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Linking Smallholder Livestock Producers to Markets: Issues and Approaches*

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I

INTRODUCTION

Sustained economic and income growth, a fast-growing urban population, and the increasing integration of global agri-food markets are fuelling rapid growth in demand for animal food products in India. This implies tremendous potential for future growth of livestock sector and significant income opportunities for livestock owners, especially smallholders. Nearly two-thirds of farm households in India are associated with livestock production, and 80 per cent of them are small landholders (≤ 2 ha). Hence, it is argued that growth in livestock sector has more potential to reduce poverty compared to a similar growth in crop sector (Mellor, 2004; Birthal and Taneja, 2006).

Smallholders' potential to capitalise from expanding demand for livestock products is, however, ambiguous. Their inability to access markets is one of the major limitations to capture the emerging opportunities. Livestock products are perishable and their marketing requirements are different from non-perishable products. These need to be sold immediately or converted into less perishable forms to avoid post-harvest losses. Individually, a small-scale producer has tiny marketable surplus, and on the other hand local markets are thin and trading in distant urban markets is uneconomical due to high costs of marketing (Birthal *et al.*, 2005; Pingali *et al.*, 2005). Thus, lack of access to markets reduces incentives to participate in markets and results in subsistence rather than market-oriented production systems (Holloway and Ehui, 2002).

The increasing dietary diversification and concerns for food safety and quality are causing significant changes in food marketing systems (Jagannathan, 2007; Pingali, 2007). Traditional marketing systems, dominated by *ad hoc* transactions and intermediaries, are being replaced by co-ordinated systems, like co-operatives, producers' associations and contract farming. Further, the corporate sector is entering into the food retailing business in a big way, accelerating the process of

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transformation of agri-food markets. The new marketing systems are expected to improve marketing efficiency and induce a shift in livestock production from subsistence to a commercial enterprise. But, there is an apprehension about the capability of small-scale producers to participate in the market-oriented production systems. Their small-scale enterprise and inability to comply with emerging food safety and quality standards may restrict their participation in domestic as well as global markets (Pingali *et al.*, 2005; Gulati *et al.*, 2007; Mehta *et al.*, 2007).

This paper examines some of the critical issues in marketing and trade of livestock and livestock products, and the conditions that can facilitate integration of small-scale producers on the supply chains. Specifically, it addresses the following two key questions:

- To what extent does the growing market for livestock products offer an opportunity for small-scale producers to improve their livelihoods?
- How can small-scale producers be integrated with markets?

The paper is organised as follows. The next section examines the opportunities for livestock producers in the domestic and global markets. The issues of scale and efficiency, which are important pre-conditions for participation in the market, are discussed in Section III. The role and importance of institutions, like co-operatives and contract farming in linking producers, especially smallholders to markets are discussed in Section IV, which is followed by a section describing conditions necessary for scaling-up of such institutions. The final section highlights some researchable issues.

II

MARKET OPPORTUNITIES

Increasing Domestic Demand

Food basket in India is undergoing a significant shift, away from staple foodgrains toward high-value food commodities, like fruits, vegetables, milk, meat, eggs and fish. The expenditure share of animal food products has changed (Table 1) in total food expenditure over the past two decades. Between 1983 and 2004-05, the

TABLE 1. SHARE OF ANIMAL FOOD PRODUCTS IN FOOD EXPENDITURE

Item (1)	Rural			Urban (per cent)		
	1983 (2)	1993-94 (3)	2004-05 (4)	1983 (5)	1993-94 (6)	2004-05 (7)
Milk and milk products	11.5	15.0	15.4	15.7	17.9	18.6
Meat, eggs and fish	4.6	5.3	6.0	6.1	6.2	6.4
Food expenditure as percentage of total expenditure	65.6	63.2	55.0	58.7	54.7	42.5

Source: Government of India, 2006a.

share of dairy products in urban food expenditure increased from 15.7 per cent to 18.6 per cent, and of meat, eggs and fish from 6.1 per cent to 6.4 per cent. The change is more apparent in the case of rural consumers.

The changes in consumption of animal products are more conspicuous in quantity terms. Between 1983 and 1999-2000, the per capita consumption of milk increased by 71 per cent, meat by 30 per cent and fish by 42 per cent (Kumar and BIRTHAL, 2004). Increase in consumption was not confined to any specific group of consumers - proportionate increase in consumption of milk was nearly much the same for the poor as well as the rich (Table 2). The increase in consumption of meat, eggs and fish was slightly higher for the rich. Compared to staple foods, the demand for high-value food products, including livestock products, is more responsive to income changes, especially at the lower end of income distribution (Kumar and BIRTHAL, 2004; Ravi and Roy, 2006), and with rise in income, the poor tend to include more of high-value food products in their food basket.

TABLE 2. PER CAPITA CONSUMPTION OF ANIMAL FOOD PRODUCTS BY INCOME CLASS AND LOCATION

(1)	(kg/annum)					
	Milk			Meat, egg and fish		
	1983 (2)	1999-2000 (3)	Per cent change (4)	1983 (5)	1999-2000 (6)	Per cent change (7)
Income class						
Poor	15.7	20.6	30.6	1.9	3.8	100.0
Rich	89.7	117.2	30.7	4.8	10.6	120.8
Location						
Rural	37.0	63.3	71.1	4.4	5.9	34.1
Urban	55.5	90.7	63.4	5.9	8.0	35.6

Source: Kumar *et al.* (2007a).

Note: Households below poverty line are classified as poor, and those above 150 per cent above poverty line are considered rich.

The changes in the per capita consumption of livestock products in rural and urban areas were almost also similar (Table 2). Consumption of meat, egg and fish increased by 34 per cent in rural areas and 36 per cent in urban areas. The proportionate increase in milk consumption was slightly higher for rural consumers than for urban consumers. This implies a tendency of convergence in the rural and urban consumption pattern of livestock products. As such, the expenditure elasticity for livestock products is estimated to be higher for rural consumers than for urban consumers (Ravi and Roy, 2006).

The changes in consumption pattern were driven by sustained rise in per capita income, urbanisation, changing lifestyles, increasing entry of women in workforce, nuclearisation of families, improvements in transport infrastructure, rise of supermarkets and increasing use of credit cards (Pingali and Khwaja, 2004). These

drivers of demand growth have been quite robust in the recent past. Between 1990-91 and 2004-05 the per capita income in India grew at 4.0 per cent and urban population at 2.6 per cent a year. These trends are quite robust and expected to continue in the near future, implying robust growth in demand for livestock products (Delgado *et al.*, 2001; Ravi and Roy, 2006; Mittal, 2006; Kumar *et al.*, 2007b). In 2025, demand for milk is expected to reach 138 million tonnes, meat 9.6 million tonnes and eggs 3.6 million tonnes, almost double of that in the year 2000 (Kumar *et al.*, 2007b).¹

Expanding Global Markets

Global demand for livestock products is increasing rapidly. Between 1980 and 2002, the total meat and milk consumption increased by 81 per cent and 29 per cent, respectively (Steinfeld and Chilonda, 2006). This change is more pronounced in the developing world. During this period, annual per capita consumption of meat increased from 14 kg to 29 kg, and milk from 23 kg to 31 kg in developing countries, while in the developed countries there was only a little change.

