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A TEST TO MEASURE THE KNOWLEDGE OF INPUT DEALERS ON CROP PRODUCTION TECHNOLOGIES

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ABSTRACT

The present study was undertaken for the development of a knowledge test to measure the knowledge levels of input dealers those who have undergone a diploma course and those who have not undergone the course which in turn measures the impact of a One-year Diploma in Agricultural Extension Services for Input Dealers (DAESI) course" which is started by MANAGE on capacity building of farmers. To measure the effectiveness of the program in imparting knowledge to the input dealers a knowledge test was constructed. The study mainly contemplates to find out the knowledge of input dealers regarding cotton, paddy and chilly production technologies. 60 Pertinent items were collected covering all aspects of selected crop production technologies. After getting jury opinion on the items of test index of item difficulty, index of item discrimination and index of item validity were worked out. Finally, Items with difficulty level indices ranging from 0.25 to 0.75 and discrimination indices above 0.20 are selected. To administer the knowledge test a respondent is given one mark for each correct answer and zero marks for each wrong answer. Thirty items were finally selected from 60 items. The test so developed finally consists of 30 statements for cotton, paddy and chilly production technologies. The reliability for the whole test was calculated using point biserial correlation.

Keywords : *cotton, knowledge, input dealers, paddy and chilly production technologies*

INTRODUCTION

The public extension is one of the major extension systems. Besides this, other private players such as agribusiness companies, agripreneurs, NGOs, input dealers, etc., are also playing a major role in technology dissemination to the farmers. Among various players, input dealer is one of the important sources of information to the farmers. Most of the farmers in India seek farm advice from input dealers. There are about 2.82 lakh input dealers in India (DAESI guidelines, 2014). Input dealers serve as second most important source of agricultural information for the farming community after progressive farmers. Therefore agricultural development has a leading position in the field among input dealers (Chandra Shekhar, 2007).Input dealers serves as an important link between the manufactures and the farmers. So he/she has the responsibility to disseminate latest farm technology upto the field level especially in the era of the free economy and the world trade organization (Khose, 2004). However, most of these input dealers are not having technical qualifications in Agriculture. In order to build their technical competency in agriculture, National Institute of Agricultural Extension Management (MANAGE) has launched a self-financed "One-year Diploma in Agricultural Extension Services for Input Dealers (DAESI) Program" so that they can blend their business with extension services besides discharging regulatory responsibilities (MANAGE, 2012). The program is to enhance the technical competency of input dealers with a view to facilitate better advisory to the farmers. Currently, this program is being implemented as a Central Sector Plan Scheme with the help of various Nodal Training Institutes (NTIs) such as Agricultural Colleges, Krishi Vigyan Kendras, Farmers' Training Centres, Agricultural Technology Management Agency (ATMA), etc. The program is conducted once a week at the district level, spread over a period of one year covering various areas of agriculture, business ethics, extension, Acts and Regulations of agri-inputs, etc. Keeping all this in mind, a knowledge test was constructed to measure the effectiveness of the diploma course in improving the knowledge of dealers. The past studies highlight the importance of development and inclusion on knowledge test to calculate the knowledge level of the farmers as done by Chauhan et.al., 2021 during their study on the knowledge level of gram panchayat farmers on fasal bhima yojana. Considering this, a study was undertaken with the objective of developing a standardized teacher-made test for measuring the extent of knowledge of input dealers on

crop production technologies.

OBJECTIVE

To develop and standardize a teacher-made test for measuring the extent of knowledge of input dealers on crop production technologies

METHODOLOGY

Input dealers are the first point of contact for farmers. In order to perform their role effectively and efficiently, they must have steady access to updated crop production technologies. The knowledge is operationalized for the present study as "The quantum of production technology aspects with special reference to cotton, paddy and chilly known to input dealers in order to protect the farmers from the high cost of cultivation. The details of the construction and standardization of this knowledge test is given below.

