

See discussions, stats, and author profiles for this publication at: <https://www.researchgate.net/publication/263773149>

# Adoption of Modern Agricultural Technologies in Bihar : A Farm Level Study

Article · April 2014

CITATIONS

28

READS

3,260

3 authors:



**K. M. Singh**

Dr Rajendra Prasad Central Agricultural University Pusa

482 PUBLICATIONS 2,168 CITATIONS

SEE PROFILE



**R.K.P. Singh**

ICAR Research Complex for Eastern Region

132 PUBLICATIONS 842 CITATIONS

SEE PROFILE



**Abhay Kumar**

ICAR Research Complex for Eastern Region

156 PUBLICATIONS 573 CITATIONS

SEE PROFILE

## Adoption of Modern Agricultural Technologies in Bihar : A Farm Level Study

K. M. Singh, R. K. P. Singh, Abhay Kumar

Received 17 January 2014; Accepted 7 April 2014; Published online 19 April 2014

**Abstract** Transfer of technology is main obstacle in realizing agricultural potential in India. Present study focuses on level of adoption, access and quality of modern technology, access to extension institutions and problems faced by extension officials in transfer of technology. Study is based on primary data collected during 2013 from farm households, agricultural scientists and extension officers and covers all the four agro-climatic zones of Bihar. Focused group Discussion and Survey method was used. Analysis revealed that KVKs covered less than one per cent of

villages under their jurisdiction, therefore govt departments were mainly responsible for implementation of agricultural development. Overall, only 22.8 percent farmers used modern seeds however, it was high at 46.67% for medium farmers. About 50 percent large farmers adopted scientific method of production of horticultural crops. About 6.25 percent farmers used pesticide in crop production compared to 12.50 and 8.0 percent in case of large farmers and marginal farmers, respectively. Only 12.50 percent farmers used paddy varieties released within five years but majority (76.25%) used varieties which were 10-20 years old, namely, *Sita, Pankaj, Rajshree, Mahsuri*. Dep of Agriculture, ATMA and KVK were main sources of information. High proportion of large farmer had access to these sources than other categories. Public system of seed production and distribution found weak which along with dissemination of information about modern agricultural development projects/schemes is a necessary factor for adoption of modern technology.

---

K. M. Singh\*  
Principal Scientist and Head,  
Division of Socio-Economics & Extension,  
ICAR Research Complex for Eastern Region,  
Patna, India  
e-mail : m.krishna.singh@gmail.com

R. K. P. Singh  
Professor of Agricultural Economics (Retd),  
Rajendra Agricultural University,  
Pusa-Samastipur, Bihar, India  
e-mail : rkpsingh2k3@rediffmail.com

A. Kumar  
Principle Scientist (Agricultural Statistics),  
Division of Socio-Economics & Extension,  
ICAR Research Complex for Eastern Region  
Patna, India  
e-mail : akumar1904@rediffmail.com  
\*Correspondence

**Keywords** Agricultural technology, Adoption, Technology dissemination, Bihar.

### Introduction

A large number of agricultural development programmes have been launched for transfer of modern agricultural technologies in Bihar and among various factors, ineffective transfer of farm technology is an important causal factor for poor performance of

**Table 1.** Number of villages covered under various Agricultural Development Schemes in study area, Bihar during 2012-13.

Head	Agri. Depart-			Total
	ATMA	ment	KVK	
Horticulture Mission	19	28	–	47
Front line department	–	1	55	56
ISOPOM	3	9	11	23
NFSM	4	272	–	276
RKVV	–	381	–	381
Macro-mode	–	9	–	9
Micro-irrigation	–	2	–	2
Total	26	702	66	792

agriculture in Bihar [1]. Only 0.4 per cent farmers had access to public extension workers for information on modern farm technology in Bihar against 5.7 per cent at national level and 22 per cent in Gujarat [2]. There exists a wide gap between potential and actual yields due to many agro-economic and socio-political factors, but weak and ineffective agricultural technology transfer is one of the most important factors [3]. Against this background, need to identify the farm technologies adopted by farmers as non-adoption of technologies viz. seed, fertilizer, pesticide, package of practices, irrigation schedule, might be the main reason of poor performance of agriculture in Bihar. The study deals with the level of adoption of modern agricultural technologies, access and quality of modern technology, and outreach of agricultural extension institutions in Bihar.

