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Knowledge level of farmers and scientists about agricultural biotechnology in Jharkhand

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Abstract
Agricultural biotechnology deals not only with genetically modified (GM) crops but also with tissue culture, micropropagation, marker assisted selection, biopesticides, etc. GM crops have potential to meet food requirement of rising population and cope adverse impact of climate change. People are having different opinion about cultivation of GM crops. There is apprehension from few people that GM crops may adversely affect human beings as well as animals. But few people are in favour of adoption of GM crops for enhancing productivity and human welfare. Knowledge about agricultural biotechnology especially GM crops is crucial for providing feedback regarding acceptance or rejection of the technology. The present study was taken up to assess the knowledge level of farmers and scientists about agricultural biotechnology. Data was collected from 50 farmers and 50 scientists of relevant disciplines in Jharkhand. Analysis of data revealed that both farmers and scientists had less knowledge about GM crops in comparison to non-GM aspects (bio-pesticide, tissue culture, DNA finger printing, marker assisted selection, etc) of agricultural biotechnology. Most of the farmers (58%) and scientists (66%) had medium level of knowledge of agricultural biotechnology. Age of the farmer respondents had significant correlation (at 0.01 level) with their knowledge level. However, research projects handled by the scientists as a leader had significant correlation (at 0.05 level) with their knowledge level about agricultural biotechnology. The outcome of study will be helpful in policy formulation about generating awareness and adoption of agricultural Biotechnology.

Keywords: Agricultural biotechnology, GM crops, knowledge level, farmers, scientists

Introduction
Majority of Indian population are dependent on agriculture and allied activities. The impact of climatic variability on agriculture could result in problems with food security and may threaten the livelihood activities. In this perspective, to meet food requirement of burgeoning human population is a great challenge. Traditional crop breeding is unable to meet this challenge. Agricultural biotechnology with its novel approaches e.g. transgenic breeding may be helpful in meeting food as well as feed requirement. Agricultural biotechnology allows plant breeders to make precise genetic changes to impart beneficial traits to the crop plants through genetic engineering. Golden rice, golden mustard, pharma foods, food with extended shelf life, new variety of corn, sorghum, wheat and plants that resist viral pests, saline soils, etc. are being developed through biotechnology. The release and marketing of genetically modified (GM) foods have resulted in a public debate in many parts of the world. This debate is likely to continue, probably in the broader context of other uses of biotechnology (e.g. in human medicine, GM foods, etc.) and their consequences for human societies. Genetically modified (GM) crops are being developed for resistance against insect pests, pathogens, abiotic stresses (e.g. high temperature, water stress, etc.), nutrient deficiency, herbicide tolerance, etc.

There is apprehension from few people that GM crops may adversely affect human beings as well as animals. But few people are in favour of adoption of GM crops for human welfare. Knowledge about agricultural biotechnology especially GM crops is very important for acceptance or rejection of the technology. There is need to study knowledge of different stakeholders about agricultural biotechnology so that government may plan and act for awareness programme, technology adoption, etc. Farmers are users of various technologies of agricultural biotechnology and scientists develop these technologies. Hence, the present study was taken up to assess the knowledge level of farmers and scientists about agricultural biotechnology.

Materials and Methods

The study was carried out during 2017. Knowledge in this study was operationalized as the understood information about agricultural biotechnology possessed by farmers and scientists of Jharkhand. For this purpose a knowledge test was developed. A test is a set of questions, each of which has a correct answer, to which the people respond (Roy and Mondal, 2004) [1]. Knowledge test (Yadav *et al*, 2018) [2] used for assessing knowledge level of farmers and scientists in Jharkhand are mentioned in Table 1. The respondents put √ mark in Correct/ wrong/ Not Known responses against each statement. For correct answer 1 score and for wrong/ not known answers 0 score were awarded. Scoring was reversed in case of negative statements. Schedule was developed using this knowledge test and pretested before data collection.