Increasing global demand for livestock products is an opportunity for India to increase its exports. India is the largest producer of milk and sixth largest producer of meat in the world. But, it shares merely 0.3 per cent in the world exports of livestock products. Its share in imports is also negligible (0.4 per cent).

The quinquennial averages of India's exports and imports of livestock products, in value terms (Table 3) show that while the imports of livestock products have declined over the past two decades, their exports have increased, especially after mid-1990s. Their share in agricultural exports increased from 3.3 per cent in 1981-85 to 6.9 per cent in 1999-2004.

TABLE 3. INDIA'S EXPORTS AND IMPORTS OF LIVESTOCK PRODUCTS

Item (1)	(US \$ million)		
	1981-85 (2)	1991-95 (3)	1999-2004 (4)
Exports			
Total agricultural products	2372	3567	5854
Livestock products	78.5 (3.31)	135.4 (3.79)	402.9 (6.88)
Buffalo meat	41.1 (1.73)	89.3 (2.50)	282.1 (4.82)
Dairy products	1.9 (0.07)	6.7 (0.19)	60.9 (1.04)
Imports			
Total agricultural products	1629	1514	4166
Livestock products	118.6 (7.28)	47.9 (3.16)	72.8 (1.74)
Dairy products	116.6 (7.17)	13.0 (0.86)	14.3 (0.34)
Hides and skins	1.3 (0.08)	34.4 (2.27)	57.5 (1.38)

Source: FAOSTAT (<http://faostat.fao.org>).

Figures in parentheses are per cent of total agricultural exports or imports.

Buffalo meat is a major item of export, accounting for about 70 per cent of the livestock exports. In agricultural exports its share increased from 1.7 per cent in

1981-85 to 2.5 per cent in 1991-95 and further to 4.8 per cent in 1999-2004. Of the total buffalo meat production in the country in 1999-2004, about 20 per cent was exported, as compared to 7 per cent in 1991-95 and 4 per cent in 1981-85. Rapid increase in the buffalo meat export in recent years was due to abolition of minimum export price condition in 1993. The major destinations for buffalo meat are Malaysia, Philippines, Saudi Arabia, Jordan and Angola.

Exports of dairy products though meager, are on the rise. In 1999-2004, dairy products accounted for over 1 per cent of the agricultural exports. Dry milk, casein and butter were the main items with a share of 48 per cent, 38 per cent and 10 per cent in the total dairy exports, respectively. Dry milk is exported mainly to Bangladesh, United Arab Emirates, Algeria, Egypt, Nepal and Bhutan; butter to United Arab Emirates, United States, Germany, France and Kuwait; and casein to United States and Germany. In recent years, casein has emerged as an important export item.

India has a comparative advantage in the production of many livestock products. Unit cost of production of beef/bovine meat, pork and eggs is much lower in India compared to major exporting countries² (Table 4). India is also a low-cost milk producer compared to many countries. It does not have a comparative advantage in chicken production.

TABLE 4. COST OF PRODUCTION OF LIVESTOCK PRODUCTS IN DIFFERENT COUNTRIES, 2001-03

Country (1)	(US\$/tonne)					
	Milk (2)	Beef (3)	Mutton (4)	Pork (5)	Chicken (6)	Eggs (7)
Australia	163	1678	1343	1299	948	1409
Brazil	-	1001	1189	529	510	683
Belgium	296	-	-	-	-	-
Denmark	-	1838	2644	1303	845	1197
France	319	-	-	-	-	-
Germany	308	2026	3730	1296	1010	1039
India	210	316	2319	394	1381	506
Netherlands	331	2241	3886	1208	846	793
New Zealand	182	-	-	-	-	-
United States	293	3074	3681	1189	1505	911

Source: FAOSTAT (<http://faostat.fao.org>).

However, India's exports are constrained by several factors - high domestic demand, high processing and transportation costs, distortions in world markets and stringent food safety and quality standards. A comparison of the domestic and world prices of major livestock products is given in Figure 1.³ India lacks competitiveness in exports of dairy products and chicken, but is highly competitive in exports of beef, mutton and pork. However, access to foreign markets, especially developed countries is restricted due to their stringent food safety and quality standards.

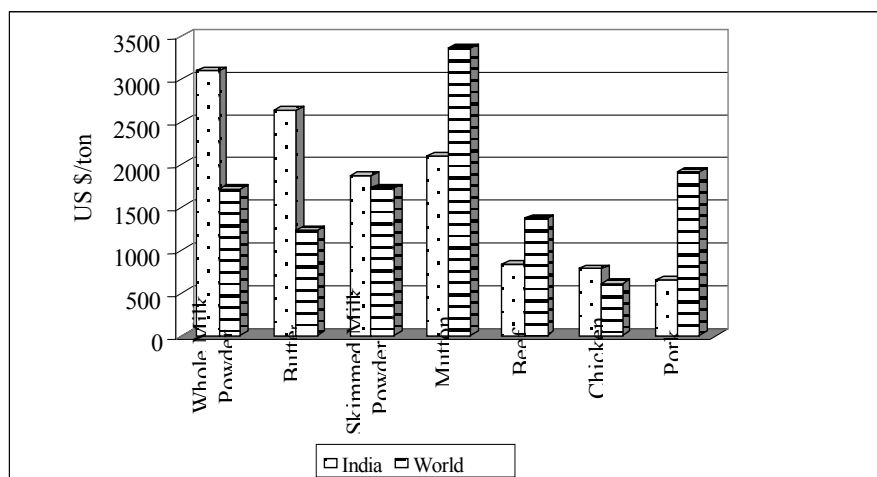


Figure 1. Domestic and World Prices of Livestock Products, 2001-03

Source: See Note 3.

World trade in livestock products, especially dairy products, is highly distorted. The European Union and the United States provide huge support to their livestock sector, which artificially keeps world prices below their true market prices. During 2002-04, producer support estimate (PSE) for dairy was 48 per cent in the European Union and 40 per cent in the US (OECD, 2006). The European Union provides huge support to meat industry. It may be mentioned here that India does not provide much support to livestock sector. For example, PSE for milk fell from 41 per cent in 1986 to less than 1 per cent in 2002 (Elumalai *et al.*, 2004).

