

Original Research Article

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Perception of Extension Functionaries about Input Supply in Jharkhand

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ABSTRACT

Agriculture is witnessing a serious challenge of declining profitability. The development of agriculture, to a large extent, depends on efficient use of modern farm inputs. Public extension system is still dominating in India and, therefore, its role in the supply of inputs is vital. In this background, a study was conducted on "Perception of extension functionaries about input supply in Jharkhand". One district belonging to each five divisions was randomly selected. Similarly, two blocks from each selected districts were also randomly selected. Six extension functionaries at the district level and 21 extension functionaries at the state level and 15 extension functionaries from each selected block were selected for the study. Thus, altogether 201 extension functionary respondents constituted the whole sample. The responses were collected on quantity, quality, price and accessibility of inputs. The computed ' χ^2 ' value revealed that there had been significant difference in the perception between block, district and state level extension functionaries in respect of sufficiency of seeds ($\chi^2=11.62$) and bio- fertilizer ($\chi^2=7.40$), quality of seeds ($\chi^2=9.97$), pesticide ($\chi^2=9.80$) and bio fertilizer ($\chi^2=11.40$) and price of pesticide ($\chi^2=7.45$) and micronutrient ($\chi^2=6.08$). Significant differences were not observed as far as accessibility is concerned. Sufficient quantity of quality inputs should be made available to the farmers at affordable prices to make the farming a lucrative occupation.

Keywords

Perception, Input supply, Extension functionaries

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Introduction

Agricultural development depends to large an extent on the efficient use of modern farm inputs such as chemical fertilizers, improved seeds, pesticides, machinery, and veterinary services. Farmers in developing countries like India are often denied access to modern inputs due to poor infrastructure and the presence of

various constraints arising from restrictive policies and the presence of powerful parastatal organizations. We need to learn important lessons from the Zimbabwe era of the 1940s and 1950s and the brief period of 1990s, when there was phenomenal growth in the Zimbabwean agricultural input supply system bolstered by conducive government policies which laid the foundation for

profitable private sector participation (Bairwa *et al.*, 2013). The role of government is diverse and varied in the development of agriculture sector. Some of the cited reasons for vital role are self-sufficiency, employment creation, support to small scale producers for adopting modern technologies and inputs, reduction of price instability and improvement of the income of farm households. This vital role can take a number of forms such as import-export policies and domestic policies like price support programmes, direct payments, and input subsidies to influence the cost and availability of farm inputs like credit, fertilizers, seeds, irrigation water, etc. Of all the domestic support instruments in agriculture, input subsidies and product price support are the most common. Various benefits are cited in justifying input subsidies: economic, environmental and social (World Bank, 2008). An agricultural subsidy is a governmental financial support paid to farmers and agribusinesses to supplement their income, manage the supply of agricultural commodities, and influence the cost and supply of such commodities (Salunkhe and Deshmukh, 2012). Public extension system still assumed the supremacy over private in ensuring supply of seed of the field crops whereas distribution of seeds of vegetables and planting material was largely in the hand of private. The supply of fertilizer, weedicides, fungicides and insecticides was also done by private agencies while services related to agro-based activities like mushroom production, bee keeping, poultry etc. were perceived inadequate by farmers in respect to both public and private extension system (Singh and Narain, 2008).

The Rockefeller Foundation is supporting three institutions to develop agricultural input supply pipelines in rural Kenya, Malawi, and Uganda with an emphasis on three key factors: (a) affordability; (b) accessibility; and (c) incentives.

Present paper analyses the perception of extension functionaries of Jharkhand Department of Agriculture regarding the quantity, quality, price and accessibility of input supply such as seed, fertilizer, farm implement, pesticide, bio-fertilizer and micronutrient.

Materials and Methods

The study was conducted in purposively selected state of Jharkhand, India. Five districts, one each from the five divisions *i.e.* Godda from Santhal Parganas, Hazaribagh from North Chhotanagpur, Palamu from Palamu, Ranchi from South Chhotanagpur and Saraikela-Kharsawan from Kolhan were randomly selected. Two blocks were selected randomly from each selected districts *i.e.* Pathargama and Sundarpahari from Godda, Sadar and Barkagoan from Hazaribagh, Lesliganj and Chattarpur from Palamu, Namkum and Chanhoo from Ranchi and Rajnagar and Gamharia from Saraikela-Kharsawan districts. Six extension functionaries at the district level, 21 extension functionaries at the state level and 15 extension functionaries from each selected block were selected for this study. Thus, altogether 201 extension functionary respondents constituted the sample.