Collection of items

The content of the test was composed of questions called items. A comprehensive list of knowledge questions on Cotton, paddy and chilly production technology was prepared by the study of relevant literature, consulting officials of extension staff of the state department of Agriculture, Scientists of ANGRAU and others who have experience in Cotton, paddy and chilly production. Initially, 60 items were collected focusing on various aspects of pest diagnosis, disease identification, fertilizer rate and seed rate. After screening, fine-tuning and editing based on the opinion of the concerned scientists, 45 items have remained. The 45 items were subjected to item analysis to screen some more items based on the opinion of the respondents (other than the final sample) in the sample area.

Selection of items

The selection of items was done on the basis of the following criteria.

- Response to items should promote thinking than routine memorization.
- They should differentiate the well-informed respondent from the less informed and should have a certain difficulty value.
- The items included should cover all areas of knowledge about the production technology of cotton, paddy and chilly.

By using the above criteria, 45 items were selected for developing knowledge test of paddy, cotton and chilly (each 15) respectively, after consulting with experts like crop specialists, Extension Specialists (ES), master trainers who train the dealers of DAESI programme and experienced farmers in cotton, paddy and chilly cultivation in the study area.

Form of items

The items selected for the construction of the knowledge test on production technology in cotton, paddy and chilly were framed in the objective form of multiple-choice & yes or No.

Pre-testing

The items selected for the knowledge test were pre-tested separately by administering the items to 60 respondents in the non-sampling area.

Item analysis

Item analysis was carried out by administering the pre-tested items to 60 input dealers. It was carried out for finding the index of item difficulty and index of Item discrimination. The index of 'item discrimination' provided information on how well an item measures or discriminates, whereas the 'Item difficulty' indicates the extent to which an item was difficult. The function of the item discrimination index was used to find out whether an item really discriminates against a well-informed respondent from a poorly informed respondent.

The data thus obtained was subjected to typical item analysis. The 15, 15 and 15 test items of cotton, paddy and chilly production technology were administered to each one of the 60 respondents. The scores allotted were 'one' for a correct answer and 'zero' for an incorrect response, computing the total scores were obtained for each of the 60 respondents on 45items. They were arranged in order from highest score to lowest. Based on this the respondents were divided into six equal groups. These groups were labeled as G1, G2, G3, G4, G5 and G6 with 10 respondents in each group, for the purpose of item analysis, the middle two groups G3 and G4 were eliminated keeping only four extreme groups with high and low scores.

After getting the four extreme groups for item analysis, the responses for each of the items were subjected to calculate difficulty index, discrimination index and point biserial correlation as shown below.

Item difficulty index [P]

The item difficulty index was worked out as the percentage of input dealers answering an item correctly.

The assumption of the item difficulty index was that the difficulty is linearly related to the level of input dealer's knowledge about recommended practices. The items with 'P' values ranging from 0.25 to 0.75 were considered for the final selection of the knowledge test. Difficulty Index can be defined as the proportion of the respondents giving correct answer to the particular item (Ray and Mondal, 2014). The difficulty Index was computed by using the following formula and presented in Table 1.

$$Difficulty\ Index = \frac{No.\ of\ respondents\ answering\ correctly}{Total\ no.\ of\ respondents}$$

Discrimination index [E 1/3]

The second criterion for item selection was the item discrimination index indicated by 'E 1/3' which is calculated by the formula.

$$E^{1/3} = \frac{(S1 + S2) - (S5 + S6)}{N/3}$$

Where S1, S2, S5 and S6 are the frequencies of correct answers in groups G1, G2, G5 and G6, respectively. N is the total number of respondents of the sample selected for item analysis that is 60. The value of the discrimination index for the knowledge items on Cotton, paddy and chilly with special emphasis on Crop production techniques were presented in Table 1. The items with E 1/3 values ranging from 0.2 to 0.8 were considered for the final selection of the knowledge test.

