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A micro analysis of fodder production and marketing in Bihar

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ABSTRACT

Production of rice-wheat crop residues, the main dry fodders, is inadequate in north Bihar. In an unorganized fodder market, middlemen dictate the term of fodder trade. The fodder purchased in villages is mostly sold in urban and peri-urban areas. Fodder is processing at every level in marketing channel, particularly in fodder surplus region as paddy straw is purchased from farmers and sold after processing (chaff cutting). The wholesalers are generally engaged in storage of fodder. Farmers are getting only 35 % of consumers' price and 46 % of consumers' price is taken by middlemen as profit margin, which is much higher as compared to food grain marketing. Inadequate storage facilities and space sometimes force producers to untimely dispose of fodder produce. To promote fodder production and trade, it is necessary to improve storage systems - on-farm as well as en route to distant markets. Fodder markets are unorganized and informal and role of public sector/government is negligible. Fodder markets are mostly without any dedicated market place, and are often stationed along roadsides and without legal credentials. Having specific market places may facilitate flow of market information, increase interaction among buyers and sellers and facilitate transparency and competition leading to fairer prices mode.

Key words: Fodder markets, Fodder production, Marketing

Changing patterns of food consumption coupled with demographic changes are resulting in increased demand for livestock products in developing countries (Delgado *et al.* 1999). Evidences indicate that nutrition related problems accounted for about 25 % loss per annum (in value terms) in dairy production and losses due to scarcity of dry and green fodders were estimated to be 5.14 and 7.83 %, respectively, in Bihar (Singh and Jha 2013). Managing green fodder for animals round the year is a serious challenge for farmers as majority of them being marginal and small holders are unable to cultivate fodder and store it leading to shortage during certain periods. Erenstein *et al.* (2007) identified the inadequacy of fodder and their poor nutritive values in the eastern parts of the Indo-Gangetic Plain where agricultural resources, particularly arable land and water are under acute stress. Chronic feed deficit is the major constraint to animal production in eastern states of the country.

The ever increasing urban population is creating huge demand for animal products, particularly milk, attracting more people to start dairy activities leading to increasing demand for fodder in the region. Trading of crop residues is there at village, state and inter-state level but the structure and functioning of these markets are poorly understood and opportunities for improving the efficiency of fodder marketing as a potential tool contributing to the alleviation of fodder scarcity have not been explored. The main objective of the study is to develop a systematic understanding of fodder markets for improving the livelihoods of resource poor livestock producers by suggesting strategies to policy makers for alleviating fodder scarcity.

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MATERIALS AND METHODS

A survey was conducted to understand the relationship in a fodder market among stakeholders like; crop feed producers, vendors, wholesalers, retailers and dairy farmers; and to identify their constraints and opportunities. The focus was on various crop residues used and marketed as fodder. The survey also took into account availability of other types of fodder e.g. cultivated fodder and collected fodders. Local and intra-state fodder exchange had been examined to identify technology, policy, institutional options for improving the efficiency of fodder markets**.** Singh (1997), Singh *et al.* (2009) and Singh *et al.* (2013) identified that recurring floods and changing cropping pattern have created two distinct regions, northern part as fodder deficit and southern part as fodder surplus regions in Bihar.

Multi-stage stratified random sampling method was adopted for selection of sample households for detailed study. North Bihar (fodder deficit region) and south Bihar

(fodder surplus region) form the first stratum for sampling purpose. At the first stage, four districts from each region, making eight sample districts were selected randomly. At next stage, two blocks from each district and two villages from each block were selected, making block sample of 16 blocks and 32 sample villages for drawing respondents for detailed investigations. Finally, for detailed survey, 15 households were randomly selected from each village, making sample size of 480 households. In addition, the other actors of fodder marketing chains consisting of fodder traders (10) and fodder consumers (10) were taken from each district. The total survey sample thus includes fodder producers (480), fodder traders (80) and fodder consumers (80) for this study.