Perception has been viewed as the organization, identification, and interpretation of sensory information in order to represent and understand the presented information, or the environment (Schacter, 2011). The responses were taken against the statements containing the items quantity supplied, quality, price and accessibility with the input supply such as seed, fertilizer, farm implement, pesticide, bio-fertilizer, micronutrient and others, were scored as scores given in parentheses quantity of supply: sufficient (2) and not sufficient (1), quality: good (3), average (2) and below average (1),

price: more than market (2) and less than market (1) and accessibility: all farmers (2) and particular group of farmers (1).

Results and Discussion

Input supply is one of the mandates of Jharkhand Department of Agriculture. There are many schemes under which the department provides input like seed, fertilizer, pesticide, bio-fertilizer, micronutrients and farm implements.

Perception of extension functionary respondents about sufficiency of input supply

Frequency distribution of extension functionary respondents in respect of perception about sufficiency of input supply is presented in Table 1. Perusal of the table indicated that majority of block extension functionaries were of the view that seeds (67.33%), fertilizer (54.00%), pesticide (53.33%), bio fertilizer (60.00%) and micronutrient (62.00%) were supplied in sufficient quantity. However, in the perception of majority of respondents (52.67%) the farm implement was not supplied in sufficient quantity. Substantially high percentage of respondents perceived that seeds (32.67%), fertilizer (46.00%), pesticide (44.00%), bio-fertilizer (40.00%) and micronutrient (38.00%) were not supplied in sufficient quantity.

In case of district level extension functionaries, the majority of respondents were of the view that seeds (76.67%), fertilizer (60.00%), farm implement (56.67%), pesticide (66.67%), bio fertilizer (56.67%) and micronutrient (63.33%) were supplied in sufficient quantity.

Substantially high percentage of respondents perceived that seeds (23.33%), fertilizer

(40.00%), farm implement (43.33%), pesticide (33.00%), bio- fertilizer (43.33%) and micronutrient (36.67%) were not supplied in sufficient quantity.

Whereas majority of state level extension functionary respondents were of the view that fertilizer (57.14%), farm implement (52.38%), pesticide (52.38%), bio fertilizer (28.57%) and micronutrient (42.86%) were supplied in sufficient quantity. However, majority of the respondents (66.67%) perceived that seed was not supplied in sufficient quantity. Substantially high percentage of respondents perceived that fertilizer (42.86%), farm implement (47.62%), pesticide (47.62%), bio fertilizer (71.43%) and micronutrient (57.14%) were not supplied in sufficient quantity.

Analysis of pooled data revealed that majority of the respondents expressed the view that seeds (65.17%), fertilizer (55.22%), pesticide (57.21%), bio-fertilizer (52.22%) and micronutrient (60.20%) were provided in sufficient quantity to the farmers. Whereas majority of the respondents (50.75%) were of the view that farm implements were not provided to the farmer in sufficient quantity.

The computed ' χ^2 ' value revealed that there had been significant difference in the perception between block, district and state level extension functionaries in respect of seeds ($\chi^2=11.62$) and bio- fertilizer ($\chi^2=7.40$). The differences in perception may be due to the fact that state level extension functionaries are more aware about the impact of seeds in increasing seed replacement rate and bio-fertilizer in the promotion of integrated nutrient management and organic farming. The fact remains that the perception about sufficiency of inputs is due to unawareness of farmers about Government schemes owing to which there is not much demand by the farming community.

Perception of extension functionary respondents about quality of input

Frequency distribution of extension functionary respondents about perception of quality of input is presented in Table 2. Perusal of the table revealed that majority of the block level extension functionary respondents were of the view that quality of seeds (73.33%), fertilizer (65.33%), farm implement (65.33%), pesticide (70.67%), bio-fertilizer (70.00%) and micronutrient (70.00%) was good.