Point biserial correlation (rbis)

The main aim of calculating Point biserial correlation (rpbis) was to work out the internal consistency of the items i.e., the relationship of the total score to a dichotomized answer to any given item. In a way, the validity power of the item was computed by the correlation of the individual item of the preliminary knowledge test calculated by using following formula suggested by Garret (1996).

$$r_{pb} = \frac{M_p - M_q}{\sigma} \times \sqrt{pq}$$

Where,

rpb = Point biserial correlation

Mp = Mean of the total scores of the respondents who answered the item correctly.

Or

Mp = (Sum of the total of XY)/ (Total number of correct answers)

Mq = Mean of the total scores of the respondents who answered the item incorrectly.

Or

Mp = (Sum total of X - Sum total of XY)/ (Total number of wrong answers)

σ = Standard deviation of the entire sample

p = Proportion of respondents giving the correct answer to the item.

p = (Total number of correct answers)/ (Total number of respondents)

q = Proportion of respondents giving an incorrect answer to the item.

q = 1 – P

X = Total score of the respondent for all items

Y = Response of the individual for the items

XY = Total score of the respondent multiplied by the response of the individual to the item

Items having significant point bi serial correlation at 1% and 5% level were selected for final knowledge test and are presented in Table 1.

Table 1 : Item Difficulty Index (P), Discrimination Index (E1/3) and Point Biserial Correlation (rpbis)

Sr No	Items	(P)	(E1/3)	(rpbis)
	Cotton production technologies			
1	Trichoderma viridae soil application is best for a) Anthracnose b)Bacterial blight c) Boll cracking d) wilt disease.	0.55	0.62	0.581**
2	Stem application reduces sucking pest problems. YES/ NO	0.24	0.83	-0.052NS
3	Stem application conserve natural predators and avoid environment pollution. . YES/ NO	0.47	0.66	0.657**
4	Reddening of leaves from boarder is symptom of a) White fly b) Aphids c) Jassids d) Thrips.	0.57	0.66	0.539**
5	Cotton can only be grown in Black soils under irrigated soils. a)Yes b)No c)Not exactly correct	0.14	0.17	0.012NS
6	Bt solution can be sprayed at ----------hours only. a)Evening b)Morning c) Both d)None	0.45	0.52	0.087**
7	Boron spray control flower dropping. YES/NO	0.92	0.11	0.077N.S
8	Zinc sulphate application is --------- for cotton. a) Must b)No need to apply	0.64	0.54	0.763**
9	Refugee Bt is sown 4 rows around Bt Crop. YES/ NO	0.88	0.16	0.074NS
10	Potash fertilizers helps for better fiber quality. YES/ NO	0.18	0.16	0.047NS
11	Bhendi is trap crop for a) Helicoverpa b)Spodoptera c) Red hairy caterpillar d) None.	0.47	0.66	0.447*
12	Boll cracking is due to ----------deficiency. a)Zinc b)Magnesiumc)Boran d)All the above	0.52	0.54	0.523**
13	Sticky traps are used for controlling Spodoptera. a)Yes b)No c)For others also	0.13	0.16	0.030NS
14	Marigold is trap crop for Heliothis. YES/ NO	0.46	0.66	0.442*
15	Cotton +Green gram intercropping ratio is a)1:2 b)1:6 c)1:4 d)1:8	0.51	0.56	0.539**
	Paddy production technologies			
16	Paddy requires well puddle soil. YES/ NO	0.94	0.17	0.047NS
17	Puddling remove the weeds and level the fields. YES/ NO	0.24	0.27	0.395*
18	Thorough pudding reduces the percolation losses of water. YES/ NO	0.19	0.13	0.029NS
19	Optimum seed rate for transplanted rice is per acre. a)10-15kg b) 25-30kg c)15-30kg d)5-10kg	0.39	0.6	0.522**
20	Carbendazim used for seed treatment chemical @------ seed in dry seed treatment and ----------in wet seed treatment. a)3g/kg&1g/kg b)2g/kg&1g/kg c)1.5g/kg&1g/kg d) 4g/kg&1g/kg	0.64	0.53	0.526**
21	Blue green algae is used as bio fertilizer in rice. YES/ NO	0.15	0.33	0.223
22	Shallow planting of seedlings ensures profuse tillering especially in rice YES/ NO	0.87	0.16	0.088*

