorgari (3)	Bishnupur (4)	Baliatore (5)	Boletala (6)
1) Collector's (Producer's) level					
(a) Cost of production (labour charge)	2.25	2.50	2.25	3.00	2.00
(b) Profits	3.28	5.20	7.70	5.20	6.25
(c) Price received	5.53	7.70	9.95	8.20	8.25
2) Local aratder's level					
(a) Cost of marketing	0.33	0.45	0.36	0.40	0.20
(i) Packaging	0.07	0.09	0.08	0.08	0.04
(ii) Labour	0.11	0.18	0.12	0.14	0.09
(iii) Transports	0.06	0.08	0.07	0.06	0.03
(iv) Storage and maintenance	0.06	0.07	0.05	0.07	0.02
(v) Marketing tax and other	0.03	0.03	0.04	0.05	0.02
(b) Profits	5.65	3.95	3.60	2.90	4.80
(c) Price received	11.51	12.10	13.91	11.50	13.25
3) Retailer's level					
(a) Cost of marketing	0.42	0.55	0.39	0.60	0.30
(i) Packaging	0.12	0.11	0.09	0.13	0.06
(ii) Labour	0.14	0.20	0.12	0.18	0.09
(iii) Transports	0.09	0.11	0.08	0.11	0.05
(iv) Storage and maintenance	0.04	0.09	0.06	0.13	0.07
(v) Marketing tax and other	0.03	0.04	0.04	0.05	0.03
(b) Profits	6.57	4.35	5.70	3.90	5.95
(c) Price received	18.50	17.00	20.00	16.00	19.50
4) Price paid by consumer	18.50	17.00	20.00	16.00	19.50
5) Marketing + Production costs	3.00	3.50	3.00	4.00	2.50
6) Marketing margin	12.22	8.30	9.30	6.80	10.75
7) Price spread	12.97	9.30	10.05	7.80	11.25

TABLE 5D. AVERAGE PRICE SPREAD AND AVERAGE MARKETING MARGIN OF MUSHROOM IN CHANNEL - 4

(Rs. per kg)

Marketing costs and Marketing margin (1)	Joypur (2)	Pirorgari (3)	Bishnupur (4)	Baliatore (5)	Boletala (6)
1) Collector's (Producer's) level					
(a) Cost of production (labour charge)	5.00	5.00	5.00	4.50	5.00
(b) Profits	15.40	13.20	17.40	12.50	13.30
(c) Price received	20.40	18.20	22.40	17.00	18.30
2) Local aratder's level					
(a) Cost of marketing	2.35	2.80	2.45	3.80	2.60
(i) Packaging	0.50	0.70	0.60	0.90	0.50
(ii) Labour	0.80	0.80	0.60	1.10	0.90
(iii) Transports	0.40	0.60	0.50	0.90	0.60
(iv) Storage and maintenance	0.50	0.50	0.50	0.80	0.40
(v) Marketing tax and other	0.15	0.20	0.25	0.10	0.20
(b) Profits	21.00	13.20	23.50	14.20	11.50
(c) Price received	43.75	34.20	48.35	35.00	32.40
3) Retailer's level					
(a) Cost of marketing	2.65	3.20	2.80	4.20	2.90
(i) Packaging	0.80	0.80	0.70	1.10	0.80
(ii) Labour	0.65	0.95	0.80	1.10	0.90
(iii) Transports	0.50	0.60	0.55	1.05	0.60
(iv) Storage and maintenance	0.50	0.60	0.50	0.80	0.40
(v) Marketing tax and other	0.20	0.25	0.25	0.15	0.20
(b) Profits	23.60	17.60	27.90	17.80	14.70
(c) Price received	70.00	55.00	79.50	57.00	50.00
4) Price paid by consumer	70.00	55.00	79.50	57.00	50.00
5) Marketing + Production costs	10.00	11.00	10.25	12.50	10.50
6) Marketing margin	44.60	30.80	51.40	32.00	26.20
7) Price spread	49.60	36.80	57.10	40.00	31.70