However, some of the respondents expressed the view that seeds (24.00%), fertilizer (30.67%), farm implements (29.33%), pesticide (25.33%), bio-fertilizer (24.67%) and micronutrient (23.33%) was of average quality. Only 2.67%, 4.00%, 5.33%, 4.00%, 5.33% and 6.67% respondents were of the view that seeds, fertilizer, farm implements, pesticide, bio-fertilizer and micronutrient respectively were of below average quality.

The majority of the district level extension functionaries were of the view that quality of seeds (73.33%), fertilizer (73.33%), farm implement (60.00%), pesticide (56.67%), bio-fertilizer (46.67%) and micronutrient (53.33%) was good. However, some of the respondent expressed the view that seeds (20.00%), fertilizer (20.00%), farm implements (36.67%), pesticide (33.33%), bio fertilizer (40.00%) and micronutrient (33.33%) was of average quality. Only 6.67%, 6.67%, 3.33%, 10.00%, 13.33% and 13.33% respondents were of the view that seeds, fertilizer, farm implements, pesticide, bio-fertilizer and micronutrient respectively were of below average quality.

The majority of the state level extension functionaries were of the view that quality of seeds (47.62%), fertilizer (61.90%), farm implement (66.67%), pesticide (47.62%), bio-

fertilizer (52.38%) and micronutrient (52.38%) was good. However, some of the respondents expressed the view that seeds (52.38%), fertilizer (38.10%), farm implements (33.33%), pesticide (52.38%), bio-fertilizer (47.62%) and micronutrient (47.62%) was of average quality. No respondents expressed the view that the inputs were of below average quality.

Analysis of pooled data revealed that majority of the respondents were of the view that quality of seeds (70.65%), fertilizer (66.17%), farm implement (64.68), pesticide (66.17%), bio-fertilizer (64.68%) and micronutrient (65.67%) was good.

However, some of the respondent expressed the view that seeds (23.67%), fertilizer (29.85%), farm implements (30.85%), pesticide (29.35%), bio-fertilizer (29.35%) and micronutrient (27.36%) was of average quality. Only 2.99%, 3.98%, 4.48%, 4.48%, 5.97% and 6.97% respondents reported that seeds, fertilizer, farm implements, pesticide, bio-fertilizer and micronutrient respectively were of below average quality.

The calculated ' χ^2 ' value showed significant difference in case of seeds ($\chi^2=9.97$), pesticide ($\chi^2 =9.80$) and bio fertilizer ($\chi^2=11.40$) between block, district and state level extension functionaries. The government purchases inputs through tender process and purchase order is given to the lowest bidder. In the process, many reputed firms do not compete whose brands are rated high in the perception of extension functionaries and farmers.

Perception of extension functionaries about price of input

Frequency distribution of extension functionary respondents about price of input is presented in Table 3.

Table.1 Perception of extension functionary respondents about sufficiency of input supply

Sl. No.	Area	Block (n=150)		District (n=30)		State (n=21)		Pooled (N=201)		' χ^2 ' value
		Sufficient	Not sufficient	Sufficient	Not sufficient	Sufficient	Not sufficient	Sufficient	Not sufficient	
1	Seeds	101 (67.33)	49 (32.67)	23 (76.67)	7 (23.33)	7 (33.33)	14 (66.67)	131 (65.17)	70 (34.82)	11.62 *
2	Fertilizer	81 (54.00)	69 (46.00)	18 (60.00)	12 (40.00)	12 (57.14)	9 (42.86)	111 (55.22)	90 (44.78)	0.40 NS
3	Farm Implement	71 (47.33)	79 (52.67)	17 (56.67)	13 (43.33)	11 (52.38)	10 (47.62)	99 (49.25)	102 (50.75)	0.96 NS
4	Pesticide	84 (56.00)	66 (44.00)	20 (66.67)	10 (33.33)	11 (52.38)	10 (47.62)	115 (57.21)	86 (42.79)	1.39 NS
5	Bio fertilizer	90 (60.00)	60 (40.00)	17 (56.67)	13 (43.33)	6 (28.57)	15 (71.43)	113 (56.22)	88 (43.78)	7.40 *
6	Micronutrient	93 (62.00)	57 (38.00)	19 (63.33)	11 (36.67)	9 (42.86)	12 (57.14)	121 (60.20)	80 (39.80)	2.96 NS

