Addressing the Biotechnology Information Needs of Agricultural Extension Workers in India

Muffy Koch[1], Vikas Chandran[2], Purvi Mehta-Bhatt[2] and Carole Portelance[1].
[1] AGBIOS, Box 475, Merrickville, ON, K0G 1N0, Canada
[2] South Asia Biosafety Program, 9, Krishna Industrial Estate, Opp. BIDC, Gorwa, Vadodara, 390015- India

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Biotechnology information workshops were held in five Indian states to address the information needs of public and private sector agricultural extension workers. Telephone interviews were undertaken with a random selection of delegates from three states to assess the effectiveness of the workshops and the usefulness of information materials distributed at the workshops. Ninety nine per cent of the respondents agreed or strongly agreed that the workshop provided information that was useful to their agricultural extension work. Since attending the workshop 97 per cent of the respondents had been asked questions about genetically modified crops and 89 per cent had used the workshop information book. The methodology produced results that were statistically significant at a 95 per cent confidence level. While the workshops proved to be effective in addressing the information needs of extension officers, the vast size of the agricultural sector in India will require more extensive outreach mechanisms to address the information needs of the large number of farmers.

Key words

extension, biotechnology, agriculture, India, evaluation, training

INTRODUCTION

Transgenic cotton varieties have been rapidly adopted by the Indian farming sector since the approval of insect tolerant events in 2002 (James, 2005). In 2004 an estimated 1.3 million acres, or 7 per cent of the total cotton growing area, was planted with approved Bt cotton varieties in addition to a sizeable market for unapproved Bt cotton seed (Qaim *et al*. 2006). The new planting materials were used by over 1 million Indian farmers in 2005, just three years after the first approval by the Indian government (James, 2005). Agricultural extension workers have struggled to keep abreast of the new, rapidly evolving technology. As a result, advice on the adoption of biotechnology planting material is provided primarily by commercial sources.

The responsibility for agriculture in India is largely devolved to state level and all states have Departments of Agriculture that include extension services, plus there are a large number of non-governmental organisations, academic institutions and private sector groups involved in extension work in each state (Sulaiman, 2003). Discussions with agricultural stakeholders, including national government, regulatory authorities, state governments, academia, and the farming industry, identified the need for biotechnology information and training to be delivered to the agricultural extension workers who traditionally advise Indian farmers.

In response to this need, the South Asia Biosafety Program (SABP) undertook five training-of-trainer workshops in five Indian states. The workshops were held in 2005 and 2006 and were designed to provide information on biotechnology that is appropriate and relevant to agricultural extension workers and to provide a forum for discussion and answering of commonly encountered questions about agricultural biotechnology. The agricultural extension workers were provided with information and visual materials to assist the transfer of knowledge to farmers.

Delegates to the workshops were identified in collaboration with State agricultural departments and included public sector, private sector and civil society representatives. The workshop program and materials were presented in a prominent local language or Hindi, depending on the proficiency of the speakers. Information was presented on the status of agricultural biotechnology in the world,

India and the State. Mechanisms for regulation and biosafety assessment of GM crops were presented and delegates were given an opportunity to raise questions they commonly encountered and to receive answers from local expert panels. Delegates took home a handbook on answers to frequently asked questions and posters to act as teaching aids when speaking to farmers about agricultural biotechnology. The handbook and the posters were in a prominent local language for each state.

In order to assess whether these workshops were meeting the needs of the extension workers, an analysis of the first three workshops was undertaken. Using telephone interviews, delegates were questioned about the usefulness of the workshop and the handouts. The feedback from these interviews is presented and analysed here.

METHODS

Five questions were devised to assess the relevance and usefulness of the workshop information and the take-home reference materials (Table 1.) Guidance in the wording of the questions was obtained from Summerhill and Taylor (1992).

Selection of interview sample

Candidates for telephone interviews were randomly sampled from the entire group of delegates (172) to the first three workshops in Gujarat, Andhra Pradesh and Maharashtra. All of the delegates were assigned a number from a table of random numbers. The assigned numbers were subsequently sorted in ascending order. A pre-determined number of delegates (120) was selected according to the order of the assigned random numbers. The randomly selected delegates were allocated to a contact list for each workshop location that identified their name, affiliation and telephone number. These lists were distributed to interviewers with the language skills required for delegates from each State. Interviews were conducted by telephone and questionnaires were filled in by the interviewer. If a particular delegate could not be contacted, the interviewer moved to the next name on the list, but returned again to contact those delegates that were not previously available. A sample of 110 delegates was interviewed in the three days allocated for this activity.