Sr No	Items	(P)	(E1/3)	(rpbis)
23	The recommended fertilizer dose of chemical fertilizers to rice is -------N: P: K kg per ha. a) 120:80:40 b)80:40:20 c)20:45:80 d)60:60:60	0.90	0.13	-0.087NS
24	Phosphorus should be applied as basal dose along with--------- potash. a)10-15kg b)14-16kg c) 15-20kg d)10-12kg	0.70	0.5	0.462*
25	Zinc deficiency can be corrected by application of 20Kg zinc phosphate or by spraying of 2% Zinc sulphate. YES/ NO	0.44	0.52	0.585**
26	Butachlor, Pretilachlor are herbicides in rice. YES/ NO	0.88	0.16	0.074*
27	Deep flooding in rice is essential from panicle initiation to dough stage. YES/ NO	0.44	0.28	0.495*
28	Paddy stem borer can be controlled by application by application of carbofuran@----------kg/ha. a)10-20 b)13-19 c)22-23 d) 24-30	0.46	0.4	0.787**
29	The leaf folder can be controlled by application of Carbofuran 3G @--------Kg/ha. a) 0.75 b)0.35 c)0.45 d)0.65	0.45	0.56	0.428**
30	The right stage for harvesting of rice to get good grain quality is when----- of the panicles turn to yellow. a)60% b)70% c) 80% d)69%	0.41	0.56	0.458*
	Chilly production technologies			
31	Ladder like marks are seen on the pod due to a) Whitefly b) Jassids c) Thrips d) Chili pod borer.	0.69	0.46	0.721**
32	Downward curling of leaves is symptom of a) Jassids b) Thrips c) Mites d) Chilly pod borer.	0.47	0.69	0.523**
33	Boron spray control flower dropping. YES/ NO	0.14	0.17	0.012NS
34	Moisture content of dry pods should be 8-10%. YES/ NO	0.94	0.17	0.047NS
35	Flower drop is due to Nitrogen deficiency. YES/ NO	0.84	0.13	0.071NS
36	Marigold is trap crop for a) Helicoverpa b) Spodoptera c) Both d) None.	0.46	0.43	0.324*
37	Scab like formation on the fruit is due to ---- a)Whitefly b)Jassids c)Thrips d) Chili pod borer.	0.98	0.23	0.057
38	Yellow Sticky traps are used for sucking pests YES/ NO	0.52	0.53	0.421*
39	Micronutrient mix should be sprayed ----- times from flowering. a)2 b)3 c)1 d)Not needed	0.53	0.63	0.226*
40	NAA (Plano fix) @-------- ppm is used to control fruit drop. a)10 b)13 c)15 d)20	0.52	0.76	0.628**
41	Calcium nitrate (CN) is used to prevent fruit drop. YES/ NO	0.52	0.53	0.421*
42	Leaf curl of chilies is transmitted by a) Whitefly b) Jassids c) Thrips d) Chili pod borer.	0.53	0.63	0.226*
43	Chilly is transplanted after ---------days of seedling. a) 35-45 b)20-22 c)30-40 d)15-20	0.19	0.16	0.025NS
44	Pendimethalin is the herbicide used for controlling weeds in the chilly crop. YES/ NO	0.87	0.16	0.088NS
45	MgSO4 should be applied at the time of peak yield of ----- a) Fruits b) Flowers c) Both d) None	0.42	0.4	0.369*

** Significant at 1 % level of probability NS: Non-Significant

*Significant at 5 % level of probability

Representativeness of the Test

Care was taken to see that the test items selected finally covered the entire universe of respondents' knowledge of cotton, paddy and chilly production technologies.

Final Selection of the items

Those items, which met all the following conditions were finally selected for the knowledge test:

(1) Items with difficulty level indices ranging from 0.25 to 0.75.

(2) Items with discrimination indices above 0.20.

(3) Items having significant point biserial correlation either at 1 percent or 5 percent level.