### Materials and Methods

The study is based on primary data obtained through survey of farm households, agricultural scientists and extension officers and covers all four agro-climatic zones i.e. North-west alluvial plain (Zone I), North-east alluvial plain (Zone-II), South-east alluvial plain (Zone-III) and North-west alluvial plain (Zone-IIIB) of Bihar. Farmers were selected using Stratified Random Sampling technique. Four agro-climatic zones of Bihar are considered as first stratum for selection of sample districts and two representative districts were selected from each zones, with a restriction that districts were not adjacent. At the third level, one block from each selected districts and at fourth level,

**Table 2.** Adoption of Modern Technology by Sample Farm Households in study villages in Bihar.

Farmer's Categories	Percentage of farmers				
	Advanced Horti-culture	Modern Seeds	Pesti-cides	AI of Animals	Advanced Fisheries
Marginal (72)	18.06	13.89	8.33	73.61	1.39
Small (57)	26.32	28.07	3.51	63.16	3.51
Medium	20.00	46.67	0.00	60.00	0.00
Large (16)	50.00	18.75	12.50	56.25	0.00
Total (160)	24.38	22.50	6.25	66.88	1.88

two villages from each sample block were selected, making sample of 16 villages for selection of farmers. Further, 10 farmers representing different class and social groups were selected randomly from each village, making total sample size of 160. Information collected on profile of farmers, irrigation status, crop production, use of inputs, sources of inputs, sources of knowledge, package of practices, participation in agricultural development schemes, govt assistance, knowledge about modern agricultural technologies, livestock, fish production and govt services in allied agricultural sector. Attention was given to adoption level of modern agricultural technologies and process of flow of information. The present study, is not designed to provide definitive answers but rather to flag issues for subsequent in-depth research.

### Results and Discussion

There are several agricultural development programmes launched for transfer of technology by state and central government. Department of agriculture (DOA) implements these projects along with Krishi Vigyan Kendra (KVK) and Agriculture Technology Management Agency (ATMA) [4]. Study attempted to find out number of villages covered under different programmes by ATMA, KVK and Department of agriculture. Analysis revealed that the KVKs covered less than one per cent of villages under their jurisdiction. On the other hand, their participation in other agricultural development programmes was almost negligible (Table 1). Line department officials (DAOs/BAOs) were engaged in transfer of technology programme through schemes by covering, on an average, 70 villages in each district. Despite a large

**Table 3.** Farm category wise proportion of farmers purchasing seeds from government sources.

Farmer's categories	Percentage of farmers				
	Wheat	Paddy	Maize	Pulses/Oil seeds	Vegetables
Marginal (72)	25.00	20.83	15.28	6.94	0.00
Small (57)	43.86	29.82	15.79	19.30	5.26
Medium (15)	53.33	26.67	20.00	13.33	0.00
Large (16)	56.25	25.00	6.25	12.50	6.25
Total (160)	37.50	25.00	15.00	12.50	2.50

number of agricultural development programmes handled by them, comparatively small proportion of farmers reported their access to line department officials. ATMA, on an average, could cover only 5 villages and 280 farmers in their respective districts. This shows that line departments are still the main agency for implementation of agricultural development schemes whereas KVK and ATMA were only helping them. It is high time that KVK and ATMA be given more responsibility for faster transfer of technology in Bihar. So far as the criteria followed in selection of village for implementing agricultural development schemes, the extension officers reported, nearness to office, easy access and acquaintance in village were important criteria for selection of village. It was also found that all the three institutions (DoA, KVK and ATMA) were operating in same set of villages in most of the districts and in some cases the same set of farmers were targeted, with preference to educated large farmers having irrigated land. Small, illiterate and tenant farmers were often ignored in implementing agricultural development projects in Bihar.

Adoption of modern agricultural technology helps farmers in increasing productivity by more than three-fold, particularly in field crops [4]. It was observed that overall 22.8 percent farmers used modern seeds in study area while, medium farmers (46.67%) and marginal farmers (13.89%) used modern seeds (Table 2). In spite of resources available to large farm households, only 18.75 percent used modern seeds. Medium and small farmers emerged as better adopters of modern seeds since they might have tried to realize higher yield by using modern seeds and method of scientific crop production from their small size of land holdings. However, the adoption level of modern varieties of seeds was much higher in agro-

climatic zone IIIB (South-west alluvial plains) than Agro-climatic Zone I, II and IIIA in Bihar mainly due to assured irrigation facilities in the zone. Comparatively high proportion of large farmers (50%) adopted scientific method of production of horticultural crops. The comparatively low proportion of marginal, small and medium farmers adopted scientific method of horticultural crop production technology as they had smaller landholding and could not afford to put their land in horticultural crops and preferred to produce foodgrains. Only 2.50 percent of farmers availed financial and technical assistance under NHM as it was available for area of one ha or more which majority did not own at one place.

