Development of a Knowledge Test to Assess Knowledge Level about Improved Dairy Farming Practices among Users and Non-users of e-Agriservice in Maharashtra

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Abstract

Effectiveness of ICT-enabled e-Agriservice - aAQUA (Almost All Questions Answered) with special reference to dairy farming, was assessed in Maharashtra. Ex-post-facto research design was followed. This paper presents the procedure to develop a knowledge index for users and non-users to assess impact in terms of knowledge gain about Improved Dairy Farming Practices (IDFPs) by availing the e-Agriservice. The study was conducted in randomly selected four districts of Maharashtra. A total of 37 items or questions were framed on breeding, feed-fodder, health care and management aspects of the IDFPs. It was found that the items with difficulty index between 0.25-0.75, discrimination index above 20 and point bi-serial correlation significant at 5 per cent level of significance was selected for the knowledge test. Thus, a total of 29 items from 37 items were retained in the knowledge test. The study would be useful for researchers and academicians to develop and use the knowledge test in other areas to measure knowledge level of dairy farmers.

Keywords: aAQUA e-Agriservice; Difficulty Index; Discrimination Index; Improved Dairy Farming Practices (IDFPs), Knowledge test; Point Bi-serial Correlation.

Introduction

Agriculture plays a vital role in the Indian economy. More than 75 per cent of the rural population depend on agriculture and allied sectors as their foremost means of livelihood. In agriculture, livestock sector plays a multi-faceted role in socio-economic development of rural households and contributes about 4.2 per cent to the gross domestic product and 25.6 per cent to the agricultural gross domestic

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product in the country. In livestock, dairying has become an important secondary source of income for millions of rural families and has assumed the most important role in providing employment and income generating opportunities particularly for marginal and women farmers.

Empirical evidence indicates that livestock and dairying is an important component of the agriculture system, providing an additional source of income and nutritional cover to a large section of the rural population, particularly the disadvantaged and poor households (Rao, *et al.*, 2003; Birthal and Ali, 2005; Ravikumar and Chander, 2006; Singh, *et al.*, 2007). However, the rapid growth of milk production in India has been mainly because of the increase in the number of animals rather than that of improved productivity. This trend is mainly due to lack of knowledge about modern dairy management practices. The adoption of scientific dairy farming practices is necessary for increasing productivity and production with an aim to make dairy business more remunerative.

Adhiguru *et al.*, (2009) stated that farmers are looking for various information sources for carrying out their production and marketing tasks efficiently. In the present digital era, with the changing environment of agriculture and livestock sector, information and knowledge has increasingly become an important factor of production for effective decision-making (Birkhaeuser, *et al.*, 1991; Cash, 2001; Galloway and Mochrie 2005; Adhiguru, *et al.*, 2009).

In this backdrop, Information and Communication Technology (ICT) has the potential to change the economy of livestock and agriculture by providing information and knowledge to the farming community (Sasidhar and Sharma, 2006). ICT is necessary for accessing required information and knowledge (Richardson 1997; Chapman, *et al.* 2004; Anandajayasekeram, *et al.*, 2008; McNamara, 2009; Aker 2010). ICT based information delivery to livestock sector can significantly improve the knowledge level in livestock farming system. The Government of India has undertaken many such interventions to strengthen the information service delivery to the potential farmers. This study analyses the use of one such demand-driven ICT based information delivery system *i.e.* aAQUA e-Agriservice on various dairy farming practices. aAQUA (Almost All Questions Answered) e-Agriservice was launched by the Developmental Informatics Laboratory (DIL) at Indian Institute of Technology (IIT) Mumbai, Maharashtra in 2003 as an information system to deliver technology options and tailored information in response to the problems and queries raised by Indian dairy farmers.

Therefore, the present study was contemplated to develop and standardize a knowledge test for measuring the difference in knowledge gain of the users and non-users by availing the e-Agriservice. The study highlights the procedure for development of a knowledge test, which would contribute to scientific and policy discussions on ICT based extension delivery system.

Material and Methods

Sampling

Maharashtra state was purposively selected for the present study as the aAQUA e-Agriservice was launched as a pilot project in this state in 2003 and still continues to deliver its services to the farmers of this state. Four out of eight pilot districts (Pune, Nasik, Jalna and Amravati) were selected randomly. Thirty users of the e-Agriservice, from the beneficiaries list (provided by the service provider of aAQUA, Agrocom Software Technologies Pvt. Ltd., Mumbai) and 30 dairy farmers as non-users, , having similar kind of socio-economic status from each district were randomly identified and surveyed using pre-tested interview schedule.

