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Knowledge Test for Agricultural Graduates on Natural farming

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ABSTRACT

Natural farming is a sustainable agricultural approach that primarily focuses on enhancing soil health and minimizing input costs. To gain deeper insights into this emerging practice, it was imperative to develop a knowledge test aimed at assessing the level of understanding among agricultural graduates regarding natural farming. The study was conducted in the State Agricultural Universities (SAUs) of Uttar Pradesh, and the test items were carefully crafted, keeping in mind the academic proficiency of the target respondents. An initial knowledge test comprising 48 items was developed and subjected to a relevancy assessment involving 35 experts in the fields of agronomy and extension education. Based on their evaluations, 40 items were selected for pretesting. These items were then administered to 42 agricultural graduates from locations outside the study area to avoid sampling bias. Following this, an item analysis was conducted to calculate the difficulty index, discrimination index, and point biserial correlation for each item. Items were retained for the final test if they met the following criteria: a difficulty index between 0.20 and 0.80, a discrimination index above 0.10, and a point biserial correlation significant at the 5% level. The reliability of the knowledge test was evaluated using the split-half method, yielding a reliability coefficient of 0.75, indicating satisfactory internal consistency. Based on these analyses, a total of 30 items were finalized for the natural farming knowledge test designed for agricultural graduates. This knowledge test serves as a crucial tool to identify and bridge existing knowledge gaps among agricultural graduates. It can be effectively used to inform the design of seminars, workshops, and training programs, thereby equipping future agricultural professionals with accurate and practical knowledge on natural farming.

HIGHLIGHTS

This test was developed to assess the knowledge of among postgraduate and Ph.D. agricultural student's regarding natural farming.

Items were selected after consultations with subject matter experts in **agronomy, soil science**, and **agricultural extension**, ensuring **content authenticity** and relevance

The 30 items of the test divided into two categories i.e. General Knowledge (concepts, principles, history) and Technical Knowledge (ingredients, preparation methods, application, and use) of natural farming.

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Reliability was test by using the split-half method which showed a good reliability, with reliability coefficient of 0.75. Final items were selected based on -**Difficulty Index** (0.20 to 0.80), **Discrimination Index** (>0.10), **Point Biserial Correlation** (significant at the 5% level).

INTRODUCTION

The introduction of the dwarf variety of grain in 1966-67 led to the emergence of the Green Revolution. This revolution primarily focused on boosting agricultural production, promoting the extensive use of agro-chemicals to achieve higher yields. (Gulati, 2000). The Green Revolution enabled the nation to achieve self-sufficiency in food production, maintain grain surpluses, and secure a significant position globally in terms of production and productivity. However, due to factors such as the indiscriminate use of agro-chemicals, mono-cropping, excessive exploitation of natural resources, the application of the 'law of diminishing returns' in agriculture (Rahman, 2015), and pollution, conventional chemical-based farming is now facing challenges. These include declining yields, rising costs, topsoil depletion, reduced soil vitality, groundwater contamination, loss of beneficial microbes, environmental pollution from chemical fertilizers and pesticides, and adverse health effects on people (Chandini, 2019). A decline in crop yield growth has been noted due to the excessive and improper use of inputs such as synthetic fertilizers and pesticides (Lal, 2009; Pingali, 2012). Numerous studies have revealed that chemical fertilizers and pesticides negatively impact soil health by destroying millions of microbes essential for supporting plant life (Zafar et al., 2001; Jayashree and Vasudevan, 2007). Natural Farming (NF) is regarded as an agro ecology-based diversified farming system that integrates crops, trees, and livestock, promoting functional biodiversity (LVC, 2010; Rosset and Martinez-Torres, 2012) to significantly reduce production costs. This is achieved by replacing chemical fertilizers and pesticides with home-grown products such as Jeevamritham, Beejamritham, Neemastra, etc., and by adopting practices like intercropping and mulching (Palekar, 2005; 2006). Emphasizing the dominance of smallholder farmers in India (68.5% marginal and 17.7% small farmers), the Economic Survey (2019) highlighted Zero Budget Natural Farming (ZBNF) as a viable alternative farming practice to enhance farmers' income. The Central Government of India and the State Government of Uttar Pradesh are actively promoting natural farming. However, in recent times, some members of the scientific community and critics have strongly opposed this alternative practice, arguing that it lacks scientific evidence, promotes specific belief systems—particularly those centered around indigenous cows—and reflects a backward-looking and chauvinistic ideology (Shotwell, 2016; EPW, 2019). Knowledge developed through research, along with research scholars, plays a crucial role in the creation, verification, and promotion of any new understanding. Similarly, the concept of natural farming must undergo rigorous research to attain validity for widespread adoption. In this context, various factors can contribute to the knowledge gap among agricultural graduates, including cognitive, attitudinal, perceptual, and technical aspects. These challenges could ultimately hinder the education, research, extension, advancement, and implementation of natural farming. Therefore, it is essential to evaluate their knowledge of natural farming. Knowledge refers to the body of comprehended information that an individual possesses (Bhatt & Patel, 2009). These obstacles may eventually impede the education, research, outreach, development, and execution of natural farming. Thus, it is crucial to assess their understanding of natural farming. Knowledge is the collection of acquired and understood information that an individual holds.