In Table 6, we present the index of marketing efficiency (IME), percentage of producers'/collectors' share in consumers' price and price spread index of sample households in different markets based on Tables 5A to 5D. It exhibits that sal-leaves maintain the highest index of marketing efficiency and highest producers' share in consumers' price in all markets, as expected. The study suggests that sal-leaves, which possesses some uniformity of price structure in most of the markets and whose range of price variation is not so far from uniformity for the same period in any particular marketing agent or inter marketing agent, has the highest index of marketing efficiency and the highest producers' share in consumers' price. Although the price structure of sal-leaves in Pirorgari market is very low compared to other markets (Table 4A), the range of price variation in all seasons for different market middlemen is not so far from uniformity; it implies that sal-leaves also retains the highest position for IME and producers'/collectors' share in consumers' price in Pirorgari market compared to other products for the same market (Table 6).

TABLE 6. INDEX OF MARKETING EFFICIENCY, PRODUCERS' SHARE IN CONSUMERS' PRICE AND PRICE SPREAD INDEX OF NTFPS OF SAMPLE HOUSEHOLDS IN DIFFERENT MARKETS

Non-timber forest products (1)	Index of marketing efficiency in different markets					Price spread index* (7)
	Joypur (2)	Pirorgari (3)	Bishnupur (4)	Baliatore (5)	Boletala (6)	
Sal-leaves	2.97	3.22	3.85	3.54	3.33	5.32
	(59.48)	(68.90)	(74.00)	(67.78)	(69.40)	
Sal-leaves plate	1.58	1.53	1.65	1.56	1.5	44.09
	(36.57)	(34.76)	(39.47)	(36.00)	(33.67)	
Fuel wood	1.98	1.70	1.72	2.05	1.40	23.30
	(49.50)	(41.33)	(42.00)	(51.33)	(28.74)	
Mushroom	1.63	1.49	1.43	1.50	1.47	98.38
	(38.83)	(33.09)	(29.88)	(35.33)	(31.75)	

Figures in parentheses represent percentage of collectors' share in consumers' price.

*The index is $\sqrt{\sum_{i=1}^{n} r_i^2}$, where r_i is the market i in a particular NTFP [Raychaudhuri and Krishna (200: p.97)].

We now turn to examine the extent of economic efficiency of NTFPs of farms (non-timber collectors' households) under our study with the help of maximum likelihood (ML) estimates of Cobb-Douglas stochastic frontier production function model with physical and price data of NTFPs (per unit basis). For calculating economic efficiency, we have used price data of cost and revenue presented in Tables 5a, b, c and d. For data of total revenues (in Rs.) we have considered consumers' price of the product in different markets. While calculating total costs, we have aggregated both labour cost of collectors for collecting NTFPs and other costs (like transport cost, storage and maintenance cost, packaging cost, marketing tax, etc.) and considered those as marketing costs; this is mainly because the labour cost is more or less same per unit of collection for all the collectors' households. Table 7 shows that the coefficients of explanatory variable and constant term are positive and statistically

significant. The significant log likelihood statistic (LR=34.069) implies high goodness of fit of the regression plane to the sample observations. With regard to economic efficiency is concerned, Table 8 shows that, as expected, sal-leaves possess lower economic efficiency compared to other NTFPs in all markets. The lowest economic efficiency for sal-leaves may be judged by the fact that lowest proportion of marketing margin in consumers' rupee is appropriated by market middlemen of sal-leaves. Table 8 also exhibits an inverse relationship between the level of economic efficiency and percentage of marketing margin (profit margin) in consumers' price for each product. Further, a comparative study based on Tables 6 and 8 suggests an inverse relationship between the level of efficiency and the index of marketing efficiency (or the percentage of producers' share in consumers' price) for each product under our study.

TABLE 7. MAXIMUM LIKELIHOOD (ML) ESTIMATES OF COBB-DOUGLAS STOCHASTIC FRONTIER PRODUCTION FUNCTION AND ECONOMIC EFFICIENCY FOR NTFPS OF SAMPLE HOUSEHOLDS IN DIFFERENT MARKETS

Dependent variable: In Y	
Explanatory variable (1)	Coefficients (2)
Constant	2.1645* (9.938)
In X	0.4721* (5.360)
Variance parameters	
λ	4.9558 (1.313)
σ	0.5943 (0.952)
σ_u	0.3394
σ_v	0.0138
Log-likelihood function	– 3.9056

Figures in parentheses indicate t values.
*Significant at 1 per cent level.