RESULTS AND DISCUSSION

Paddy, wheat, maize and pulses were the main sources of dry fodder in Bihar since these crops constitute about 90 % area under dry fodder in surveyed villages (Table 1). However, maize is not an important source of fodder in surplus region. Production of dry fodder has close association with size of land holdings. In both the regions, larger size of land holdings produced larger quantum of dry fodder.

Rice-wheat cropping system is common in surplus region and constituted about three-fourths of area under dry fodders whereas in fodder deficit region area under these 2 crops constituted about two-thirds of total area under dry fodder crops. Pulses are the third important dry fodder producing crop in surplus region whereas maize emerged as third important dry fodder producing crop in deficit region due to adoption of winter maize in large area. The recent declining trend in area under rice and use of combined harvester in rice-wheat crops, particularly in fodder surplus region, seems to be a threat to fodder availability in Bihar. Other dry fodder crops (other cereals, oilseeds, spices etc) are not important as they contributed less than 1 % to total dry fodder production in surveyed villages.

Green fodder production: Green fodder, one of the most essential components of feeding animals, make them healthy and productive, particularly to obtain desired level of milk production (Singh *et al*. 2012). In Bihar, commercial dairy production started due to expansion of dairy co-operative institutions, which provided assured marketing facilities for milk even in remote villages. But production of green fodder crops was not a common practice. In surveyed villages, the fodder crops (berseem, oat, lucern, jowar, maize etc.) were main sources of green fodder grown on about 1 % of gross cropped area against national average of 4 %. However, *lucern* is grown in sample villages located nearby headquarters of State Agricultural Universities. Per household annual green fodder production/collection was 17 q in study area. Almost negligible area was put to green fodder crops but cultivated fodder constituted about 50 % to total green fodders availability in these villages (Table 2).

Table 1. Average area under different crop (ha/household)

Particulars	Surplus region	Deficit region	Average
Wheat	1.11(30.66)	0.43(25.00)	0.77(28.73)
Paddy	1.60(44.20)	0.73(42.44)	1.17(43.66)
Maize	0.08(2.21)	0.18(10.47)	0.13(4.85)
Other cereals	0.01(0.28)	0.01(0.58)	0.01(0.37)
Pulses	0.46(12.71)	0.13(7.56)	0.29(1.49)
Fodder crops	0.05(1.38)	0.02(1.16)	0.04(1.49)
Miscellaneous	0.31(8.56)	0.21(12.21)	0.25(9.33)
Total	3.62(100.00)	1.72(100.00)	2.68(100.00)

Figures within parenthesis indicate the %.

Table 2. Per household green fodder production on surveyed households (q)

Particulars	Surplus region	Deficit region	Average
Wheat	0.00(0.00)	0.04(0.26)	0.02(0.12)
Paddy	0.19(1.02)	0.03(0.20)	0.11(0.65)
Maize	1.64(8.81)	4.18(27.23)	2.90(17.04)
Other cereals	1.31(7.04)	3.88(25.28)	2.59(15.22)
Pulses	0.23(1.24)	0.03(0.20)	0.13(0.76)
Fodder crops	13.35(71.73)	3.68(23.97)	8.56(50.29)
Miscellaneous	0.66(3.55)	1.68(10.94)	1.18(6.93)
Sugarcane	1.23(6.61)	1.83(11.92)	1.53(8.99)
Total	18.63(100.00)	15.37(100.00)	17.02(100.00)

Figures within parenthesis indicate the %.

Cultivated green fodders contributed about 73 % to total green fodders availability in surplus region against only 24 % in deficit region, mainly due to well-developed agriculture and livestock production systems in the former region. In Bihar, pulses (lathyrus and peas) were important green fodders during terminal months of winter but these were not important crops in the majority of surveyed villages and contributed only 1.23 % in surplus and 0.20 % in deficit region. Sugarcane green tops were commonly used as green fodder and it contributed about 6.61 and 11.92 % to total green fodder production in surplus region and deficit region, respectively. Besides the green fodder production, members of weaker section households collected green fodders (grass, weeds, leaves of perennial trees, bamboo etc) for meeting the requirement of animals in general and dairy animals, in particular, which were estimated to be not less than one million tonnes in a year in Bihar (Singh *et al.* 2009).