METHODOLOGY

The knowledge test for natural farming was created using a standardized methodology. The knowledge test included questions (items) on natural farming. A question bank was developed by reviewing literature, consulting textbooks, visiting natural farms and relevant websites, and engaging in discussions with subject matter experts and field extension personnel. The items were then thoroughly examined with the assistance of specialists in Agronomy and Extension. The questions were crafted to assess the knowledge level of agricultural graduates regarding natural farming. A total of 48 knowledge items were created for the relevancy test (Kumar et al., 2016). The item statements were reviewed by an expert panel of judges to assess their relevance and to screen them for inclusion in the final test. (Kline, 1986). To do this, the 48 items were forwarded to a panel of 35 judges who are specialists in agronomy and extension education. They were asked to critically assess each item for its applicability in gauging agricultural graduates' understanding of natural farming. The judges were asked to respond using a five-point rating system: 5, 4, 3, 2, and 1 for highly relevant, relevant, undecided, less relevant, and not relevant. (Vijayan et al, 2022). Total 30 responses were find. The rating scale scores for each judge's response were added to determine the item's relevancy score. Relevance percentage, relevance weightage, and mean relevancy scores were calculated for each item based on the data. Items that met the normal criteria (mean relevancy score > 3.0, relevance weightage >0.70, and relevance percentage >70) were chosen. Thirty products in all were chosen. The items that were gathered in order to design the knowledge exam were objective. There were several yes-or-no questions among the multiple-choice

items. 42 respondents who were not from the area where the data was collected were given the 40 items that were chosen. For each question in the knowledge test, the respondents were asked to describe how they felt about it. Correct answers received a score of 1, while erroneous answers received a score of 0. Each item's overall knowledge score was determined by adding the scores provided by each responder. (Kaur et al., 2020). The discrimination and difficulty indices were computed using this information. The percentage of respondents who correctly answered a question was used in this study to calculate the item difficulty index P. The formula was used to calculate it.

$$P = NC/N \times 100$$

Where N is the total number of respondents, P is the difficulty index, and NC is the number of respondents that provided a correct response. Items with P values ranging from 20 to 80 were taken into consideration for the final knowledge exam in this study.

To determine item discrimination, the E1/3 method was used to calculate the discriminating power of each of the 40 items. This method involved splitting the 42 respondents into six equal groups, each with seven respondents, and placing them in descending order of the size of their knowledge scores. The two groups in the middle were disqualified. To determine the "Discrimination Index," only four extreme groups—that is, the groups with the highest and lowest scores—were taken into account. This formula was used to calculate it:

$$E1/3 = ((S1+S2)-(S5+S6))/(N/3)$$

Where N is the total number of responders who received the items. The highest and higher score correct answer rates are denoted by S1 and S2, respectively. The frequencies of right responses for lower and lowest score answers are denoted by S5 and S6, respectively. In the final knowledge exam, items with a discrimination index greater than 0.1 are chosen.