Figures in parentheses indicate percentages

*Significant at the 0.05 level of probability

NS = Non Significant

Table.3 Perception of extension functionaries about price of input

Sl. No.	Input	Block (n=150)		District (n=30)		State (n=21)		Pooled (N=201)		' χ^2 ' value
		More than market	Less than market	More than market	Less than market	More than market	Less than market	More than market	Less than market	
1	Seeds	31 (20.67)	119 (79.33)	4 (13.33)	26 (86.67)	8 (38.10)	13 (61.90)	43 (21.39)	158 (78.61)	3.29 NS
2	Fertilizer	34 (22.67)	116 (77.33)	5 (16.67)	25 (83.33)	9 (42.86)	12 (57.14)	48 (23.88)	153 (76.12)	5.14 NS
3	Farm Implement	27 (18.00)	123 (82.00)	6 (20.00)	24 (80.00)	6 (28.57)	15 (71.43)	39 (19.40)	162 (80.60)	1.32 NS
4	Pesticide	18 (12.00)	132 (88.00)	3 (10.00)	27 (90.00)	7 (33.33)	14 (66.67)	28 (13.93)	173 (86.07)	7.45*
5	Bio fertilizer	15 (10.00)	135 (90.00)	4 (13.33)	26 (86.67)	6 (28.57)	15 (71.43)	25 (12.44)	176 (87.56)	5.86 NS
6	Micronutrient	15 (10.00)	135 (90.00)	5 (16.67)	25 (83.33)	6 (28.57)	15 (71.43)	26 (12.94)	175 (87.06)	6.08*

Figures in parentheses indicate percentages

* Significant at the 0.05 level of probability

NS = Non Significant

Table.2 Perception of extension functionaries about quality of input

Sl. No.	Particular	Block (n=150)			District (n=30)			State (n=21)			Pooled (N=201)			'χ ² ' value
		Good	Avg.	Below avg.	Good	Avg.	Below avg.	Good	Avg.	Below avg.	Good	Avg.	Below avg.	
1	Seeds	110 (73.33)	36 (24.00)	4 (2.67)	22 (73.33)	6 (20.00)	2 (6.67)	10 (47.62)	11 (52.38)	0 (0.00)	142 (70.65)	53 (26.37)	6 (2.99)	9.97 *
2	Fertilizer	98 (65.33)	46 (30.67)	6 (4.00)	22 (73.33)	6 (20.00)	2 (6.67)	13 (61.90)	8 (38.10)	0 (0.00)	133 (66.17)	60 (29.85)	8 (3.98)	3.17 NS
3	Farm Implement	98 (65.33)	44 (29.33)	8 (5.33)	18 (60.00)	11 (36.67)	1 (3.33)	14 (66.67)	7 (33.33)	0 (0.00)	130 (64.68)	62 (30.85)	9 (4.48)	1.88 NS
4	Pesticide	106 (70.67)	38 (25.33)	6 (4.00)	17 (56.67)	10 (33.33)	3 (10.00)	10 (47.62)	11 (52.38)	0 (0.00)	133 (66.17)	59 (29.35)	9 (4.48)	9.80 *
5	Bio fertilizer	105 (70.00)	37 (24.67)	8 (5.33)	14 (46.67)	12 (40.00)	4 (13.33)	11 (52.38)	10 (47.62)	0 (0.00)	130 (64.68)	59 (29.35)	12 (5.97)	11.40 *
6	Micronutrient	105 (70.00)	35 (23.33)	10 (6.67)	16 (53.33)	10 (33.33)	4 (13.33)	11 (52.38)	10 (47.62)	0 (0.00)	132 (65.67)	55 (27.36)	14 (6.97)	9.34 NS

Figures in parentheses indicate percentages

*Significant at the 0.05 level of probability

NS = Non Significant

Table.4 Perception of extension functionary respondents about accessibility of input