Thus, 30 items (10 on each crop production technology) Out of 45 items were retained finally, for the final knowledge test. The selected items were given in Table 2.

Table 2 : Final items selected for knowledge test on crop production technologies

Cotton production technologies				
1	Trichoderma viridae soil application best for.			
	a)Anthracnose	b)Bacterial blight	c)Boll cracking	d) wilt disease
2	Stem application conserve natural predators and avoid environment pollution.			
	a)Yes	b)No	c)May be	d)May not be
3	Reddening of leaves from boarder is symptom of			
	a)White fly	b)Aphids	c) Jassids	d)Thrips
4	Zinc sulphate application is ----------for cotton			
	a) Must	b) no need to apply	c)Both	D)None
5	Bhendi is trap crop for			
	a)Helicoverpa	b)Spodoptera	c)Red hairy catterpilar	d)None
6	Boll cracking is due to---------- deficiency			
	a)Zinc	b)Magnesium	c) Boran	d)All the above
7	Cotton +Green gram intercropping ratio is			
	a)1:2	b) 1:6	c)1:4	d)1:8
8	Bt solution can be sprayed at ----------hours only.			
	a)Evening	b) Morning	c) Both	d)None
9	Potash fertilizers helps for better fiber quality. YES/ NO			
10	Marigold is trap crop for Heliothis. YES/NO			
Paddy production technologies				
11	Optimum seed rate for transplanted rice per acre			
	a)10-15kg	b) 25-30kg	c)15-30kg	d)5-10kg
12	Carbendazim is seed treatment chemical @------ seed in dry seed treatment and --------in wet seed treatment.			
	a) 3g/kg&1g/kg	b)2g/kg&1g/kg	c) 1.5g/kg&1g/kg	d) 4g/kg&1g/kg
13	Deep flooding in rice is essential from panicle initiation to dough stage.			
	a)Yes	b)No	c)Not decided	d)none
14	Paddy stem borer can be controlled by application of carbofuran@-------kg/ha.			
	a)10-20	b)13-19	c)22-23	d) 24-30
15	The right stage for harvesting of rice to get good grain quality is when----- of the panicles turn to yellow			
	a)60%	b)70%	c) 80%	d)69%
16	Phosphorus should be applied as basal dose along with--------- potash.			
	a)10-15kg	b)14-16kg	c) 15-20kg	d)10-12kg
17	Zinc deficiency can be corrected by application of 20Kg zinc phosphate or by spraying of 2% Zinc sulphate.			
	a)Yes	b)No	c)Zn deficiency not observed in paddy	d)Zn application is not necessary

18	The leaf folder can be controlled by application of Carbofuran 3G @--------Kg/ha.			
	a) 0.75	b)0.35	c)0.45	d)0.65
19	Blue green algae is used as bio fertilizer in rice. YES/ NO			
20	Butachlor, Pretilachlor are herbicides in rice YES/ NO			
Chilly production technologies				
21	Ladder like marks are seen on the pod due to			
	a)Whitefly	b)Jassids	c)Thrips	d) chilly pod borer
22	Downward curling of leaves is symptom of.			
	a)Jassids	b)Thrips	c) Mites	d) chilly pod borer
23	Yellow Sticky traps are used for sucking pests. YES/ NO			
24	Micronutrient mix should be sprayed ------ times from flowering			
	a) 2	b)3	c)1	d)Not needed
25	$MgSO_4$ should be applied at the time of peak yield of			
	a) Fruits	b)Flowers	c) Both	d) None
26	NAA(Planofix) @----- ppm is used to control fruit drop			
	a) 10	b)13	c)15	d)20
27	Marigold is trap crop for			
	a) Helicoverpa	b)Spodoptera	c)Both	d)None
28	Scab like formation on the fruit is due to ------			
	a)Whitefly	b)Jassids	c)Thrips	d)Chilly pod borer
29	Calcium nitrate (CN) is used to prevent fruit drop. YES/ NO			
30	Leaf curl of chilies is transmitted by			
	a)Whitefly	b)Jassids	c)Thrips	d)Chilly pod borer