Nevertheless, in recent years PSE for some of the livestock products in a few countries has come down. This may raise world prices of livestock products and cause a shift in the production and exports toward countries having comparative advantage in production (Upton, 2001). India is expected to benefit from free trade. For dairy products, Rakotoarisoa and Gulati (2006) and Peng and Cox (2006) assert that with less distortions in global trade India may emerge as a marginal exporter first, and then likely to improve its exports over time. Accessing global markets, however, will depend on the extent to which India's livestock industry improves its scale and efficiency, and complies with the international food safety and quality standards.

Unfolding globalisation though offers an opportunity for exports, it also poses a threat of cheap imports. India has opened up its market by removing quantitative restrictions on imports, and reducing tariffs on livestock products. Tariff rates for milk, cream, cheese and yogurt have been reduced from 40 per cent in 1995 to 30 per cent in 2004, and for processed meat from 50 per cent to 30 per cent. However, tariffs on powdered milk and meat (fresh, chilled and frozen) have been raised. Distortions in world trade, if continued may adversely affect India's livestock sector.

III

LIVESTOCK PRODUCTION AND SMALLHOLDERS

Indian farmers have responded positively to the increasing demand for livestock products. Milk production increased from 36 million tonnes in 1982-83 to 93 million tonnes in 2004-05 at an annual growth rate of 4.3 per cent (Table 5). During this period, meat production almost doubled, from 3 to 6 million tonnes. Rapid growth occurred in poultry sector - poultry meat and egg production grew at an annual rate of 12.3 per cent and 5.7 per cent, respectively. Improvements in genetic potential of animals (crossbred/improved species), feed and fodder supply and animal health services made faster growth possible in dairy and poultry production (Birthal and Taneja, 2006).

TABLE 5. GROWTH IN LIVESTOCK PRODUCTION IN INDIA

Product (1)	Production (million tonnes)		Annual compound growth rate (per cent)
	1982-83 (2)	2004-05 (3)	1982-83 to 2004-05 (4)
Milk	35.80	92.50	4.26
Meat	2.98	6.03	3.47
Buffalo meat	0.93	1.48	2.37
Mutton	0.52	0.71	1.55
Poultry meat	0.16	1.72	12.30
Eggs (million No.)	11454	45201	5.72

Source. Government of India (2006b) for milk and eggs, FAOSTAT (<http://faostat.fao.org>) for meat.

Dairying is the most important segment of India's livestock economy, accounting for over two-thirds of the livestock production, in value terms. The share of milk in the value of agricultural output increased from 11.8 per cent in 1980-82 to 15.4 per cent in 2003-05. In absolute terms, its contribution almost trebled from an average Rs. 377 billion in 1980-82 to Rs. 1,031 billion in 2003-05 (at 1999-2000 prices). This could happen due to increasing tendency of commercialisation, driven by the organised sector. Bhavani *et al.* (2006) have estimated an annual growth of 6.4 per cent in dairy processing between 1984-85 and 2002-03.

The extent to which smallholders can benefit from demand-driven growth in livestock production crucially depends on their (i) marketable surplus/scale of production, (ii) production efficiency and (iii) access to domestic and global markets. In this section, we deal with the scale of production and its efficiency, and the issues related to market access are discussed in the next section.

Evidence on marketed/marketable surpluses of livestock products is anecdotal. Marketed surplus of milk is estimated to be 54 per cent of the total production (Dairy India, 2007). It is expected to be higher for commodities like meat and eggs, which are largely produced for the market. An idea about the marketable surplus of milk can be had from an analysis of the household level production data from the 59th Round

of the National Sample Survey Organisation (Government of India, 2005a). Using these data, we have examined the scale of milk production by landholding size (Table 6). On an average, 44 per cent farm households in India are associated with dairying. Amongst marginal landholders (up to 1ha) only 39 per cent participate in dairying. The participation rate increases with size of landholding, reaching upto 69 per cent for large landholders (> 4ha). However, the marginal and small landholders dominate the dairying activity, contributing 68 per cent to the total milk production.

TABLE 6. SCALE OF MILK PRODUCTION BY LANDHOLDING SIZE, 2003

(1)	(per cent)				
	Marginal (up to 1ha) (2)	Small (1-2ha) (3)	Medium (2-4ha) (4)	Large (>4ha) (5)	All (6)
Percentage of total households	65.5	18.1	10.7	5.7	100.0
Percentage households producing milk	38.9	48.3	56.7	68.5	44.2
Percentage distribution of milk producing households	57.6	19.8	13.7	8.9	100.0
Percentage share in milk production	49.2	19.6	16.7	14.5	100.0
Milk production (litres/household/annum)					
			Households		
≤ 500	39.8	33.5	28.8	22.3	35.5
500-1,000	27.9	27.5	25.0	24.1	27.1
1,000-2,000	21.3	23.4	25.5	23.6	22.5
2,000-5,000	9.6	13.6	17.3	23.3	12.7
> 5,000	1.4	2.1	3.3	6.7	2.3
Total	100.0	100.0	100.0	100.0	100.0
			Share in milk production		
≤ 500	10.2	7.5	5.4	3.1	7.8
500-1,000	19.5	16.7	12.6	8.8	16.3
1,000-2,000	28.8	27.2	25.0	16.7	26.1
2,000-5,000	27.2	32.1	35.4	36.0	30.8
> 5,000	14.2	16.4	21.5	35.4	19.0
Total	100.0	100.0	100.0	100.0	100.0

Source: Government of India (2005a): Extracted unit level data from CD-ROM.

Scale of milk production is small for a majority of households. For 36 per cent households, it is very minuscule (≤500 litres/annum) and for another 27 per cent between 500-1,000 litres/annum. These households contribute only 24 per cent to the total milk production. This production level can provide some nutritional benefits to the family, but not enough surpluses for the market. Only 15 per cent households produce >2,000 litres per annum and contribute 50 per cent to the total milk production.

Small-scale dairying is more prominent at the lower end of land distribution. For two-thirds marginal landholders the average milk production is ≤1,000 litres of milk per annum, and only 11 per cent of them have above 2,000 litres per annum. But, for 30 per cent large landholders the scale of production is above 2,000 litres per annum.

The proportion of households producing 1,000-2,000 litres annually is almost similar across all categories of landholders.

Scale of dairy production though is positively associated with land ownership, a considerable proportion of small landholders take up dairying as a commercial activity (Table 7). Among the households producing more than 5,000 litres of milk per annum, 54 per cent belong to marginal and small landholders. Sharma *et al.* (2003) have also observed dominance of small landholders (≤ 2 ha) in commercial dairying. This implies that the small landholders are capable of scaling up dairy production if they can overcome some of the production and marketing constraints.