The point-biserial correlation (Rp bis) is a relationship between a continuous and a dichotomous variable (Demirtas & Hedeker, 2016). Point biserial correlation was calculated to examine an item's internal consistency and its link to the overall score when it was discovered to be a dichotomized response to a particular item.

$$Rp\ bis = (Mp-Mq)/\delta \times \sqrt{pq}$$

where the point biserial correlation is denoted by Rp bis. Mp is the average score of all respondents who correctly answered a question. Mq is the average score of all respondents who provided an erroneous response to a question. The full sample's standard deviation is denoted by δ. The percentage of respondents who correctly answer a question is denoted by the letter "p." "q" is the percentage of respondents that answered a question incorrectly.

A statistical test using n-2 degrees of freedom was performed on the computed point biserial correlation values. As the final items of the knowledge test, 30 items with a point bi-serial correlation value that was significant at the 5% level of significance were chosen.

RESULTS

Purposively choosing the knowledge test's items after consulting with a number of subject matter experts guaranteed its content authenticity. The items were chosen from agronomy, soil science, and agricultural extension in the particular area of natural farming, which is related to the study of knowledge test of agricultural graduates towards natural farming. The split half approach was used to assess the knowledge test's dependability (Kerlinger, 2004). The test's good dependability is indicated by its reliability score of 0.75. The test items were then put through point biserial correlation, discrimination index, and difficulty index. The knowledge test's final items were chosen based on their point bi-serial correlation value, which was significant at the five percent level of significance, difficulty index value between 0.2 and 0.80, and discrimination index value above 0.1. In the end, 30 items (Table 1) were chosen for the natural farming knowledge test in order to separate the knowledgeable students from the less knowledgeable ones. A total of 30 items were categorized into two groups prior to the test being given to the graduates: general knowledge about natural farming and technical information about natural farming.

Table 1. Presentation of Difficulty index & Discrimination Index for the statements of knowledge test on Natural Farming (Final items).

S. No.	Items	Difficulty Index		Point Biserial Correlation (Rp bis)
1	Who introduce the Natural farming in India? a. Mosanobu Fukuoka / b. Subhash Palekar /c. Narendra Modi /d. Acharya Devavrat	60.00	0.2	0.16*