Sale of fodder: Inter-region and intra-region dry fodder marketing was a common practice in Bihar. Dry fodder producing crops are grown for production of grains, mainly for human consumption and fodder production is the by-product of crop production process. Rice and wheat straws are main dry fodders which constituted about 95 % of total dry fodders sold in surveyed villages, however, the quantum of sale of these 2 dry fodders was higher in surplus region than that in deficit region (Table 3). Paddy straw was the most important dry fodder with stake of about 66.60 % in dry fodder marketing in surveyed villages, however, its stake was higher in fodder marketing in surplus region (72.10%).

Table 3. Per household different types of dry fodder sold (q)

Particulars	Surplus region	Deficit region	Average
Wheat	14.32	14.55	14.41
Paddy	41.12	23.80	34.31
Maize	00.00	04.40	01.73
Other cereals	00.02	00.00	00.01
Pulses	01.52	00.13	00.98
Other crops	00.05	00.13	00.08
Total	57.03	43.01	51.52

Table 4. Percentage of fodder sold by the farm-household to different type of buyer

Particulars	Surplus region	Deficit region	Average
Farmer	18.89	51.12	29.46
Dairy producer	1.45	0.42	1.12
Vendor	71.59	35.89	59.88
Wholesaler	1.49	4.62	2.51
Retailer	6.58	7.95	7.03

Wheat straw was the second important dry fodder with respect to production and marketing.

Despite much higher production of wheat straw in surplus region, per household quantum of sale was almost identical in both the regions. It was mainly due to farmers' preference to wheat straw over paddy straw for feeding their animals in surplus region. There was no market for maize stalk in surplus region, as the area under maize was almost negligible. Marketing of pulses straw was not a common practice. Per household sale of quantum of pulses straw was higher in surplus region than deficit region, mainly due to higher area and production of pulses in surplus region.

Green fodder production and marketing is in rudimentary stage in Bihar. A very small quantity of green fodder was marketed in peri-urban area in surveyed areas (Gupta *et al*. 2014). Maize green fodders are generally sold after harvesting of cobs, which meet the green fodder demand for poor households within the village. On the other hand, other green fodder marketing was practiced in surplus region but per household quantum of marketing was even less than half quintal. Important reasons for almost absence of green fodder marketing in Bihar may be traced from practice of non-commercialized animal production, predominance of non-descript low yielding animals and poor economic status of majority of farm households. However, government programme for increasing awareness about importance of green fodder is almost absent except some initiatives taken by Bihar State Milk Co-Operative Federation Ltd in making available fodder seeds to members of dairy co-operatives. Wholesaler and dairy producers hardly buy directly from producer farmers in both the regions. However, farmers sold 6 to 8 % of fodder to retailers in surveyed villages. In both the regions, farmers sold their substantial quantity of fodders in their respective villages, particularly to vendors. About one-third of fodder was sold to fellow farmers within their respective villages. The comparatively high sale of fodder to fellow farmers in deficit region was mainly due to availability of large number of farmer purchasers within the village. Fodder being low value high volume produce is costly to transport and hence normally consumed locally (Shah *et al.* 2011). In Bihar also, farmers do not prefer to transport their fodders to market place for sale (Table 4).

While analyzing terms of fodder trade, cash purchase was the common terms of fodder trade in both the regions, however, one-fourth of rural commercial dairy units purchased fodder on credit since they purchased majority of fodders (91%) from fellow farmers.

Fodder marketing process: Fodder marketing, in general, is a simple business, which requires comparatively less capital and specialization. About 89 % vendors, 75 % wholesalers and 88 % retailers were involved in self-started fodder business. A sizable proportion of traders (72.5%) operate from the village doing their business from the home (51.5 %) or from dedicated premises (21%) within their respective village. About 27.5 % of fodder traders operate in urban/ semi-urban areas, generally situated close to motorable roads to facilitate easy transaction and transportation of fodders.