Sl. No.	Input	Block (n=150)		District (n=30)		State (n=21)		Pooled (N=201)		'χ ² ' value
		All farmers	Particular group of farmers	All farmers	Particular group of farmers	All farmers	Particular group of farmers	All farmers	Particular group of farmers	
1	Seeds	73 (48.67)	77 (51.33)	15 (50.00)	15 (50.00)	10 (47.62)	11 (52.38)	98 (48.76)	103 (51.24)	0.03 NS
2	Fertilizer	57 (38.00)	93 (62.00)	12 (40.00)	18 (60.00)	12 (57.14)	9 (42.86)	81 (40.30)	120 (59.70)	2.81 NS
3	Farm Implement	48 (32.00)	102 (68.00)	9 (30.00)	21 (70.00)	9 (42.86)	12 (57.14)	66 (32.84)	135 (67.16)	1.11 NS
4	Pesticide	64 (42.67)	86 (57.33)	9 (30.00)	21 (70.00)	10 (47.62)	11 (52.38)	83 (41.29)	118 (58.71)	2.04 NS
5	Bio fertilizer	49 (32.67)	101 (67.33)	6 (20.00)	24 (80.00)	10 (47.62)	11 (52.38)	65 (32.34)	136 (67.66)	4.34 NS
6	Micronutrient	53 (35.33)	97 (64.67)	5 (16.67)	25 (83.33)	10 (47.62)	11 (52.38)	68 (33.83)	133 (66.17)	5.88 NS

Figures in parentheses indicate percentages

NS = Non Significant

Perusal of the table indicated that majority of the block level extension functionaries were of the view that price of seeds (79.33%), fertilizer (77.33%), farm implement (82.00%), pesticide (88.00%), bio fertilizer (90.00%) and micronutrient (90.00%) was less than market. However, some respondents expressed the view that seeds (20.67%), fertilizer (22.67%), farm implements (18.00%), pesticide (12.00%), bio- fertilizer (10.00) and micronutrient (10.00%) were supplied at more than market price prevailing in local market.

In case of district level extension functionaries, majority of respondents were of the view that price of seeds (86.67%), fertilizer (83.33%), farm implement (80.00%), pesticide (90.00%), bio- fertilizer (86.67%) and micronutrient (83.33%) was less than market. However, a few respondents expressed the view that seeds (13.33%), fertilizer (16.67%), farm implements (20.00%), pesticide (10.00%), bio fertilizer (13.33) and micronutrient (16.67%) were supplied at more than market price prevailing in local market.

The majority of state level extension functionaries expressed the view that price of seeds (61.90%), fertilizer (57.14%), farm implement (71.43%), pesticide (66.67%), bio-fertilizer (71.43%) and micronutrient (71.43%) was less than market. However, a few respondents expressed the view that seeds (38.10%), fertilizer (42.86%), farm implements (28.57%), pesticide (33.33%), bio- fertilizer (28.57) and micronutrient (28.57%) were supplied at more than market price prevailing in local market.

The pooled data indicated that majority of the respondents were of the view that price of seeds (78.61%), fertilizer (76.12%), farm implement (80.60%), pesticide (86.07%), bio-fertilizer (87.56%) and micronutrient

(87.06%) was less than market. However, a few percentage of respondents expressed the view that seeds (21.39%), fertilizer (23.88%), farm implements (19.40%), pesticide (13.93%), bio- fertilizer (12.44) and micronutrient (12.94%) were supplied at more than market price prevailing in local market.

The computed ' χ^2 ' value indicated significant difference in respect of pesticide ($\chi^2=7.45$) and micronutrient ($\chi^2=6.08$) meaning thereby significant difference in the perception block, district and state level extension functionaries. This is the perception of the extension functionaries taking into account Government subsidy. Even then the significant difference in the perception of block, district and state level functionaries in respect of pesticide and micronutrient gives a cue that Government should think about price rationalization and subsidy support.