TABLE 8. PRODUCT-WISE AND MARKET-WISE LEVEL OF ECONOMIC EFFICIENCY FOR SAMPLE HOUSEHOLDS (OBTAINED FROM STOCHASTIC FRONTIER PRODUCTION FUNCTION MODEL)

Non-timber forest products	Level of economic efficiency in different markets				
	Joypur	Pirorgari	Bishnupur	Baliatore	Boletala
(1)	(2)	(3)	(4)	(5)	(6)
Sal-leaves	0.9098 (0.25)	0.8692 (0.22)	0.1335 (0.10)	0.6771 (0.20)	0.7481 (0.20)
Sal-leaves plate	0.9470 (0.43)	0.9563 (0.45)	0.9285 (0.28)	0.9394 (0.39)	0.9437 (0.42)
Fuel wood	0.9562 (0.43)	0.9621 (0.52)	0.9629 (0.54)	0.8514 (0.42)	0.9883 (0.67)
Mushroom	0.9153 (0.52)	0.9589 (0.56)	0.9770 (0.64)	0.9563 (0.54)	0.9660 (0.62)

Figures in parentheses represent percentages of marketing margin for market middlemen in consumers' price.

The study, however, suggests that the higher the economic efficiency of farms, higher the proportion of net return (in Rs.) is appropriated by market middlemen or lower the percentage of producers'/collectors' share in consumer's price is retained by the producers (collectors). Thus lower level of economic efficiency for sal-leaves (Table 8), higher level of its marketing efficiency and lower level of price spread index (Table 6), and more uniformity of its price structure and price variation (Table 4b) reveal more efficient and more competitive market system for sal-leaves compared to other NTFPs in all markets under our study.

Table 9 reports the DF and ADF tests of the stationarity of the absolute price series of sal-leaves in two markets – Bishnupur and Pirorgari, over the estimated period (fourteen years) in two forms – with a constant/drift and a linear trend, and with a constant/drift and without a linear trend. For the levels of the series, none of the forms rejects the null hypothesis of non-stationarity at 5 per cent level. But after first differencing, each series in both the forms rejects the null hypothesis of non-stationarity at 5 per cent level of significance. It indicates that the variables are I(1), that is, integrated of the order one. As the price series of two variables are integrated of the same order, we now present bound testing approach to cointegration (Table 10). It shows that the calculated F-statistic is significant in both the forms - with a constant and a linear trend, and with a constant and without a linear trend – at 5 per cent level when the price series of market-II (Pirorgari) is the dependent variable. It implies that there is cointegration or long run relationship between two variables only when the price series of market-II (Pirorgari) is dependent variable. We now present Granger causality test within vector auto-regressive (VAR) model and vector-error correction (VEC) model in Table 11 as it is observed that there is no cointegration between the price series of the two markets when market-I is the dependent variable and there is a cointegration when market-II is the dependent variable.

TABLE 9. UNIT ROOTS OF PRICE SERIES IN TWO MARKETS– BISHNUPUR AND PIRORGARI

	Level form			First difference form		
Markets	Test type	Lag length	Test statistic(τ)	Test type	Lag length	Test statistic(τ)
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Bishnupur	ADF without trend	1	– 0.4287 (– 3.2698)	DF without trend	0	– 5.3267* (– 3.2698)
	DF with linear trend	0	– 3.6593 (– 3.9949)	DF with linear trend	0	– 5.3814* (– 4.0816)
Pirorgari	ADF without trend	1	– 2.6478 (– 3.2698)	DF without trend	0	– 5.3641* (– 3.2698)
	DF with linear trend	0	– 2.9640 (– 4.0816)	DF with linear trend	0	– 5.0805* (– 4.0816)

Figures in parentheses represent critical values.
*Significant at 5 per cent level.