Reliability of the test

Reliability refers to the consistency of scores obtained by the same individuals when re-examined with the same test on different occasions or different sets of equivalent items or under variable examining conditions (Anastasi, 1986). In this study, the reliability of the test was assessed by using the "split-half" technique. The final knowledge test containing a total of items was divided into two sets containing odd and even-numbered items. The two test sets were administered to 30 respondents of the non-sampling area. The total score obtained by each of the respondents in odd and even-numbered item sets was calculated separately& Pearson correlation coefficient between the two sets was calculated. The "r" value obtained was 0.613, which is significant at 1% level of probability indicating the knowledge test had a high level of internal consistency &was sufficiently reliable.

Validity of the test

Knowledge test developed on production technology of cotton, paddy and chilly was subjected to content and construct validity. The construct validity of the test items was tested by the method of point biserial correlation (rpbis). The items have significant values at 1% and 5% level indicating the validity of the test. According to Anastasi (1986), content validity involves essentially the systematic examination of test content to determine whether it covers a representative sample of the behavior domain to be measured. Since, all test items represent the whole universe of production technology of cotton, paddy and chilly collected from various sources as discussed earlier. It was assumed that the score obtained by administering the knowledge test of this study measures what was intended to measure.

Thus the knowledge test developed in the present study can measure the knowledge of DAESI and Non-DAESI Agri. Input dealers as it showed the greater Degree of reliability and validity.

Administration of the test

All the 30 (10 Cotton, 10 Paddy and 10 Chilly) items in the knowledge test were read out to the respondents after establishing rapport with them. The respondents were asked to answer the items by themselves.

Scoring procedure

A score of one and zero was given for correct and wrong answers for each item respectively and the total number

of correct responses given by a respondent out of the 30 (10 Cotton, 10 Paddy and 10 chilly) items was the knowledge score obtained by him or her. Thus the maximum-minimum possible score for a respondent were 30 and 0 respectively.

Categorization of the respondents

After arriving at knowledge scores, the respondents were grouped into three categories based on the cumulative square root frequency method.

RESULTS AND DISCUSSION

The number of knowledge items selected under the sub-topic 'cotton production technologies' after preliminary screening out of fifteen raw statements are ten; these items had a difficulty index value between 0.30 and 0.80 and a discrimination index value between 0.30 and 0.55 and a relevant value of point bi-serial correlation coefficient (Table 2). Similarly, the number of knowledge items selected out of fifteen raw items under the sub-topic 'paddy production technologies' after preliminary screening is ten; these items had a difficulty index value between 0.30 and 0.80 and a discrimination index value between 0.30 and 0.55 and a relevant value of point bi-serial correlation coefficient.(Table 2). Likewise following the same criteria knowledge items selected for sub-topic 'chilly production technologies' are ten. (Table 2). Finally, a sum of 30 items out of 45 raw knowledge items were retained to constitute the standardized knowledge test on the topic crop production technologies. The final test consisting of 30 items ((10 Cotton, 10 Paddy and 10 chilly) was selected to measure the knowledge of DAESI and Non-DAESI Agri. Input dealers on crop production technologies of cotton, paddy and chilly. The overall possible score ranges between 0 to 30 for crop production technologies. The inclusion of different forms of statements avoids prejudice judgment and will capture the actual knowledge possessed by the input dealers. The final statements give a scenario about crop production technologies in the study area.

CONCLUSION

The knowledge of input dealers on different crop production technologies is important in connection with the effectiveness of the One-year Diploma in Agricultural Extension Services for Input Dealers (DAESI) Program launched by MANAGE. The impact of the program on capacity building of input dealers can be assessed which in turn helps the farmers in delivering the timely services and can supplement the public extension system in delivering the services. Hence, a test to measure the knowledge of input dealers on different crop production technologies has been developed. The knowledge test can be used by future researchers also with suitable modifications to analyze the knowledge levels to assess the potential of other crop production technologies in different agro-climatic zones.

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CONFLICT OF INTEREST

The authors of the paper declare no conflict of interest

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