TABLE 7. PARTICIPATION OF SMALL LANDHOLDERS IN COMMERCIAL DAIRYING, 2003

Farmer category (1)	(per cent)				
	Milk production (litres/household/annum)				
	≤ 500 (2)	500-1000 (3)	1000-2000 (4)	2000-5000 (5)	> 5000 (6)
Marginal	64.6	59.4	54.5	43.7	36.1
Small	18.7	20.1	20.6	21.2	18.3
Medium	11.1	12.6	15.5	18.7	19.8
Large	5.6	7.9	9.3	16.3	25.8

Source: Government of India (2005a): Extracted unit level data from CD-ROM.

Commercialisation has occurred more rapidly in the poultry sector. Over the past three decades, the sector has undergone a significant transformation, from a backyard activity in the 1960s to a technology-based industrial activity today. This transformation has been triggered by the entry of organised sector, which invested considerably in technology (breeding, hatching and feeding), marketing and processing (Landes *et al.*, 2004). Farmers now grow internationally-recognised breeds with better feed conversion efficiency.

The poultry sector started witnessing some organisational changes during the early 1990s. Realising that production and market risks in poultry are high and beyond the bearing capacity of small-scale producers, some leading firms initiated contract farming with provisions of chicks and feed to producers at no cost, an assured off-take of output and guaranteed returns for their contribution to production cost. Contract farming in poultry is now widespread. For example, nearly 40 per cent broiler production in the country now comes through contract farming (Fairoze *et al.*, 2006). However, its spread has been uneven. It is more prevalent in Tamil Nadu, Karnataka, Maharashtra and Andhra Pradesh, where 60-90 per cent of broiler production is through contracts.

Contract farming has been accompanied by significant scaling-up of poultry production systems. Nearly three decades ago, the average flock size hardly ever exceeded 500 birds/cycle/farm, but such small-scale units are now rare (Mehta *et al.*, 2003). Despite all this, poultry production remains important to the small

landholders. In Andhra Pradesh, 28 per cent broiler farmers were found to be landless and another 22 per cent had landholding size not exceeding 2 ha (Birthal *et al.*, 2005).

Having examined the scale of production, the question then arises whether small-scale producers are as efficient as large producers. It is often argued that small-scale producers lack efficiency due to several operational constraints, such as lack of access to inputs, technology and services. A review of some recent studies presents a mixed picture. In dairying, small-scale producers have been found to be more efficient (Sharma *et al.*, 2003). In poultry too, small-scale producers have been reported as efficient as large producers (Mehta *et al.*, 2003; Birthal *et al.*, 2005; Fairuze *et al.*, 2006). Contrarily, there is evidence of small-scale dairy producers being less efficient also (Birthal *et al.*, 2005; Birthal *et al.*, 2006). Nonetheless, the evidence by and large indicates that small livestock holders are, if not more, as efficient as large producers.

IV

LINKING PRODUCERS TO MARKETS: ROLE OF INSTITUTIONAL INNOVATIONS

Small livestock producers lack access to markets. They will participate in the market if the benefits from participation outweigh the costs. Very often, marketing and transaction costs are higher for small-scale producers, which restrict their participation in the market. In this section, we provide a brief overview of markets and marketing costs, and then discuss the role and importance of institutions, like co-operatives and contract farming in linking producers to markets.

Markets for livestock and livestock products are thin and underdeveloped in India. There are about 2,000 markets for live animals. Most of these are irregular, uncertain and lack transparency in transactions, especially in pricing. Besides, most markets lack basic marketing infrastructure and facilities. Likewise, slaughtering facilities are also inadequate. There are 5,520 registered and 4,707 unregistered slaughterhouses in the country (Government of India, 2006b). The latter contribute about half to the total meat production. Markets for live animals are often located in urban areas, far from production centres.

Distant markets and lack of infrastructure raise transportation and other marketing costs. For cattle and buffalo, marketing costs guzzle 20-30 per cent of the sale price (Chandra Mohan Reddy, 2000). As a result, most transactions in live animals take place in villages among the rural households (Bhatia *et al.*, 2005). The transactions, especially in meat animals are dominated by itinerant traders. They buy animals from the farmers, and after assembling sell them in the market at much higher prices. Their net margin ranges from 15 to 40 per cent of acquisition and transportation costs in the case of sheep and goats and 30 to 100 per cent in the case of cattle and buffalo (personal communication with itinerant traders).

Marketing and transaction costs are also high for livestock products – for milk, these are estimated at 15-20 per cent of the sale price in the urban markets (Birthal *et al.*, 2005; Birthal *et al.*, 2006). These costs are higher for small-scale producers -

around 23 per cent. Hence, the small-scale producers are forced to sell their marketable surpluses to vendors or informal traders. Informal markets, however, are not reliable. During flush production season, vendors/traders often offer lesser than market price, and even decline procurement of output.

The issue thus boils down to ‘how to provide producers remunerative and sustainable access to markets?’ In this context, dairy co-operatives have played an important role. Starting from the Kheda district of Gujarat in 1946, these are now spread throughout the country. In 2004-05, there were over 113 thousand dairy co-operative societies in the country, procuring 7.33 million tonnes of milk from 12.33 million producer-members (Table 8). Milk procurement by co-operatives as per cent of production has increased to 7.9 per cent in 2004-05 from 3.0 per cent in 1980-81.

TABLE 8. PERFORMANCE OF DAIRY CO-OPERATIVES

(1)	1980-81 (2)	1990-91 (3)	2004-05 (4)
No. of dairy co-operative societies	13284	63415	113152
Members (million)	1.75	7.48	12.33
Milk procured (million tonnes)	0.94	3.54	7.33
Milk procured (per cent)	2.96	6.57	7.92

Source: National Dairy Development Board (2005).

Dairy co-operatives have succeeded fairly in linking the producers to markets, especially in Gujarat, Maharashtra, Karnataka, Tamil Nadu and Kerala (Table 9). These states together contribute over 69 per cent to the total milk procurement by the co-operatives, while their share in the total milk production in the country is only 26 per cent. In these states, co-operatives procure 12-32 per cent of the milk produced there. It may be noted that agriculture in these states is rainfed and unstable, and by

TABLE 9. PERFORMANCE OF DAIRY CO-OPERATIVES AT STATE LEVEL, 2004-05

Percentage of milk output procured (1)	State (2)	Per cent share in milk procured (3)	Per cent share in milk produced (4)	Per cent share in private processing plants (5)
Above national average	Gujarat (31.7 per cent)	69	26	Maharashtra (23 per cent) Karnataka (5 per cent)
	Karnataka (25.2 per cent)			
	Maharashtra (15.0 per cent)			
	Tamil Nadu (15.1 per cent)			
	Kerala (12.1 per cent)			
Below national average	Rajasthan (6.5 per cent)	19	34	Weak
	Andhra Pradesh (5.3 per cent)			
	Orissa (4.7 per cent),			
	Bihar (3.7 per cent)	11	33	55 per cent
	West Bengal (3.1 per cent)			
	Madhya Pradesh (2.6 per cent)			
	Punjab (3.3 per cent), Haryana (2.6 per cent) Uttar Pradesh (2.1 per cent)			

Source: National Dairy Development Board (2005), Government of India (2006b).