TABLE 10. RESULTS OF THE BOUND TEST FOR COINTEGRATION

Regression equation (1)	Test type (2)	Lag length (3)	Test statistic (F) (4)
$P_{1t} = (P_{2t})$	without trend	0	4.4825 (7.24)
	with linear trend	0	5.0572 (5.68)
$P_{2t} = (P_{1t})$	without trend	0	8.5638* (7.24)
	with linear trend	0	5.7872* (5.68)

Figures in parentheses represent critical values.
*Significant at 5 per cent level.

The results in Table 11 provide information on the direction of short run causality and long run causality. In the short run when price series of market-II is dependent variable no significant causal effects are observed to exist between price series of two markets. Turning to t-statistic on the coefficient of lagged error-correction term in the VEC model, the price series of market-II (i.e., when price series of market-II is the dependent variable) is significant at 5 per cent level with the expected sign. It signifies that the proportion of the long run disequilibrium in P_2 is corrected in the next period. The coefficient of lagged error-correction term suggests that once shocked, there is moderate convergence to equilibrium. It is relevant to mention that we use Granger causality test without error-correction term of the price series of two markets when price series of market-I is dependent variable because there exists no cointegration between the price series when price series of market-I is dependent variable. The result portrayed in Table 11 also suggests that t value of the coefficient of one year lagged ΔP_2 term is insignificant. It implies that there exists no short run significant casual effect between the price series of two markets when price series of market-I is dependent variable.

TABLE 11. RESULTS OF THE VECTOR AUTO-REGRESSIVE AND VECTOR ERROR-CORRECTION TESTS

Regression equation (1)	Lag length (2)	Test statistic (t) of error-correction term (3)	Test statistic (t) of lagged independent variable (4)
$P_{1t} = (P_{2t})$	1	-	0.3048 (2.365)
$P_{2t} = (P_{1t})$	1	– 3.7464* (2.447)	– 0.3634 (2.447)

Figures in parentheses represent critical values.
*Significant at 5 per cent level.

IV

CONCLUSIONS

To recapitulate briefly, the major points discussed in our empirical findings are: (1) More than 70 per cent of the total households under our study live below poverty

line and they almost belong to either SC or ST community; (2) NTFP is the main source of forest income for considerable majority of households living below poverty line in all FPCs except one, and half of their money income is yielded from NTFPs; (3) The agents of LAMPS appropriate highest price per unit (in Rs.) of products – kendu leaves and sal seeds – from the collectors who are obliged to sell at the LAMPS selected centres other than local market places and at a price selected by the latter without the practice of bargaining; (4) The market study shows that the village wholesalers serve as the most important marketing agent of sample collectors' households and pay the highest price to the collectors in all markets. It implies lowest price discrimination for the products of collectors' households by village wholesalers; (5) There exists uniformity of price structure for collectors in almost all markets paid by different market middlemen for the same period only for sal-leaves, the major NTFPs of this region. It also attains the highest index of marketing efficiency or highest producers' (collectors') share in consumers' price or lowest price spread index, and lowest level of economic efficiency (or lowest percentage of marketing margin for market middlemen) in all markets reflecting more efficient and more competitive market system for sal-leaves in the area we surveyed; (6) As to the marketing cost of NTFPs is concerned, the labour cost is the most important component of marketing costs among all cost components followed by packaging and transport costs; and (7) The test of market integration for sal-leaves based on time-series data for fourteen years from two markets suggests that the individual price series of these two markets are integrated in the first difference form. The cointegration test indicates that there is a long run relationship between two markets only when the price series of Pirorgari market is dependent variable. Moreover, vector error-correction model also confirms that in the long run prices of Bishnupur market causes a change in the prices of Pirorgari market meaning that causality run interactively from the Bishnupur market to Pirorgari market. The test of market integration also confirms more efficient and more competitive market system for sal-leaves of all NTFPs under our study.