Table 1: Knowledge test about agricultural biotechnology

Sl. No.	Selected knowledge statements (Items)	Options		
		Correct	Wrong	Not known
1	Gene is found on chromosomes in a cell of an organism.			
2	Bt cotton, Bt brinjal, Bt tomato, Bt soyabean, Bt maize, Bt canola, Bt paddy, etc. are examples of GM / Transgenic crops.			
3	Agricultural Biotechnology does not only deal with transgenic crops but also with tissue culture, micropropagation, marker assisted selection, etc			
4	Genetically Modified (GM) crops are being developed not only for resistance against insect pests but also to cope with pathogens, abiotic stresses, nutrient deficiency and herbicide tolerance			
5	Bt Cotton only reduces losses caused by attack of Ballworm.			
6	Barnase Barstar gene derived from bacteria plays important role in hybrid seed production in mustard crop			
7	Whole genome sequencing of many crop plants such as rice, tomato, pigeon pea, etc. are available			
8	Transgenic cauliflower, cabbage, potato, brinjal, tomato, rice, mustard and bhindi have not been developed in India			
9	Biopesticide (e.g, Trichograma,, Trichoderma, NPV, etc.) are effective in managing insect pest and disease in various crops			
10	Improved variety of Banana (G- 9) was developed through tissue culture technique			
11	Synthetic seed is also developed through tissue culture technique			
12	Paddy variety 'Improved Pusa Basmati 1' has been developed using Marker Assisted Selection (MAS)			
13	Golden rice has not enhanced content of beta Carotene (precursor of Vitamin A)			
14	DNA finger printing is used for analysis of diversity at genome level			
15	Phytoremediation is used for removal of toxic elements from soil through planting of suitable plants followed by uprooting and transplanting at other places			
16	Bt Brinjal is not released for cultivation in Bangladesh			
17	China has approved commercial Bt Rice trials			
18	Double Bt genes are used in Biotech Crops to avoid increase in population of resistant insects			
19	Release of GM crop is not regulated process			
20	Sugarcane seedling was developed through tissue culture technique			

Fifty farmers from different villages of Namkum and Mander blocks in Ranchi district and fifty scientists of agricultural extension, biotechnology and relevant disciplines in Jharkhand were randomly selected for data collection. The knowledge score of each individual in farmers and scientists categories was calculated by summing the scores obtained by him/ her on all the items. Score of respondents may vary from 0 to 20. The higher score indicated that respondents have more knowledge about agricultural biotechnology.

Results and Discussion

Fig. 1 depicted that scientists had more knowledge about agricultural biotechnology than farmers. Farmers had maximum knowledge about item 4 i.e. GM crops are being developed not only for resistance against insect pests but also to cope with pathogens, abiotic stresses, nutrient deficiency and herbicide tolerance. Many farmers had knowledge about GM crops. However, farmers had minimum knowledge about item 11 i.e. synthetic seed is also developed through tissue culture technique. Most of the farmers were not aware about synthetic seed. Scientists scored highest knowledge score in item 1 and 3 i.e. Gene is found on chromosomes in a cell of an organism and Agricultural Biotechnology does not only deal with transgenic crops but also with tissue culture, micropropagation, marker assisted selection, etc. These are basics of agricultural biotechnology and known to scientists. Scientists scored least in item 8 i.e. Transgenic cauliflower, cabbage, potato, brinjal, tomato, rice, mustard and bhindi have not been developed in India.

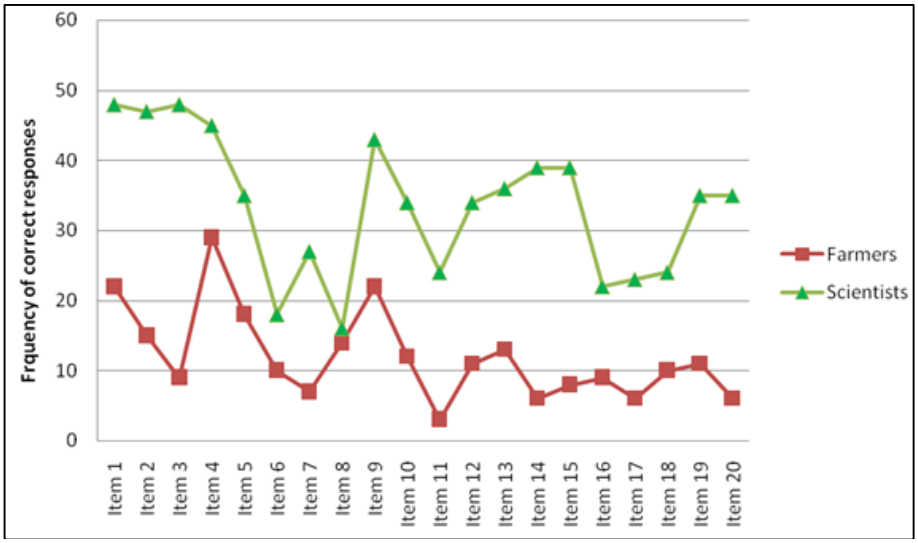

Fig 1: Item wise knowledge of farmers and scientists about agricultural biotechnology

Fig.2 depicted that both farmers and scientists had more knowledge about non-GM aspects (bio-pesticide, tissue culture, DNA finger printing, marker assisted selection, etc) of agricultural biotechnology in comparison to GM crops. Farmers were less aware about Bt brinjal, Bt tomato, Bt soyabean, Bt maize, Bt canola, transgenic cauliflower, cabbage, potato, etc.