Translation/Back-translation

The questions, which were conceived originally in English, were translated into Hindi, Gujarati, Telagu and Marathi. Delegates were interviewed in the language of choice from this list. In order to control the content of each question, independent translators, who had not seen the original English versions, were asked to translate each of the questions from the interview languages back into English (Behling and Law, 2000). These re-translated questions were reviewed to ensure that the original content of each question was preserved in the translation. No revision of translations was required.

Pre-test of questionnaire

Questions were pre-tested with a small test group of 10 delegates who were not chosen as part of the random sample group (Summerhill and Taylor, 1992). The results of this pre-test were evaluated for clarity of understanding of the questions. No revision was required.

Table 1. Questions used in the telephone interviews.

Question	Answer format[1]
1. The workshop provided information that was useful to me as an agricultural extension officer.	1=Strongly Agree 2=Agree 3=Neutral (neither agree/disagree) 4=Disagree 5=Strongly disagree
2. Have you used the handbook in your extension work since the workshop?	Yes / No *If No: (haven't used the book)* a. What is the primary reason for not using the book? b. What suggestions do you have for improving the book? (Do not prompt)
3. Have you used the information posters in your extension work since the workshop?	Yes / No *If No: (haven't used the information posters)* a. What is the primary reason for not using the information posters? b. What suggestions do you have for improving the information posters? (Do not prompt)
4. Have farmers asked you questions about GM crops?	Yes/ No
5. The information materials helped me address farmers' questions about GM crops.	1=Strongly Agree 2=Agree 3=Neutral (neither agree/disagree) 4=Disagree 5=Strongly disagree

[1] Format abbreviated for Questions 2 and 3.

Statistical Analysis

For the results of questions 2, 3 and 4, Clopper and Pearson charts (Steel and Torrie, 1980) were used to determine 95% confidence intervals on the mean proportion of Yes and No answers. Confidence intervals on the mean responses to questions 1 and 5 were determined using JMP® software (version 4.0.2, SAS Institute Inc., 2000). Data from these questions were treated as categorical since they did not fit a normal distribution.

RESULTS

In response to the statement "The workshop provided information that was useful to me as an agricultural extension officer", 63 per cent of the respondents strongly agreed and 36 per cent agreed with the statement (Figure 1). None of the respondents disagreed and less than one per cent remained neutral. These results were significant at the 95 per cent confidence level.

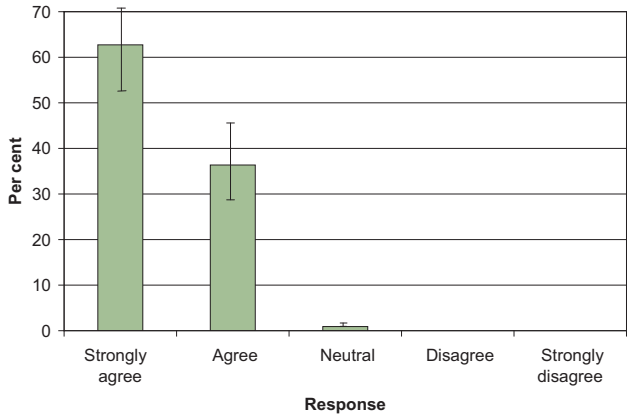

Figure 1. Distribution of responses to the statement "The workshop provided information that was useful to me as an agricultural extension officer". Confidence intervals are given at the 95 % confidence level.

Of the respondents, 89.1 per cent had used the workshop information book and 87.3 per cent had used the information posters since attending the workshop (Table 2). Those who had not used the book or the posters (10.9 and 12.7 per cent, respectively) gave similar reasons for both resources, *i.e.* not having an opportunity to work with farmers since the workshop, or preferring to promote organic agriculture. However, 97 per cent of the respondents had been asked questions about GM crops since they attended the workshop (Table 2).

Table 2. Responses to questions on the use of the resource materials and whether farmers had asked questions about GM crops since the workshop.