It is argued that marketing of a farm commodity and marketing efficiency influence farmer's decision in allocating area under a particular crop in a particular time period. A commodity having lower profit margin for market middlemen or higher level of marketing efficiency usually influence producers' decision for accelerating the product of the particular commodity. Higher profit margin of market middlemen or inefficient marketing system of all NTFPs except sal-leaves under this study may hamper the sustainability of the JFMP forest resources because the sustainability of JFMP depends on the regular survival needs of the poor forest communities from the collection, consumption and sale of NTFPs. Lower profit margin or unfair price for collectors' might lead to large illicit felling of timber products by the poor forest communities for having higher price per unit of product and higher profit margin in relation to NTFPs. To this end, competitive price structure of the NTFPs is the urgent need for the benefit of poor forest communities

as well as for final consumers of these products. Creating an open and efficient market for communities would generate higher revenues and offer a strong incentive for communities to take on increasing responsibility for forest management and promote more efficient forest utilisation (World Bank, 2006: p.42). So, in order to have the higher outreach of the JFM programme, government should restrict the power of the LAMPS so that the collectors of NTFPs may sell their products at a higher price and increase their income. Government induced market activities, co-operative marketing system, better information of storage structure may help in overcoming the deficiency of the marketing system of NTFPs.

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NOTES

1. The success of Arabari experiment in JFMP in Midnapore district of West Bengal, which acts as a precursor to JFMP in India, is well known. However ironically, in the same district, JFMP of Arjuna mouza failed to deliver results because the beneficiary community was only entitled to receive the long-term benefit at the end of every 5-year without any benefit of their regular survival needs (Mukherjee, 1995: pp.3130-3132). Saxena and Sarin (1999) addressed non-sustainability of Village Forest Committee (VFC), because to make VFC sustainable forest dependent communities require continuous and annual flow of products (Saxena and Sarin, 1999: pp.190-214).

2) Time series price data of sal-leaves were mainly collected from the records of business wholesalers' association that were directly related to the business of sal-leaves in the area we surveyed.

3) Poverty line income in rural West Bengal on the basis of PCME (per capita monthly expenditure) by NSS of 55th Round (1999-2000) is Rs. 350.17. Based on the CPIAL (Consumer Price Index of Agricultural Labour [General]) per capita monthly expenditure for the year 2005-06, the poverty line income for the year 2005-06 is calculated as Rs. 393 /- approximately.

4) All marketing of kendu leaves, a nationally listed non-timber product, must be done through state forest departments, associated forest marketing corporations, or licensed traders operating on behalf of the state (World Bank, 2006: p.43).

REFERENCES

Agarwal, B. (1986), *Cold Hearths and Barren Slopes: The Woodfuel Crisis in the Third World*, Allied Publications, New Delhi.

Aigner, D.J., C.A.K. Lovell and P. Schmidt (1977), "Formulation and Estimation of Stochastic Frontier Production Function Models", *Journal of Econometrics*, Vol. 6, No. 1, pp. 21-37.

Chandrasekharan, C. (1998), *Role of Non-Wood Forest Products in Sustainable Forest Management*, SEANN Workshop, Dehra Dun.

Correa, M. (1999), "The Need for Emancipatory Research: Experiences from JFPM in Uttara Kannada", in R. Jeffery and N. Sundar (Eds.) (1999), *A New Moral Economy for India's Forests - Discourses of Community and Participation*, Sage Publications India Pvt. Ltd., New Delhi.

Dickey, D.A. and W.A. Fuller (1979), "Distribution of Estimates for Autoregressive Time Series with a Unit Root", *Journal of the American Statistical Association*, Vol. 74, pp. 427-443.

Engle, R.F. and C.W.J. Granger (1987), "Co-integration and Error Correction: Representations, Estimation and Testing", *Econometrica*, Vol. 55, No. 2, pp. 251-276.

Fortenbery, T.R. and H.D. Zaptaa (1993), "An Examination of Cointegration Relation Between Future and Local Grain Markets", *Journal of Future Markets*, Vol. 13, No. 8, pp. 921-932.

Handerson, J.M. and R.E. Quandt (1980), *Microeconomic Theory: A Mathematical Approach*, McGraw Hill, Singapore.