Figures in parentheses against states in Col.2 indicate milk procured as per cent of total produced in the state.

providing a market for milk co-operatives are helping farmers to improve their livelihood. Further, they have also stimulated milk production, which is evident from the fact that growth in milk production in Gujarat, Maharashtra and Karnataka during 1981-82 to 2005-06 was 5-6 per cent a year, higher than in most other states.

Milk procurement by co-operatives in most other states is meager, less than 7 per cent of the milk produced. In Uttar Pradesh, Punjab and Haryana, the private sector has a larger presence. These states account for 54 per cent of the private processing plants.

Dairy co-operatives also provide inputs, information and technical support to producers, which eventually lead to improvement in production efficiency and reduction in marketing and transaction costs. Gupta *et al.* (2006) observed that members of dairy co-operatives in Punjab, could realise 9 per cent higher yield and 29 per cent higher profits than that of independent suppliers in the open market. The production and marketing costs to member-suppliers were also lower by about 30 per cent.

In recent years, dairy policy has undergone a sea change. Until 1991, dairy co-operatives were heavily protected from internal and external competition through regulatory and fiscal measures. Today, external trade in dairy products is liberalised and the dairy industry is open to private sector. These measures have attracted considerable private investment and the number of private dairy processing plants in the organised sector increased from 213 in 1995-96 to 493 in 2005-06 (Government of India, 1997; 2006b).

The private sector procures almost the same quantity of milk as the co-operatives do. Most private processors use one or other variant of contract farming to source milk from the producers. Through contracts, the processors get an assured supply of raw material and thus can utilise optimally their installed capacity, infrastructure and manpower. The producers also benefit from assured off-take of produce, reduced price uncertainty, lower marketing and transaction costs, and an easy access to inputs, technology, credit and services. However, the producers will join contract farming if the expected net benefits are higher from it compared to alternative marketing options. Several studies have confirmed that producers do benefit from contract farming (Dries and Swinnen, 2004; Coastales *et al.*, 2003; Simmons *et al.*, 2005; Birthal *et al.*, 2005; Ramaswami *et al.*, 2006).

The costs and benefits of contract farming in milk in Punjab and broilers in Andhra Pradesh are given in Table 10. In the case of milk, net revenue to contract producers was double than that for non-contract producers. It was largely because of reduction in marketing and transaction costs, which were lower by 93 per cent for contract producers. Lower marketing and transaction costs reduced the total cost of production by one-fifth, which otherwise was not significantly different from that for non-contract producers.

TABLE 10. ECONOMICS OF CONTRACT VERSUS NON-CONTRACT PRODUCTION IN MILK AND BROILERS

Item (1)	Milk			Broilers		
	Contract (2)	Non-contract (3)	Percentage difference (4)	Contract (5)	Non-contract (6)	Percentage difference (7)
Production cost	5586	5782	-2.5	-	-	-
Marketing and transaction cost	100	1442	-93.1	38	90	-57.8
Total cost	5686	7170	-20.7	-	-	-
Price	9337	8991	3.8	-	-	-
Net revenue	3651	1821	100.5	2255	2003	12.6

Source: BIRTHAL *et al.* (2005).

Note: Production cost and price of broilers could be estimated for contract producers because of supply of critical inputs and off-take of output by the firm without any obligations to the producers.

Difference in the net revenue for contract and non-contract broiler producers is not as high as in the case of milk, but contract farming performs important functions of banking and insurance. Firms provide day-old chicks and feed at no cost to the producers, which in a sense is interest-free credit for them. Firms, in turn, lift the entire output and pay producers fixed growing charges for their contribution to cost (labour, water, electricity litter and rent for fixed assets). This insures producers against market risks. The coefficient of variation in the net revenue for contract producers was estimated at 3.4 per cent, as against 69.5 per cent for non-contract producers. Ramaswami *et al.* (2006) showed that with contract farming producers could shift as much as 88 per cent of the risk to the firms.

However, some studies have shown that contract farming in poultry especially broilers is not remunerative (Mehta *et al.*, 2003; Fairuze *et al.*, 2006). This is possible, if price seasonality is ignored, which is considerably high in the poultry products (Figure 2). The non-contract producers realise higher profits when prices are high (or vice versa), while contract producers receive fixed growing charges, irrespective of market price. Thus, ignoring price seasonality (based on single production cycle) may conclude either way.

Contract farming is also subjected to other criticisms. It is often argued that contract farming empowers the processors to extract monopsonistic rent in output market and monopoly rent in input market. A glance at the price and cost of production of milk in Table 9 provides that these were almost the same for contract and non-contract producers, lending little support to this argument. However, it is not impossible to extract monopsonistic rent, if there is no competition in the local market. In the long-run, with the entry of more buyers in the market, the producers tend to shift from one marketing option to another. Thirunavukkarasu and Sudeepkumar (2005) have observed such a tendency in the milk market in Tamil Nadu, where 57 per cent producers had shifted from one option to the other, mostly from informal to formal markets. This shift was caused by non-price factors, such as regular payments and supply of inputs and services by the processors. This implies

that non-price factors are as important as price in cementing market relationship with the producers.

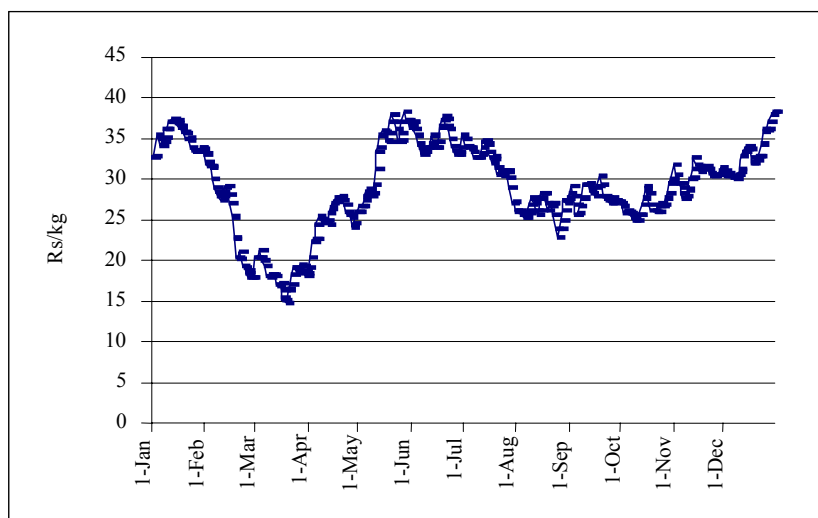


Figure 2. Seasonality in Farm-Gate Prices of Broilers, 2004-06

Source: All India Broiler Farmers' Marketing Co-operative Ltd.