Insecticide/pesticide use in crop production, particularly in food grain production is very low in Bihar as only 6.25 percent farmers used pesticide in crop production, however, 12.50 percent large farmers used pesticide but none of medium farmers used pesticide in surveyed year; however about 8 percent marginal farmers used pesticide in crop production, mainly in vegetable cultivation. Farmers using pesticide reported poor quality of pesticides in the market along with lack of reliable information on formulation, quality and appropriate type of pesticides to be used. Thus, a need to improve the farmer's knowledge through strengthening the extension system.

Animal production is the most important secondary occupation in rural areas and Artificial insemination (AI) is most practicable and economically feasible method breed improvement for increasing livestock production [5]. About three-fourth farm household adopted this method for their dairy animals. But they depended on co-operatives or private sources for AI services as out of 538 blocks only 450 Block AI Centres were operational in Bihar.

Seed is the most important critical input for increasing crop production hence, the reliability of seeds is more important. Farmers when asked to indicate "whether they ever purchased modern seeds of principal crops" from public sources, about 37.50 percent reported purchasing wheat seeds from government sources however access to government sources for wheat seeds was higher for large and medium farmers (<50%). Only 25 percent of marginal farmers purchased wheat seeds from government sources, indicating less priority to marginal farmers in seed distribution programme of Government. It is worth noting

**Table 4.** Aging of seeds of principal crops in surveyed villages of Bihar.

Crops	Period of seed release							
	< 5 years		5-10 years		10-20 years		> 20 years	
	No. of farmers	%	No. of farmers	%	No. of farmers	%	No. of farmers	%
Paddy	20	12.5	60	37.50	62	38.75	39	24.38
Wheat	25	15.63	26	16.25	47	29.38	56	35.00
Maize	34	21.25	56	35.00	12	7.50	0	0.00
Pulses	2	1.25	20	12.50	17	10.63	0	0.00

that only 15 percent farmers purchased maize seeds from government sources and mainly due to fact that two interviewed villages were located adjacent to Rajendra Agricultural University, Pusa. (Table 3).

About one-fourth of all four categories purchased paddy seeds from govt. sources but almost all farm households were using local varieties of pulses seeds and only 12.5 percent of farmers purchased modern varieties of pulses/oil seeds from government sources like National seeds Coorporation (NSC) and State Farm Corporation (SFC), but these seeds were not released within the period of five years [6].

Though vegetables/fruits cover only 10 percent of cropped area but generate 50 percent of income earned through crop production in Bihar, still Government has not made any dent in production and sale of vegetable seeds. About 97.50 percent farmers reported use of vegetable seeds either home grown or purchased from market. Despite implementation of NHM, farmers' access to modern varieties of vegetable seeds has not been improved. State government's Road Map for production and distribution of vegetable seeds has not been implemented. There is an urgent need to launch a massive vegetable seed multiplication and technology transfer programme in Bihar.

Seed is a critical and basic input for attaining sustainable growth in agricultural production and a carrier of new technology for crop production and purity of even self-pollinated seeds is maintained only up to five years of release but farmers are still using varieties released in 1970s [6]. Though statistics on use of High Yielding Varieties (HYV) seeds by government indicates more than 90 percent coverage under HYV seeds of each wheat and maize crops and more than 70 percent in case of paddy but the major-

ity of farmers used degenerated seeds, particularly in case of rice wheat. Seeds were categorized in four major categories, varieties released during last five years, last 5 - 10 years, last 10 - 20 years and more than 20 years. Farmers were asked to indicate the name of varieties of principal crops which were used by them to know the year of their release and varieties released within five years were considered as quality modern seed variety (Table 4). Analysis revealed that only 12.50 percent farmers used paddy seed varieties released within the period of five years, but majority (76.25%) used varieties released during last 10-20 years. Farmers used paddy varieties, *Sita*, *Pankaj*, *Rajshree*, *Mansuri* released more than 15 years ago and one-fourth even reported using varieties released more than 20 year ago. In case of wheat, about 16 percent farmers used recently released varieties which were released within five years and 16.25 per cent used wheat seed varieties released within 5 to 10 years. At the same time about 29 percent farmers used seeds released during last 10 to 20 years. However, 35 percent of farmers used wheat seeds (UP 262), released more than 20 years ago and majority were not able to recognize the wheat varieties used by them. Bihar is leader in production of winter maize in the country. The majority of farmers (56%) used maize varieties released during last 10 years. Only 12 out of 104 maize growing farmers used maize seeds released during last 10-20 years. Majority of farmers purchased recently released hybrid maize varieties. In Bihar, maize seed market is dominated by private sector and stake of state agricultural university, Bihar Government and public seed corporation has been dismal.