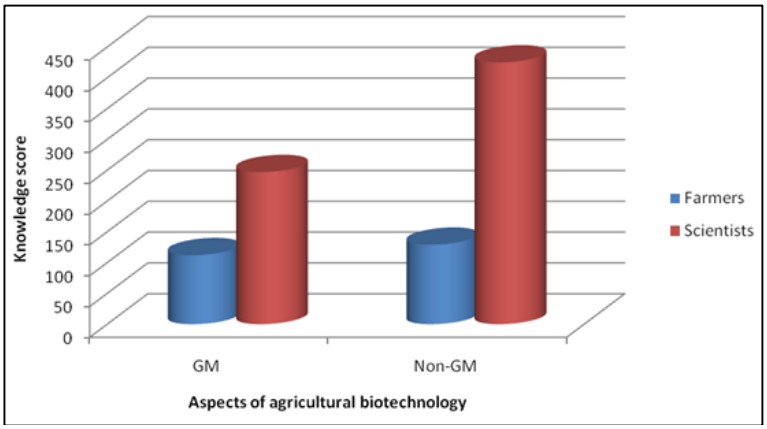

Fig 2: Knowledge of farmers and scientists about GM crops and Non-GM aspects in agricultural biotechnology

Table 2 showed that difference between mean knowledge score of scientists and farmers about agricultural biotechnology was significant at 0.05 level of probability and scientists' knowledge score was more than double than that of farmers. Most of the scientists (66%) and farmers (58%) had medium level of knowledge about agricultural biotechnology.

Table 2: Knowledge level of farmers and scientists about agricultural biotechnology

Farmers (N=50)			Scientists (N=50)			
Mean knowledge score	**Knowledge Level**	**Frequency (%)**	**Mean knowledge score**	**Knowledge Level**	**Frequency (%)**	**"t" value between mean knowledge score**
5	Low	11(22)	13.44	Low	6(12)	2.92*
	Medium	29(58)		Medium	33(66)	
	High	10(20)		High	11(22)	

* Significant at 0.05 level of probability

In order to determine the relationship between profile of respondents and their knowledge level, correlation coefficient was computed. It was observed that age of the farmer respondents had significant correlation (at 0.01 level) with their knowledge level (Table 3). It was negatively correlated. It showed that young farmers had better knowledge of agricultural biotechnology than old farmers. Sex, caste, occupation and annual income of farmers had non-significant correlation with their knowledge level.

Table 3: Relationship between profiles of farmers with their knowledge about Agricultural Biotechnology

S.No.	Independant variables	Coefficient of correlation (r value)
1	Age	-.366**
2	Sex	-.098
3	Caste	0.171
4	Occupation	-.226
5	Annual income	.117

**. Correlation is significant at the 0.01 level (2-tailed).

Table 4 indicated that age, sex, family background and service length of scientists had non-significant correlation with their knowledge level regarding agricultural biotechnology. However, research projects handled by the scientists as a leader had significant correlation (at 0.05 level) with their knowledge level. The knowledge level of scientists who had projects related to agricultural biotechnology was found very high.

Table 4: Relationship between profiles of scientists with their knowledge about Agricultural Biotechnology

S. No.	Independant variable	Coefficient of correlation (r value)
1	Age	-.017
2	Sex	.203
3	Family Background (rural, semi-urban and urban)	-.096
4	Service length	-.041
5	Research projects handled as leader	.289*

*. Correlation is significant at the 0.05 level (2-tailed)

Conclusion

Knowledge test consists of twenty statements of agricultural biotechnology, out of which eight statements were regarding GM crops and twelve statements represented non-GM aspects of agricultural biotechnology. Knowledge score obtained from above mentioned test reflected awareness of people about GM crops, biopesticide, DNA finger printing, tissue culture, marker assisted selection and other aspects of agricultural biotechnology. Most of the farmers (58%) and scientists (66%) had medium level of knowledge of agricultural biotechnology. Both farmers and scientists had less knowledge about GM crops in comparison to non-GM aspects (bio-pesticide, tissue culture, DNA finger printing, marker assisted selection, etc) of agricultural biotechnology. This result will be useful for policy makers in making plan for generating awareness about GM crops among farmers.

References

1. Roy GL, Mondal S. Research methods and social sciences and extension education, 2nd ed. Kalyani publishers, Ludhiana, 2004.
2. VK Yadav, Nirmal Kumar, Neetu Kumari, BP Bhatt, Ujjwal Kumar, Abhay Kumar *et al*. A test to measure knowledge level of people about agricultural biotechnology, Multilogic in Science, vol. viii, special (c), 2018, 134-137.