Instrument

To find out the knowledge level of respondents, a knowledge test was developed after reviewing the available literature, discussion with the project staff and experts and Question-Answer forum of the aAQUA e-Agriservice particularly. "Knowledge gain" was operationalized as the amount of information possessed by the users and non-users about different aspects of IDFPs by utilising aAQUA e-Agriservice. Figure 1 shows the detailed procedure followed for the development of the knowledge test.

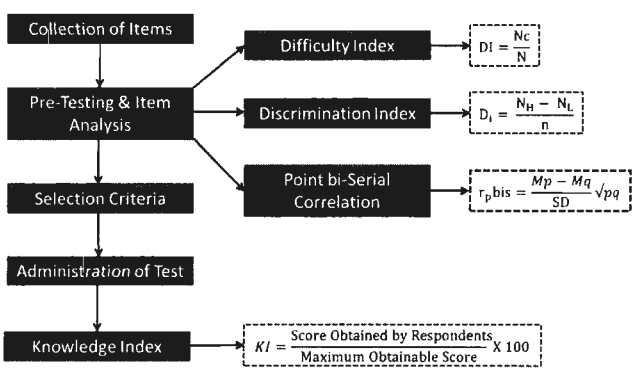

Fig. 1: Procedure followed for Knowledge Test Development

The content of the knowledge test is composed of questions called items. A comprehensive list of items about IDFPs was prepared using the following criteria: (i) It should promote thinking (ii) It should have certain difficulty and (iii) It should differentiate well informed from less informed. A total of 37 items/ questions which were objective and dichotomous to facilitate easy and objective scoring were selected.

Item Analysis

A preliminary test consisting of 37 statements were administered to 40 non-sample population and their responses were obtained and subjected to difficulty index, discrimination index and point-bi-serial correlation as given below:

i) Difficulty Index: The difficulty of an item varies from individual to individual. When a respondent answers an item correctly, it is assumed that the question was less difficult for him. The assumption in this item, statistics of difficulty was that difficulty is linearly related to level of respondents' knowledge about IDFPs. The difficulty index for each of the 37 items was calculated by dividing the total correct responses for a particular question/ item by total number of respondents as follows:

$$DI = \frac{Nc}{N}$$

Where,

DI = Difficulty index

N_C = Number of respondents answering correctly

N = Total number of respondents

ii) Discrimination Index: If the item are answered by some respondents correctly and not by others, such item has greater power to discriminate more knowledgeable from less knowledgeable ones than another statement which is either answered correctly by everyone or none in the sample. In a way, the items carrying higher discrimination power implicitly indicate that such items are moderately difficult and they are the ones that discriminate between the ones who answer it correctly from those who are unable to do so. The discriminatory power of all the 37 items was worked out by the following method.

First, respondents were arranged in descending order on the basis of their performance in the whole test. Out of this list, top 25 per cent and bottom 25 per cent of the respondents were treated as high and low groups. Thus, 10 respondents' scores from each with highest and lowest group were used to evaluate the individual items. For each question, the number from both groups, who answered it correctly were counted. The discrimination index was calculated as follows:

$$Di = \frac{N_H - N_L}{n}$$

Where,

Di = Discrimination index

N_H = Number of respondents in 25% high groups who answered correctly

N_L = Number of respondents in 25% low group who answered correctly

n = Number of respondents in 25% sample

iii) Point Bi-serial Correlation: The main aim of calculating point bi-serial correlation was to work out the internal consistency of items that is the relationship of total score to a dichotomized answer to any given item. In a way, validity power of the item was computed by correlation of individual item of the whole test. Point bi-serial correlation for each item to preliminary knowledge test was calculated by using the following formula as given by Garrett and Woodworth (1969) and tested at N-2 degrees of freedom.

$$r_p bis = \frac{M_p - M_q}{SD} \sqrt{pq}$$

Where,

$r_p$bis = Point bi-serial correlation

M_p = Mean of total scores of respondents (answered item correctly)

M_q = Mean of total scores of respondents (answered item incorrectly)

SD = Standard deviation of entire sample

p = Proportion of respondents answering correctly

q = Proportion of respondents answering incorrectly

Results and Discussion

After analyzing the responses, the items having difficulty index between 0.25-0.75, discrimination index above 20 and point bi-serial correlation significant at the 5% level were finally selected for the final knowledge test. Thus, finally a total of 29 items from the 37 items were retained for the final knowledge test (Table 1). For an individual dairy farmer, minimum and maximum knowledge scores were 29 and 87, respectively. Each trait was measured independently and overall knowledge was computed using the knowledge index.