2	Which state first adopted the Natural farming approach? a. Andhra Pradesh/ b. Gujarat /c. Madhya Pradesh / d. Uttar Pradesh	80.00	0.5	0.64*
3	Natural farming is suitable for which crops? a. Food crops/ b. Horticultural crop /c. Vegetable cops /d. All of the above	66.67	0.2	0.27*
4	Natural farming mainly focused on? a. Human health /b. Soil health /c. Animal health /d. Environment health	50.00	0.5	0.38*
5	Zero budgets indicates? a. No cost of production /b. No requirement of buy inputs from /c. No money are required for farming /d. None of these markets	56.67	0.6	0.49*
6	Natural farming approach is? a. Sustainable farming /b. Eco-friendly farming /c. Diversified Farming /d. All	66.67	0.4	0.40*
7	Natural farming does not allowed? a. Farm yard manure /b. vermicompost /c. Saptdhanya /d. Dasparniark	36.67	0.2	0.27*
8	Natural farming also known as? a. Ground method farming /b. Fukuoka method farming /c. Simple method farming /d. Farm based farming	56.67	0.6	0.39*
9	First book on natural farming is? a. Prakritik kheti /b. Adhyatmik kheti /c. One Straw revolution /d. Farming with nature	56.67	0.6	0.60*
10	Natural Farming based on? a. Wild animal /b. Exotic Cow /c. Indigenous Cow / d. All cattle	53.33	0.2	0.06*
11	Ghanjeevamrith works as? a. Culture /b. Seed treatment solution /c. Mulching /d. Moisture conservation Agents	63.33	0.4	0.49*
12	How many main pillars of natural farming are decided? a. Three /b. Four /c. Five /d. Six	53.33	0.5	0.36*
13	How many type of mulching are used in natural farming. a. 4 / b. 5 /c. 3 /d. 2	80.00	0.5	0.62*
14	Main component of Agniastra. a. Neem /b. Chillis /c. Dhatura /d. None of these	36.67	0.2	0.17*
15	Which is not a component of Beejamritha. a. Lime /b. Field soil /c. Jaggery /d. Indigenous cow dung	73.33	0.3	0.19*
16	Ghanjeevamrit can be stored for how many time for best use? a. 3 month /b. 6 month /c. 9 month /d. 12 month	70.00	0.4	0.30*
17	In how many days Brahmastra is ready for use? a. 1 day /b. 2 days /c. 3 days /d. 6 days	70.00	0.2	0.25*
18	Pulse flour is used in? a. Brahmastra /b. Neemastra /c. Jeewamreeta /d. Wapasa	50.00	0.5	0.48*
19	Which one practice is not follow in natural farming? a. Crop Rotation and Intercropping /b. Fertigation /c. Contours and Bund /d. Plant protection	60.00	0.6	0.47*
20	Weed management practices in natural farming are? a. Manual /b. Chemical /c. Mulching /d. A and C both	43.33	0.2	0.25*

21	Natural farming is focused on activity of earthworms - **Yes /No**	63.33	0.2	0.15*
22	Separate markets are available for natural grown products- **Yes /No**			
23	Natural farming system is a water conservation approach- **Yes /No**	53.33	0.3	0.13*
24	Natural farming is scientifically approved- **Yes /No**	73.33	0.5	0.48*
25	Various certification agencies are available for natural farming- **Yes /No**			
26	Hybrids are not allowed in natural farming- **Yes /No**			
27	Wapasa is a Moisture conservation practice in natural farming- **Yes /No**			
28	Sour buttermilk is used as fungicide- **Yes /No**			
29	Neemastra is used to control the sucking type insects and catterpilars- **Yes /No**	53.33	0.3	0.24*
30	Achhadan is a form of mulching- **Yes /No**			

DISCUSSION

The given test consists of 30 statements that collectively represent the overall content of natural farming. It encompasses various perspectives, ranging from the development and historical background to the technical knowledge associated with natural farming. The test is divided into two distinct sets of questions. The first set, titled "General Knowledge of Natural Farming," covers the foundational aspects of natural farming. This includes an introduction to the concept, its basic meaning and principles, early adoption, key components, and the various other names by which natural farming is known. The second set, known as "Technical Knowledge of Natural Farming," focuses on the specific components involved. It includes detailed information on the ingredients used, the preparation processes, methods of application and recommended dosages, as well as the practical uses and importance of each component under different agricultural conditions. It also explores the mechanical aspects related to the practice of natural farming. This knowledge test is designed to assess the understanding and proficiency of postgraduate and Ph.D. level agricultural students in Uttar Pradesh.

CONCLUSION

This knowledge test serves as a valuable tool for evaluating agricultural graduates' understanding of natural farming. It plays a crucial role in identifying knowledge gaps that may exist in the implementation of natural farming practices. By highlighting these gaps, the test can inform the design and delivery of need-based training programs for agriculture graduates. With appropriate modifications and updates, the test can also be utilized to assess the level of knowledge on natural farming among various stakeholders, including agricultural graduates, Krishi Vigyan Kendra (KVK) subject matter specialists, and extension personnel across Uttar Pradesh and other states in India. Such evaluations can contribute significantly to strengthening natural farming education and extension efforts at regional and national levels.

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