Pulses are principal crop in Bihar but farmers do not have access to modern varieties of seeds. Only 1.25 percent interviewed farmers could use recently released varieties (released during last 5 years), how-

**Table 5.** Dissemination of information about modern agricultural technologies and development projects/schemes in sample villages, Bihar. \*Some farmers are getting information from multiple sources, figure in parentheses denote the number of farmers interviewed.

Farmer's categories	Percentage of farmers		
	Dep of Agriculture	ATMA	KVK
Marginal (72)	29.17	41.67	54.17
Medium (15)	35.09	50.88	59.65
Medium (15)	6.67	53.33	53.33
Large (16)	25.00	68.75	81.25
Total (160)	28.75	48.75	58.75

ever, 75 percent of interviewed farmers were using local varieties of pulses because recently released pulses varieties were not available, mainly due to poor performance of agricultural research system in Bihar. Pulses production also got less priority in research and transfer of technology programmes, resulting in unavailability of recently released pulses varieties, low level of awareness among farmers about pulses varieties and poor access of farmers to modern varieties of pulses in Bihar. While analyzing the various the sources of information among the public sources it was found that KVK were main source of information to 58.75 per cent farmers, followed by ATMA (48.75%) and DoA (25.75%). It showed that newly created institutions like KVK and ATMA performed better than line departments of State Government in transfer of technology (Table 5).

## Conclusion

Transfer of technology has been the main obstacle in realizing agricultural potential in the country in general and Bihar in particular. The present study focuses on level of adoption, access of farmers to farm technology, quality of modern technology, access to agricultural extension institutions and problems faced by extension officials in transfer of farm technology. It has been observed that the coverage of agricultural development programmes is limited to few villages, however, line department still dominates in spreading of modern agricultural technology. Mandate given to newly created institutions (ATMA and KVK) is still

limited for few activities. Adoption level of artificial insemination is comparatively high due to active participation of co-operatives and private sector in Bihar. Less than one fourth of farmers could adopt advanced horticulture and modern crop seeds in Bihar. Small size of land holding and fragmented land emerged as main constraint to adoption of modern agricultural and horticultural technology in Bihar [7]. While analyzing use of modern varieties of principal crops, we observed comparatively high level of adoption on small and medium farms. Hence, there is no relationship between size of farm and adoption of modern varieties of seeds in Bihar. However, the majority of farmers are still using degenerated seeds of principal crops (except maize) mainly due to non-availability of quality seeds in the market. Public system of seed production and distribution is still weak in Bihar. Dissemination of information about modern agricultural development projects/schemes is a necessary factor for adoption of modern technology. In Bihar, ATMA and KVK have performed better in dissemination of the information.

## References

1. Kisan Ayog (2009) A report on transfer of technology in Bihar. State Farmers Commission, Bihar, Patna.
2. NSSO (2005) Access to modern technology for farming. NSS Report No. 500, Min of Stat and Program Implementation, Govt. of India.
3. Meena MS, Singh KM (2012) Decision process innovations, constraints and strategies for adoption of conservation agriculture. <http://dx.doi.org/10.2139/ssrn.2088710>
4. Singh KM, Jha AK (2012) Innovative approaches in technology dissemination: Experiences of ATMA Model in Bihar. <http://dx.doi.org/10.2139/ssrn.2168646>
5. Singh KM, Seanson BE, Jha AK, Meena MS (2012) Extension reforms and innovations in technology dissemination—The ATMA model in India. <http://dx.doi.org/10.2139/ssrn.2168642>
6. Singh KM, Jha AK, Meena MS, Singh RKP (2012) Constraints of rainfed rice production in India: An overview. In : Shetty PK, Hegde MR, Mahadevappa M. Innovations in rice production, National Institute of Advance Studies, Indian Institute of Science Campus, Bangalore, pp 71-84, 2012. <http://dx.doi.org/10.2139/ssrn.2210401>
7. Singh KM, Meena MS, Kumar A, Singh RKP (2012) Dimensions of poverty in Bihar <http://dx.doi.org/10.2139/ssrn.2017506>