Another criticism against co-ordinated marketing systems, especially contract farming is that it discriminates against smallholders because of high costs of contracting with a large number of them. Nevertheless, there is a counter argument also. The reliance on a few large producers could be risky, especially when a processor does not have alternative supply sources, while contracting with a large number of small-scale producers spreads the supply risk. It is also argued that small-scale producers have sufficient labour resource and can therefore produce at a lower cost.

Evidence on the participation of small-scale producers in the co-ordinated marketing systems is mixed. Birthal *et al.* (2005) have found significant involvement of small-scale producers in contract farming in milk, but not in broilers. In the case of milk, 56 per cent producers possessed ≤ 5 milch animals, while for 32 per cent broiler producers, the flock size did not exceed 5,000 birds/cycle. In dairy co-operatives, 37 per cent members were found as small landholders (Gupta *et al.*, 2006).

V

SCALING-UP INSTITUTIONAL INNOVATIONS

Livestock producers benefit from institutional innovations that link them with markets. There is a need to scale up or replicate such institutions, which are localised

at present. The potential benefits of scaling-up will go beyond primary production, and its multiplier effects will be significant in the secondary and tertiary sectors. Three elements that are critical to scaling-up as well as require policy focus are: (i) physical infrastructure (roads, electricity, communication, refrigerated transport, cold chains, etc.) that can facilitate linkages between production and markets, (ii) investment in food processing, and (iii) an enabling regulatory and legal framework.

Infrastructure is essential to reduce marketing and transaction costs and post-harvest risks, which are higher for perishable commodities. India lacks both public and private infrastructure. Road network is poor and power supply is erratic, which discourage private investments in the refrigerated transport, cold chains and food processing.

Poor infrastructure and investment result in low level of processing. In India only 6 per cent poultry meat, 21 per cent buffalo meat and 15 per cent milk are processed in the organised sector (Government of India, 2005b). On the other hand, demand for processed products is on the rise and is likely to be stronger in future (Dong, 2005). Further, with rise in income, urbanisation and globalisation, food safety and quality issues are becoming important. Retailers and exporters will impose consumer preferences on the processors and producers. This necessitates better co-ordination of supply chain from genetics to end-users, and significant efforts and investment in food safety and quality compliance measures.

Credit plays an important role in scaling-up. While some enterprises like dairying can be initiated or scaled-up with a small amount of capital, others like poultry are capital-intensive. Presently, livestock sector, including poultry shares only 4 per cent of the total credit to agricultural sector (Birthal and Taneja, 2006). Livestock also need to be protected against vagaries of nature and diseases through insurance and animal health care.

The central and state governments have taken some important initiatives to strengthen market linkages. The Agricultural Produce Market Committee (APMC) Act has been replaced by the Model Act on Agricultural Marketing in 2003, which allows the processors/marketing firms to directly secure their raw material requirements outside the state-designated markets through contract farming or any other form of vertical co-ordination. The Milk and Milk Products Order (MMPO), 1992 has been amended in 2002. The amended order puts no restriction on setting up new processing capacity and does away with milkshed area approach. Registration under MMPO is now only for enforcing food safety and quality. Other measures, like institutional financing of contract farming schemes, priority sector lending to food processing industry and reduction in excise duties on the processed products also promote, though indirectly, the production-market linkages.

The governments should create a level playing field for the growth of right kind of market institutions, promote competition among various market players, and encourage smallholders to form producers' organisations to deal with agribusiness

firms. Besides, there is a need to provide some legal measures that protect producers as well processors against opportunistic tendencies.

VI

ISSUES FOR FURTHER RESEARCH

The potential of livestock sub-sector in sustaining agricultural growth is being increasingly recognised. Lack of producers' access to markets may stall the growth in livestock production. In the past, dairy co-operatives, by linking producers to markets, have acted as a stimulant to growth. The situation however is changing. Market liberalisation and globalisation are causing significant changes in the food markets and food procurement systems, and their social and economic consequences are being widely debated. These forces necessitate an in-depth empirical assessment of tangible as well as intangible costs and benefits associated with different marketing systems. Specific issues that need further probing are:

First, high marketing and transaction costs are strong barriers to smallholder producers' participation in market. A comprehensive assessment of marketing and transaction costs, risks and returns associated with various marketing systems will provide an insight into their relative efficiency and help policymakers choose the most efficient one for scaling-up.

Second, there is an apprehension that small-scale producers will be marginalised in the process of scaling-up of the co-ordinated marketing systems. Though there is an evidence that indicates that smallholders are not altogether excluded from these systems, the issue needs an in-depth analysis focusing on the conditions (e.g., competitiveness in production and marketing) that favour or disfavour smallholders' inclusion in the new arrangements. Another related issue is of identification of appropriate institutional structures (producers' associations and intermediate contracts) for smallholders, and their sustainability.

Third, there is an argument that contract farming empowers agri-business firms to extract monopsonistic rent in the output market and monopoly rent in the input market or firms even may practice collusive oligopoly. The evidence needs to be documented under different market environments, e.g., less competitive vis-à-vis more competitive, and remote vis-à-vis nearby markets.

Fourth, current knowledge about the impact of institutional innovations is limited to a comparison of some economic parameters, like yield, production and marketing costs, and returns for participating versus non-participating producers. Issues, such as changes in the production system (technology, input use, scale of production, environment, etc.), household income, employment, standard of living and quality of human resources, and spillover effects on the local economy remain untouched, and need to be looked into.

Finally, globalisation of food markets is likely to have a significant impact on India's livestock sector and the households dependent on it. Globalisation offers an

opportunity to access foreign markets, but requires compliance of food safety and quality standards, which are becoming stringent. Further, continuing distortions in world markets, in the face of a liberal domestic trade policy, may lead to an import surge, threatening livelihood of millions of livestock producers. Thus, there is a need to assess impact of globalisation and domestic trade policies on livestock producers, especially smallholders, and suggest appropriate technological, institutional and policy measures to convert these challenges into opportunities.

NOTES

1. There is a considerable difference in the estimates of the future demand for livestock products on account of differences in data sources and income and price elasticities used. For example for 2020, Ravi and Roy (2006) have projected demand for milk at 201 million tons, meat at 5.6 million tonnes and eggs at 44.5 billion numbers; Mittal (2006) projects milk demand at 191 million tonnes; and Delgado *et al.* (2001) project milk demand at 132 million tonnes and meat at 9 million tonnes.