Round the year availability of fodder is essential to ensure continuous supply of fodder. Since Bihar is a fodder deficit state, it is essential that whatever fodder is available should be stored properly. It was observed that about one-fourth of the vendors, one-third of the retailers and half of the wholesalers in Bihar opted for storage of fodder (Table 5). It is a common practice that traders purchase fodder from the farmers/ producers but do not lift whole lot of fodder once at a time. Instead they store fodder in the threshing floor of farmers and lift it gradually as and when required. A meager proportion of fodder is also stored at the business premises or adjacent to houses of the traders. About 41 % traders in the state were involved in some sort

Table 5. Percentage of traders reporting storage and processing

Particulars	Surplus region		Deficit region		Average	
	Storage	Processing	Storage	Processing	Storage	Processing
Vendor	16.7	41.7	33.3	0.0	25.9	18.5
Wholesale trader	50.0	52.0	50.0	0.0	50.0	25.1
Retail trader	26.9	92.3	39.1	8.7	32.7	53.1
Total	25.0	57.5	37.5	5.0	31.3	41.3

of fodder processing. There was a distinct pattern of processing between the deficit and surplus regions. Traders in deficit region hardly opted for processing and only some retailers (9 %) did go for light processing like chopping of maize stovers, etc. It is important to recall that wheat straw is the main marketed fodder in the deficit region and it is automatically chopped in small pieces at producers' farms while harvesting by the combine harvesters or thrashers.

In contrary, paddy straw which dominates the fodder markets in surplus region is harvested and thrashed manually by beating or hitting the small bundles (*antia*) of paddy. It is, thus, imperative that paddy straw is chopped in small pieces before feeding. Chopped paddy straw fetches higher price and hence, almost all retailers and half of wholesalers chopped paddy straw before selling. Even a good % age of venders (42 %) in surplus region was found to be involved in light processing by cutting the paddy straw in fine pieces before selling it in the markets. Surprisingly no other forms of processing like preparation of silage, fodder bricks, urea treated forage, etc. were reported in the study area.

Grading, storage and processing are important marketing functions which are practiced in efficient marketing system. Though fodder marketing is not professionalized in Bihar, two-thirds of farm households stored about 14.51 % fodder produced in surveyed villages. The storage of dry fodder was mainly for own consumption, however, 20 % farmers reported that they stored fodder for selling in off-season on higher prices. Farmers of both the regions do not differ significantly with respect to storage of dry fodder. Grading and sorting were not a common practice in surveyed villages but 8.2 % farmers in surplus region and 3.6 % farmers in deficit region practiced grading of dry fodder. Grading or sorting was only done for paddy straw because it is generally sold without processing. There are some visible variations also in size, colour and texture of paddy and some of the farmers tried to grade before sale of paddy straw. On the other hand, grading was not done in case of wheat dry fodder, since wheat grain and straw are produced simultaneously by threshing of wheat plants. Wheat- straw was sold and there was neither scope nor feasibility for grading of wheat straw.

In sample villages, majority of vendors procured fodder from villages and sold it at different places like nearby markets, towns (peri-urban and urban areas), and other dedicated business premises for fodder (Table 6). The similar pattern of sale was observed in both the regions under study. It is obvious that vendors played a very limited role in meeting the rural demand for fodder. The wholesale traders procured fodder directly from producers in villages and/ or from the vendors at their business premises; mostly established by the side of highways/ roads close to urban centres/ towns. In surplus zone, wholesalers did not face much trouble in securing supply of fodder; they had good contact with different vendors who supply them fodder at their business premises. About 57.5 % of the fodder purchased by the wholesale traders was delivered at their business premises and 42.5 % of fodder purchased by the wholesale traders was obtained from the villages. However, the work of wholesale traders in deficit region was full of drudgery. In order to meet the demand for fodder, they had to procure a major chunk of fodders (74.2 %) from the producers scattered in villages throughout the region. It is evident that merely one-fourth of the fodder (25.8 %) was purchased at the business premises. In surplus region, about two-thirds (67.6 %) of the fodder was sold in town from their business premises. The situation in deficit regionwas exactly opposite because wholesalers were able to sell only 26 % of fodder at their business premises and they need to explore market for sale of fodder in the villages. Almost similar was the situation of retail traders. They had to travel in villages, find producers having surplus fodder or willing to sale, and maintain contact with producers, vendors and agents. All these involve time, money and labour. But their contacts and connections often make the marketing easier. The retail traders were able to sell 96 % of fodder from their business premises only.