Johanson, S. (1988), "Statistical Analysis of Cointegration Vectors", *Journal of Economic Dynamics and Control,* Vol. 12, Nos. 2 and 3, pp. 231-254.

Lovell, C.A.K. (1993), "Production Frontiers and Productive Efficiency", in H.O.Fried, C.A.K.Lovell and Schnidt (Eds.), *The Measurement of Productive Efficiency: Technique and Application,* Oxford University Press, New York.

Mallik, R.M. (2000), "Sustainable Management of Non-Timber Forest Products in Orissa: Some Issues and Options", *Indian Journal of Agricultural Economics*, Vol. 55, No. 3, July-September, pp. 385-396.

Mathbor, G.M. and M. Rodgers (2002), "Factors Enhancing and Inhibiting the Effectiveness of Community Participation in Development Projects", *The Indian Journal of Social Work*, Vol. 63, No. 3, pp. 340-357.

Meeusen, W. and Julien van den Broeck (1977), "Efficiency Estimation from Cobb-Douglas Production Functions with Composed Error", *International Economic Review*, Vol. 18, No. 2, pp. 435-444.

Mukherjee, N. (1995), "Forest Management and Survival Needs: Community Experience in West Bengal", *Economic and Political Weekly*, Vol. 30, No. 49, December 9, pp. 3130-132.

Mukherjee, N. (2002), "Measuring of Social Capital: Forest Protection Committees in West Bengal", *Economic and Political Weekly,* Vol. 37, No. 29, July 20, pp. 2994-2997.

Naik, G. (1997), "Joint Forest Management: Factor Influencing Household Participation", *Economic and Political Weekly*, Vol. 32, No.48, November 29, pp. 3084-3089.

Naik, G. and S.K. Jain (2001), "Efficiency and Unbiasedness of Indian Commodity Futures Markets", *Indian Journal of Agricultural Economics*, Vol. 56, No. 2, April-June.

Narayan, P.K. and R. Smyth (2003), "The Causal Relationship between Female Employment and Fertility in South Asia: An Application of the Bound Testing Approach to Cointegration", *The Indian Journal of Labour Economics,* Vol. 46, No. 2, April-June, pp. 247-252.

Pesaran, M.H. and Y. Shin (1999), "An Auto-regressive Distributed Lag Modelling Approach to Cointegration Analysis", in S. Strom (Ed.) (1999), *Econometrics and Economic Theory in the 20th Century: The Ragnar Frisch Centennial Symposium,* Cambridge University Press, Cambridge, pp. 271-411.

Raychaudhuri, G.S., and R. Krishna (2001), "Some Aspects of Wheat Price Policy in India", in K.S. Dhindsa and A. Sharma (Eds.)(2001), *Dynamics of Agricultural Development: Policy Planning and Liberalisation*, Concept Publishing Company, New Delhi.

Rudra, A. (1992), *Political Economy of Indian Agriculture*, K. P. Bagchi & Company, Calcutta, pp. 47-69.

Sarker, D.N. and N. Das (2004), "Historical Relevance of Joint Forest Management Programme and the Key Element of its Sustainability: An Evidence from Western Midnapore Division in West Bengal", *International Journal of Environment and Development,* Vol. 1, No. 2, pp. 169-191.

Saxena, N.C. and M. Sarin (1999), "The Western Ghats Forestry and Environmental Project in Karnatka: A Preliminary Assessment", in R. Jeffery and N. Sundar (Eds.) (1999), *A New Moral Economy for India's Forests: Discourses of Community and Participation*, Sage Publications India Pvt. Ltd., New Delhi.

Upadhyay, S. (2003), "Forest Boundaries: Confusing Definitions", *Economic and Political Weekly*, Vol. 38, No. 10, March 8, p.939.

World Bank (2005), "Community-based Natural Resources Management", *Agriculture Investment Sourcebook: Agriculture and Rural Development*, The World Bank, Washington, D C., U.S.A.

World Bank (2006), *India: Unlocking Opportunities for Forest-Dependent People*, The World Bank, Agriculture and Rural Development Sector Unit, South Asia Region, Oxford University Press, New Delhi.