2. Brazil, Australia, United States of America, Netherlands, Denmark and Germany are important meat exporting countries. In 2004, these accounted for 51 per cent of the world meat exports, in value terms. Germany, New Zealand, France, Netherlands, Belgium and Australia are major exporters of dairy products, accounting for 60 per cent of the world exports.

3. Domestic prices are taken from 'Agricultural Prices in India' published by the Directorate of Economics and Statistics, Ministry of Agriculture, Government of India. International prices are from FAO Food Outlook No.1, June 2006. Dairy product prices are Oceania export price f.o.b, beef price is Argentina frozen beef cuts export unit value, pork price is US frozen products export unit value, mutton price is New Zealand lamb carcasses wholesale price and chicken price is US broiler cuts export unit value.

REFERENCES

- Bhatia, J., U.K. Pandey, and K.S. Suhag (2005), "Small Ruminant Economy of Semi-Arid Region in Haryana", *Indian Journal of Agricultural Economics*, Vol. 60, No. 2, April-June, pp. 163-183.
- Bhavani, A., Ashok Gulati and D. Roy (2006), "Food Processing Industry: How Have the Reforms Affected its Structure?", Paper Presented at the Workshop *Plate to Plough: Agricultural Diversification and Its Implications for the Smallholders*, organised by the International Food Policy Research Institute (Asia Office), New Delhi, and the Institute of Economic Growth, New Delhi at New Delhi, September 20-21.
- Birthal, P.S., P.K. Joshi and Ashok Gulati (2005), *Vertical Coordination in High-Value Food Commodities: Implications for Smallholders*, Markets, Trade and Institutions Division Discussion Paper No. 85, International Food Policy Research Institute, Washington, D.C., U.S.A.
- Birthal, P.S., A.K. Jha, M. Tiongco, C. Delgado, C. Narrod and P.K. Joshi (2006), *Equitable Intensification of Smallholder Market-Oriented Dairy Production in India through Contract Farming*, Annex I of the IFPRI-FAO Final Report *Contract Farming of Milk and Poultry in India: Partnerships to Promote the Environmentally Friendly and Equitable Intensification of Smallholder Livestock Production*. International Food Policy Research Institute, Washington, D.C., U.S.A.
- Birthal, P.S. and V.K. Taneja (2006), "Livestock Sector in India: Opportunities and Challenges for Smallholders", in P.S. Birthal, V.K. Taneja and W. Thorpe, (Eds.) (2006), *Smallholder Livestock Production in India: Opportunities and Challenges*, National Centre for Agricultural Economics and Policy Research, New Delhi, and International Livestock Research Institute, Nairobi.
- Chandra Mohan Reddy, Y.V.R. (2000), *A Study of Livestock Markets and Marketing of Livestock in Rangareddy District of Andhra Pradesh*, M.Sc. Dissertation, Department of Agricultural Economics, Acharya N.G. Ranga Agricultural University, Hyderabad.
- Coastales, A.C., C. Delgado, Ma. A. O. Catelo, M. Tiongco, A. Chatterjee, A. delos Reyes (2003), "Policy, Technical and Environmental Determinants and Implications of the Scaling-up of Broiler and Swine

- Production in the Philippines”, Annex I of the IFPRI-FAO Final Report *Livestock Industrialization, Trade and Social-Health-Environmental Impacts in Developing Countries*, Phase II, International Food Policy Research Institute, Washington, D.C., U.S.A.
- Dairy India (2007), *Dairy India 2007*, Dairy India Yearbook, New Delhi.
- Delgado, C., M.W. Rosegrant and S. Meijer (2001), *Livestock to 2020: The Revolution Continues*, Paper Presented at the Annual Meeting of the International Trade Research Consortium (IARTC), Auckland, New Zealand, January 18-19. Available at http://www.ilri.org/ILRI_Dev-pdf/delgado.pdf.
- Dong, F. (2005), *The Outlook for Asian Dairy Markets: The Role of Demographics, Income, and Prices*, Working Paper 05-WP399, Centre for Agricultural and Rural Development, Iowa State University, Ames, Iowa.
- Dries, L. and J. Swinnen (2004), “Foreign Direct Investment, Vertical Integration and Local Suppliers: Evidence from the Polish Dairy Sector”, *World Development*, Vol. 32, No.9, pp. 1525-1544.
- Eaton, C., and A.W. Shepherd (2001), *Contract Farming: Partnerships for Growth*, FAO Agricultural Services Bulletin 145, Food and Agriculture Organisation of the United Nations, Rome, Italy.
- Elumalai, K., P.S. Birthal and S.K. Sharma (2004), “Producer and Consumer Support Estimates for Indian Dairy”, Paper Presented at the South Asia Regional Conference of the International Association of Agricultural Economists on *Globalisation of Agriculture in South Asia: Has It Made a Difference to Rural Livelihood?*, Organised by the Centre for Economic and Social Studies, Hyderabad, Acharya N.G. Ranga Agricultural University, Hyderabad, and the Indian Society of Agricultural Economics, Mumbai, at Hyderabad, March 23-25.
- Fairoze, M.N., L. Achoth, K.K. Prasanna Rashmi, M. Tiongo, C. Delgado, C. Narrod and P.G. Chengappa (2006), “Equitable Intensification of Smallholder Market-oriented Poultry Production in India through Contract Farming”, Annex I of the IFPRI-FAO Final Report *Contract Farming of Milk and Poultry in India: Partnerships to Promote the Environmentally Friendly and Equitable Intensification of Smallholder Livestock Production*, International Food Policy Research Institute, Washington, D.C., U.S.A.
- FAOSTAT (2007), <http://faostat.fao.org>, Food and Agriculture Organisation, Rome.
- Government of India (1997, 2006b), *Basic Animal Husbandry Statistics*, Department of Animal Husbandry and Dairying, Ministry of Agriculture, Government of India, New Delhi.
- Government of India (2005a), *Income, Expenditure and Productive Assets of Farm Households*, Report No. 497(59/33/5), National Sample Survey Organisation, Ministry of Statistics and Programme Implementation, Government of India, New Delhi.
- Government of India (2005b), *Vision, Strategy and Action Plan for Food Processing Industries in India*, Ministry of Food Processing, Government of India, New Delhi.
- Government of India (2006a), *Level and Pattern of Consumer Expenditure 2004-05*, Report No. 508(61/1.0/1), National Sample Survey Organisation, Ministry of Statistics and Programme Implementation, Government of India, New Delhi.
- Gulati, A., P.K. Joshi and Ralph Cummings Jr. (2007), “The Way Forward: Towards Accelerated Agricultural Diversification and Greater Participation of Smallholders”, in P.K. Joshi, Ashok Gulati and Ralph Cummings Jr. (Eds.) (2007), *Agricultural Diversification and Smallholders in South Asia*, Academic Foundation, New Delhi.
- Gupta, K., D. Roy and H. Vivek (2006), “How Do Co-operatives Select Farmers and How do Farmers Benefit from Producer Organisations: The Case of Milkfed Dairy Co-operative in Indian Punjab”, Paper Presented at the Workshop *Plate to Plough: Agricultural Diversification and Its Implications for the Smallholders*, organized by the International Food Policy Research Institute (Asia Office), New Delhi, and the Institute of Economic Growth, New Delhi at New Delhi, September 20-21.
- Holloway, G. and S. Ehui (2002), *Expanding Market Participation among Smallholder Livestock Producers: A Collection of Studies Employing Gibbs Sampling and Data from the Ethiopian Highlands*, Socioeconomics and Policy Research Working Paper 48, International Livestock Research Institute, Nairobi.
- Jagannathan, P. (2007), “Will Dairy be Retail Giants’ Milch Cow?”, *The Economic Times*, August 21.
- Kumar P., Mruthyunjaya and M.M. Dey (2007a). Long-term Changes in Indian Food Basket and Nutrition, *Economic and Political Weekly*, Vol.42, No.35, September 1-7.