Economics of fodder marketing: Fodder marketing involves a number of actors along the supply chain. The most common fodder supply chain begins with the

Table 6. Purchase and sale of fodder by different market functionaries from village and town in study area

(%)

Particulars	Surplus region		Deficit region		Average	
	Village	Town	Village	Town	Village	Town
Vendor						
Purchased	97.6	2.4	94.5	5.4	96.2	3.8
Sold	0	99.9	0.9	99.1	0.4	99.5
Wholesale trader						
Purchased	42.5	57.5	74.2	25.8	58	42
Sold	32.4	67.6	0	100	17.3	82.7
Retail trader						
Purchased	13.1	86.9	54.6	45.4	20.4	79.6
Sold	0	100	0	100	0	100
Total						
Purchased	25.7	74.3	69.5	30.5	36.9	63.2
Sold	1.3	98.7	0.3	99.7	1.1	98.9

Table 7. Marketing cost incurred and net margin of different actors in fodder marketing in the study area

(In ₹/q)

Particulars	Vendors	Wholesale	Retailer	Total	% age of Consumers' Price
Producers price	177	-	-	177	35.4
Transportation costs	1.5	4.9	1.6	8	1.6
Labour and weighing cost	0.5	0.4	2.8	3.7	0.7
Storage cost	8	0.7	1.8	10.5	2.1
Processing cost	26	23.1	19.9	69	13.8
Marketing margin	59	77	96	232	46.4
Consumer price	-	-	-	500.2	100

producers and proceeds further along a number of different channels with the help of various kinds of actors such as vendors, wholesalers, retailers, and ends with the ultimate users, who are scattered across the state.

There are 5 main actors or points of action in the wheat and rice straw supply chain: producer, vendor, wholesaler, retailer and consumer. In between, there are other small actors such as bullock cart owners, assemblers, and commission agents who serve different principal agents to facilitate transactions. Among different marketing channels, the most important channel is "producer-vendor-wholesaler-consumer" which accounts for about two-thirds of fodder marketing in Bihar. Marketing cost and margin in fodder marketing is discussed for this channel only. There are four other important costs in fodder marketing namely; transportation, labour and weighing, storage and processing.

Analysis of cost and margin in fodder marketing revealed that the market margin obtained by different functionaries accounts for about 46.4 % of consumers price however, retailers margin was comparatively high (₹ 96). Fodder is processed at every stage and per quintal cost of processing was worked out at ₹ 69 which was 13.8 % of consumers' rupee. Transportation and labour cost was about 2 % of consumers' price because the most of fodder was marketed in adjacent urban area. In fodder marketing, producers got only 35.4 % of consumers' price. It was only due to non-holding capacity of farm households who do not have sufficient safe place for fodder storage and the majority of them made distress sale of fodder. There is no any market place for fodder, hence, vendors purchase fodder at their own terms.

Inadequate storage facilities and space sometimes force producers to dispose much of their fodder rather than storing it for later use for their own needs or sale when prices are higher. To promote fodder production and trade, it is necessary to improve storage systems -on-farm as well as en route to distant markets. Fodder markets are unorganized and informal and the role of the public sector/government is negligible. Most fodder markets occur without any dedicated market place, often along roadsides and without legal credentials. Having specific market places may facilitate flow of market information, increase interaction among buyers and sellers and facilitate transparency and competition leading to fairer prices.

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