Perception of extension functionary respondents about accessibility of input

Frequency distribution of extension functionary respondents about the perception of accessibility of input is presented in Table 4. The table indicated that majority of the block level extension functionaries expressed the view that seeds (51.33%), fertilizer (62.00%), farm implements (68.00%), pesticide (57.33%), bio- fertilizer (67.33%) and micronutrient (64.67%) were accessible to only particular group of farmers. However, a substantially high percentage of respondents expressed the view that seeds (48.67%), fertilizer (38.00%), farm implements (32.00%), pesticide (42.67%), bio- fertilizer (32.67%), and micronutrient (35.33%) were available to all the farmers.

The majority of the district level extension functionary respondents expressed the view that seeds (50.00%), fertilizer (60.00%), farm implements (70.00%), pesticide (70.00%),

bio- fertilizer (80.00%) and micronutrient (83.33%) were accessible to only particular group of farmers. However, a substantially high percentage of respondents expressed the view that seeds (50.00%), fertilizer (40.00%), farm implements (30.00%), pesticide (30.00%), bio- fertilizer (20.00%), and micronutrient (16.67%) were available to all the farmers.

The majority of the state level extension functionaries expressed the view that seeds (52.38%), fertilizer (42.86%), farm implements (57.14%), pesticide (52.38%), bio fertilizer (52.38%) and micronutrient (52.38%) were accessible to only particular group of farmers. However a substantially high percentage of respondents expressed the view that seeds (47.62%), fertilizer (57.14%), farm implements (42.86%), pesticide (47.62%), bio fertilizer (47.62%), and micronutrient (47.62%) were available to all the farmers.

The pooled data revealed that majority of the respondent expressed the view that seeds (51.24%), fertilizer (59.70%), farm implements (67.16%), pesticide (58.71%), bio- fertilizer (57.66%) and micronutrient (66.17%) were accessible to only particular group of farmers. However, a substantially high percentage of respondents expressed the view that seeds (48.76%), fertilizer (40.30%), farm implements (32.82%), pesticide (41.29%), bio- fertilizer (32.34%), and micronutrient (33.83%) were available to all the farmers.

The calculated ' χ^2 ' values were found non-significant in all the cases *i.e.* seeds, fertilizer, farm implements, pesticide, bio- fertilizer and micronutrient which indicated that there were no significant differences in the perception between block, district and state level extension functionaries. The non-significant difference in the perception between block,

district and state level extension functionaries leads to infer that most of the schemes are for particular group of farmers laden with stringent criteria and the extension workers have to take the schemes to targeted group of farmers, so, they did not perceive any problem on account accessibility.

It can be concluded that there had been significant difference in the perception between block, district and state level extension functionaries in respect of sufficiency of seeds ($\chi^2 = 11.62$) and bio-fertilizer ($\chi^2 = 7.40$), quality of seeds ($\chi^2 = 9.97$), pesticide ($\chi^2 = 9.80$) and bio fertilizer ($\chi^2 = 11.40$) and price of pesticide ($\chi^2 = 7.45$) and micronutrient ($\chi^2 = 6.08$). Significant differences were not observed as far as accessibility is concerned. The farmers, by and large, are not aware about Government schemes. There is not much difference in price even after Government subsidy. There is a need for broad basing the schemes so that all the needy farmers could access the Government support. Sufficient quantity of quality inputs should be made available to the farmers at affordable prices. These will ensure reduction in cost of cultivation thereby increase the income of the farmers to make the farming a lucrative occupation.

References

- Rockefeller Foundation Report (2001). Developing rural agricultural input supply systems for farmers in Africa (Malawi, Kenya, and Uganda)
- Salunkhe and Deshmukh (2012) the over view of Government subsidies to agriculture sector in India, Journal of agriculture and veterinary science vol 1 pp 43-47
- Schacter, Daniel (2011). *Psychology*. Worth Publishers.
- Shoji Lal Bairwa, S. Kushwaha, and Suresh Bairwa (2013). Agricultural Inputs and

- Service Delivery Systems in India: A Review, www. Academia edu/
Singh, A.K. and Narain, S. (2008). Effectiveness of Public and Private Extension Service, *Indian Research Journal Extension Education*, 8(2&3): 110-114.
- Swanson, B.E., B.J. Farner, and R. Bahal. (1990). The Current Status of Agricultural Extension. Traditional Frontiers. World Bank Discussion Paper 236. Washington, D.C.

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