- Kumar, P., Mruthyunjaya and P.S. BIRTHAL (2007b), "Changing Consumption Pattern in South Asia", in P.K. Joshi, Ashok Gulati and Ralph Cummings Jr. (Eds.) (2007), *Agricultural Diversification and Smallholders in South Asia*, Academic Foundation, New Delhi.
- Kumar, P. and P.S. BIRTHAL (2004), "Changes in Consumption and Demand for Livestock and Poultry Products in India", *Indian Journal of Agricultural Marketing*, Vol. 18, No. 3, October-December, pp. 110-123.
- Landes, M., S. Persaud and J. Dyck (2004), *India's Poultry Sector: Development and Prospects*, Agriculture and Trade Report WRS04-03, United States Department of Agriculture, Washington, D.C., U.S.A.
- Mehta R., M. Saqib and J. George (2007), "Challenging Avenues in Sanitary and Phyto-sanitary Agreement for India: A Case Study of Selected Processed Food Products", in P.K. Joshi, Ashok Gulati and Ralph Cummings Jr. (Eds.) (2007), *Agricultural Diversification and Smallholders in South Asia*, Academic Foundation, New Delhi.
- Mehta, R., R.G. Nambiar, C. Delgado and S. Subramanyam (2003), "Policy, Technical and Environmental Determinants and Implications of the Scaling-up of Broiler and Egg Production in India", Annex II of the IFPRI-FAO Final Report *Livestock Industrialization, Trade and Social-Health-Environmental Impacts in Developing Countries*, phase II, International Food Policy Research Institute, Washington, D.C., U.S.A.
- Mellor, J. (2004), "Agricultural Growth and Poverty Reduction: The Rapidly Increasing Role of Smallholder Livestock", in (V. Ahuja, Ed.) *Livestock and Livelihoods: Challenges and Opportunities for Asia in the Emerging Market Environment*, National Dairy Development Board, Anand.
- Mittal, S. (2006), *Structural Shift in Demand for Food: Projections for 2020*, Working Paper No. 184, Indian Council for Research on International Economic Relations, New Delhi.
- NDDB (2005), *Annual Report 2004-05*, National Dairy Development Board, Anand, Gujarat.
- OECD (2006), *Producer and Consumer Support Estimates, OECD Database 1986-2005*, Organisation for Economic Cooperation and Development, Paris.
- Peng, T., and T.L. Cox (2006), "An Economic Analysis of the Impacts of Trade Liberalisation on Asian Dairy Market", *Food Policy*, Vol. 31, No. 1, pp. 249-259.
- Pingali, P. (2007), "Westernization of Asian Diets and the Transformation of Food Systems: Implications for Research and Policy", *Food Policy*, Vol. 32, No. 3, pp. 281-298.
- Pingali, P. and Y. Khwaja (2004), *Globalisation of India Diets and the Transformation of Food Supply Systems*, ESA Working Paper No. 04-05, Food and Agriculture Organisation of the United Nations, Rome.
- Pingali, P., Y. Khwaja and M. Meijer (2005), *Commercialising Small Farms: Reducing Transaction Costs*, ESA Working Paper No. 05-08, Food and Agriculture Organisation of the United Nations, Rome.
- Rakotoarisoa, M., and Ashok Gulati (2006), "Competitiveness and Trade Potential of India's Dairy Industry", *Food Policy*, Vol. 31, No. 1, pp. 216-227.
- Ramaswami, B., P.S. BIRTHAL and P.K. Joshi (2006), *Efficiency and Distribution in Contract Farming: The Case of Indian Poultry Growers*, Markets, Trade and Institutions Discussion Paper No. 91, International Food Policy Research Institute, Washington, D.C., U.S.A.
- Ravi, C. and D. Roy (2006), "Consumption Patterns and Food Demand Projections: A Regional Analysis", Paper Presented at the Workshop *Plate to Plough: Agricultural Diversification and Its Implications for the Smallholders*, organised by the International Food Policy Research Institute, Asia office, New Delhi, and the Institute of Economic Growth, New Delhi at New Delhi, September 20-21.
- Sharma, V.P., C. Delgado, S. Staal, R.V. Singh (2003), "Policy, Technical and Environmental Determinants and Implications of the Scaling-up of Milk Production in India", Annex III of the IFPRI-FAO Final Report *Livestock Industrialisation, Trade and Social-Health-Environmental Impacts in Developing Countries*, phase II, International Food Policy Research Institute, Washington, D.C., U.S.A.
- Simmons, P., P. Winters and I. Patrick (2005), "An Analysis of Contract Farming in East Java, Bali and Lombok, Indonesia", *Agricultural Economics*, Vol. 33, No. 3, pp. 513-525.
- Steinfeld, H., and P. Chilonda (2006), "Old Players, New Players" in *Livestock Report 2006*, Food and Agriculture Organisation of the United Nations, Rome.
- Thirunavukkarasu, D. and N.K. Sudeepkumar (2005), "Milk Marketing Options for the Dairy Farmers in Open Economy and Their Choice in Tamil Nadu, India", *Livestock Research for Rural Development*, Vol.17, No. 8. Retrieved from <http://www.cipav.org.co/lrrd/lrrd17/8/thir17092.htm>.
- Upton, M. (2001), *Trade in Livestock and Livestock Products: International Regulation and Role for Economic Development*, Livestock Policy Discussion Paper No. 6, Food and Agriculture Organisation of the United Nations, Rome.