Question	Response Mean (percentage); (95% CI[1])	
	Yes	**No**
Have you used the handbook in your extension work since the workshop?	89.1; (94.5; 82.0)	10.9 (18.0; 5.5)
Have you used the information posters in your extension work since the workshop?	87.3; (90.0; 79.0)	12.7 (23.0; 8.0)
Have farmers asked you questions about GM crops?	97.3; (99.0; 91.0)	2.7 (9.0; 1.0)

[1] CI = confidence interval (upper limit; lower limit)

In response to whether the respondents had found the workshop materials helpful in addressing farmer's questions, 76 per cent strongly agreed that the materials had been useful, 14.5 per cent agreed that the materials had been useful and nine per cent remained neutral, neither agreeing nor disagreeing (Figure 2). These results were significant at the 95 per cent confidence level.

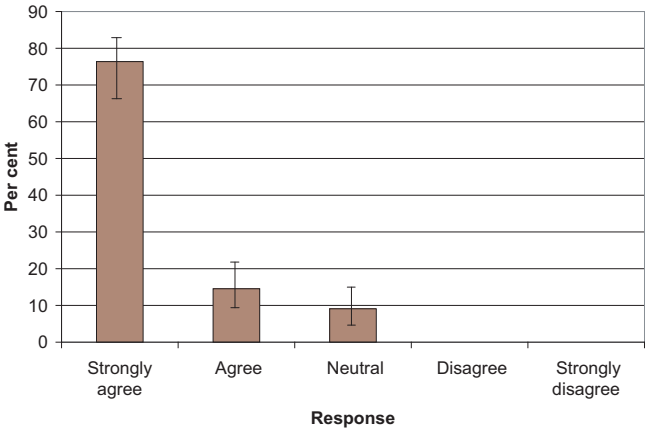

Figure 2. Distribution of responses to the statement "The information materials helped me address farmers' questions about GM crops". Confidence intervals are given at the 95% confidence level.

DISCUSSION

Nearly all of the respondents (99 per cent) agreed (36 per cent) or strongly agreed (63 per cent) that the workshops provided information that was useful to them as agricultural extension officers. This suggests that the planning and implementation was successful in meeting the immediate needs of the target group with respect to accessing information on agricultural biotechnology.

Use of the handout materials was high at 89 per cent and 87 per cent of respondents for the handbooks and posters, respectively. This indicates that the information was useful to most of the target group in assisting them to carry out their activities as agricultural extension workers. The use of the handbook was slightly higher than the use of the information posters and this may be attributed to the greater amount of information in the handbook, relative to the posters. In addition, a number of respondents indicated that they had placed the posters on office walls, which would limit the use of these materials as teaching aids in the field.

That 97 per cent of the respondents had been asked questions on GM crops by farmers since the workshop is a clear indication that the workshop targeted the correct stakeholder groups to enable information transfer to Indian farmers. However, based on the size of agriculture in India, these workshops provided input to only a small group of extension workers.

While 99 per cent of the respondents indicated that the workshop provided useful information for their activities as agricultural extension workers, only 90.9 per cent of the respondents agreed that the information material helped to answer farmers' questions on GM crops. Considering that 97 per cent of the respondents had been asked questions by farmers since the workshop, it might be concluded that about six per cent of the

delegates were able to address farmers' questions without need for the workshop information.

It is not believed to be contradictory that only 89.1 per cent of respondents had used the handout materials since the workshop, while 90.9 per cent agreed that the materials had been helpful in addressing farmers questions. Information from the handouts could have assisted answering farmers' questions without the materials being physically used in the explanations.

The format of the workshops appears to meet the needs of the agricultural extension workers at State level. Foremost to this success was probably the presentation of workshops in a local language or Hindi and the translation of workshop handouts into a local language appropriate for each state venue. The active level of participation at the workshops indicated that the information was relevant and topical, addressing an immediate need in the sector.

However, the vast number of farmers in India requires more rapid dissemination of information than can be achieved by training 50 extension workers per year in each state. While this work is seen as valuable and effective, it needs to be supplemented by other outreach efforts such as distance learning to accelerate the access to information on biotechnology and new products as they enter the market.

CONCLUSION

This assessment of the biotechnology information workshops held for state-level agricultural extension workers indicates that the interventions have been effective at addressing an identified need for information in this sector. The SABP program ran five training-of-trainer workshops in five states in 2005 and 2006. The materials and formats for these workshops have been tested and proven to be effective. In addition, the expertise to implement workshops that are appropriate to each State's language requirements and priorities resides in India. Based on this proof of concept and the available expertise it is hoped that planning and implementation of subsequent workshops will be forthcoming from the Indian government and State agricultural departments. Ultimately these workshops should increase the level of information available to farmers and enable them to make informed decisions on the adoption of biotechnology planting materials.

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