$$\text{Knowledge Index} = \frac{\text{Score obtained by repondents}}{\text{Maximum obtainable score}} \text{X100}$$

Table 1. Difficulty, Discrimination Index and Point Bi-serial Correlation Values of Knowledge Statements about IDFPs

Sl. No.	Statements	Difficulty Index	Discrimination Index	Point bi-serial correlation
A.	**Breeding Practices**			
1	**Name of popular cattle breed in your area**	0.53	0.50	0.867
2	**Name of popular buffalo breed**	0.58	0.45	0.766
3	**What is the correct maturity age of inseminating crossbreed heifer?**	0.60	0.50	0.763
4	**After how many days, a normal cow comes into regular heat?**	0.50	0.40	0.532
5	What are the signs of oestrus (Heat)?	0.83	0.30	0.551
6	What is /are the breeding method(s) of improvement in your cattle and buffaloes?	0.78	0.30	0.467
7	How many times AI/ Natural service should be done in a heat cycle of dairy animals?	0.80	0.15	0.362
8	**Which source is providing the frozen semen for A.I.**	0.65	0.45	0.726
9	**After how many days of insemination animal should be checked for pregnancy?**	0.63	0.20	0.253
B.	**Feeding & Fodder Production Practices**			
10	**How much of colostrum should be fed to newly born calf?**	0.45	0.40	0.074

11	**What should be fed daily to high yielding milch animals?**	0.50	0.45	0.709
12	**What are the different methods of enriching the poor quality wheat straw?**	0.25	0.30	0.587
13	**What is balance feeding?**	0.60	0.50	0.763
14	How much milk is increasing by using of mineral supplementation to crossbred cows and buffaloes?	0.23	0.20	0.553
15	**What is the performance of feeding mineral supplementation to cows and buffaloes?**	0.33	0.30	0.654
16	Name some of the fodder crops which are highly suitable for your areas?	0.58	0.15	-0.229
17	**How much average green fodder is required for an animal per day?**	0.65	0.45	0.804
18	**How much average dry fodder is required for an animal per day?**	0.60	0.50	0.790
19	**What is the Total Mixed Ration? If Yes, state some of its benefits.**	0.35	0.30	0.572
20	**What is the Complete Feed Block? If Yes, state some of its benefits.**	0.30	0.35	0.572
C.	**Health Care Practices**			
21	**What are the common diseases against which vaccination should be done?**	0.65	0.50	0.846
22	**When is the vaccination done against the following diseases?**	0.35	0.35	0.516
23	**What are the important symptoms of H.S.?**	0.48	0.45	0.879
24	**What are the important symptoms of FMD?**	0.53	0.50	0.867
25	**What are the important symptoms of mastitis disease?**	0.60	0.50	0.805
26	**What are the causes of mastitis?**	0.38	0.35	0.823
27	**What are the different methods of disinfection?**	0.68	0.50	0.858
D.	**Management**			
28	**What are the ways to resolve chronic reproductive problems in cows & buffaloes?**	0.28	0.30	0.601

29	**When should milking be stopped before next calving?**	0.35	0.30	0.800
30	What are approaching signs of parturition?	0.23	0.30	0.587
31	What are the advantages of colostrum feeding?	0.88	0.15	0.467
32	**What practices should be followed to get clean milk production?**	0.73	0.45	0.805
33	**What is the normal life of raw milk at room temperature?**	0.43	0.45	0.790
34	**What should be done to maintain the cleanliness of the cattle shed?**	0.75	0.40	0.762
35	**Which is the correct method of milking?**	0.55	0.40	0.598
36	**What is the appropriate timing for dehorning in calves?**	0.45	0.45	0.843
37	Which one of these records do you know and maintain in your dairy farm?	0.85	0.15	0.441

Note: Selected statements are in bold font.

Conclusion

Information and communication technology is one of the effective approaches for agricultural development especially for agricultural extension. It is playing a significant role in supporting and facilitating demand-driven extension. To ensure the efficiency and explore the fullest potential of ICT, it is vital to know its significance among the farming communities. Therefore, the present developed knowledge test could be used to measure the farmer's knowledge gain through other ICT based projects for dairy development in rural India.

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