

Assessing Pre-Service Teachers Knowledge towards Agronomy skills and Irrigation system. A study for self-sustainability

Maria Josephine Arokia Marie. S^{1*}, Subendu Panda¹, Hari Haran. R¹, Shikha Banerjee¹

¹Department of Education, Indira Gandhi National Tribal University, Amarkantak (MP), India

Abstract

Education system in India is short of linking vocational skills in curriculum to strengthen the rural community development especially agronomy skill in school curriculum and higher education. This study tends to find the attitude of Pre-Service Teachers towards the agronomy skill knowledge and irrigation system followed in India. The term agronomy in the paper covers both soil management and crop production. This study limits to the dimension of irrigation system to maintain soil and crops and also the attitude of PST's towards agronomy knowledge. The study was conducted for 50 PST's of Indira Gandhi National Tribal University (IGNTU) of Madhya Pradesh, 50 responses were collected through online mode using google docs. To collect data a questionnaire was developed with two major dimensions for understating the knowledge of PST's in agronomy and attitude towards irrigation in two parts nine items relating to knowledge in agronomy and its characteristics in part I and sixteen items related to attitude towards irrigation in the field of agriculture in part II. The collected responses were analysed using percentage analysis in terms of items, gender, family back ground and locality as independent variables. The findings shows that the PST's have high knowledge about agronomy but they were less aware of maintenance of soil system which is the vital part of the agriculture and their attitude towards irrigation system was also appreciable at the same time it is necessary to make them aware of marketing and teach suitable irrigation system to enhance economic condition. The study recommends that knowledge and attitude is well recognised with them it is only to properly integrate in the curriculum so that it will reflect in an profitable approach.

Key words: Agronomy skills, agricultural knowledge, attitude towards irrigation, self-sustainability, Pre-Service Teachers

Introduction

According to (Jellason et al., 2020) reflects how knowledge of climatic condition is essential for the improvement of crop production when compared to the people who do not involved directly. The attitude of PST's was also positive with regards to the application of agronomical skills the study of (Casper et al., 2020) also reflects that people cannot survive without having proper relation with ecosystem how one interact with it also reflects . The study relates the importance of agronomical knowledge and tends to find the attitude of irrigation system which in turn tries to create an extension policy in the curriculum according to the cited (Landini, 2020) relationship of extended work as policy would create more benefit in the country if one try to integrate the agronomical knowledge in the regular practices. (Gow et al., 2020) also suggest that social practices improves the knowledge, similarly PST's while undergoing training process will gain appropriate knowledge which will be disseminated to the future students of the country to meet the global demand of unemployment. (Jeong & Choi, 2020) Unemployment issues can only be resolved by including agricultural paper in the regular curricular system, if the teachers are well equipped with the agricultural knowledge then it will be easily reached to the students. Therefore the study implies to study the innovative knowledge of science to be applied for the better nourishment of crops for PST's.

The knowledge of science and innovation applied for better farming of nourishment items, natural resources and minerals is called agronomy, and if it is used in meaningful way for better production is called agronomy skill development for self-sustainability. Agronomy knowledge also covers plant inheritance, its variety and trading qualities, and all necessary constituents, essential climatic conditions and knowing soil system for better cropping. Agronomy knowledge is not a single study it is interdisciplinary shields enormous knowledge of economy, biology of living organism, geological features of soil and other apparent qualities. At current scenario agronomy is amalgamated with innumerable affairs such as distributing sustenance, equipping individuals for effective farming (Puech et al., 2020) spatial differentiation and crop management. Several research has been carried out in terms of soil system, water system, minerals needed and deficiency, plant physiology, climatic conditions, cattle rearing, weedicides and insecticides (Moreau et al., 2020). Development in these knowledges create awareness among people for desirable growth in ones economic condition. But in country like India these knowledges are not thought in school level or included in higher education as an obligatory concern to be studied. Farming is extremely necessary for improving economic conditions basically in India and it is increasing day by day in a sluggish way. The area under cultivation is static or even shrinking, compared to

other developed European nations here in India the basic knowledge of agronomy and minimum concept in agriculture is very much important with the demand of time. Therefore the study intends to find the PST's attitude towards agronomy knowledge and irrigation system so that the knowledge can be imparted in the future generations classroom in turn the study focus on finding the attitude towards agronomy skill knowledge for PST's.

Need and Significance of the study

India is basically an agricultural nation where maximum of its population is associated with agriculture. Indian farming is at intersection and the need of great importance isn't just to make cultivating as productive taunt to draw in and hold the individuals who need to stop cultivating yet in addition to improve agrarian efficiency and consequently income, to comprehend the issue of camouflaged joblessness in agrarian work power(Okiror et al., 2011) it is necessary to develop positive attitude towards agronomy. The conceivable answer for this issue can be attitude advancement in agricultural part. Indian agribusiness understandings stand with low efficiency, land and water system issues, pressure because of urbanization and accumulation of common people, characteristic ideas, fluctuating costs, promote risks and economic instability. In this study the PST's of present scenario along these lines and approaches planned for creating practical knowledge of farming with proper address and awareness in agriculture(Government of India - Ministry of Finance, 2013). Practical farming requires a drawn-out viewpoint and proceeding with exercises more than a few ages. In this manner, execution and conduct of current understudy instructors and experts will assurance the maintainability of farming in the future. In this situation, since attitudes, norm and value are vital elements of human behaviours and attitudes become especially vital because they provide direction and purpose to behaviours and performance. Thus, a better understanding of the student teachers attitudes of sustainable agriculture. Later it would support the development of teaching and learning initiatives in this area deliberately (Tzanopoulos et al., 2011). There is a developing mindfulness that agricultural agendas considered and must give what mankind needs today as well as what the human family will require after ten years or even a time from now. The mix of new innovations and the utilization of android phones opens up another scope of educating learning techniques where under the study instructors can assume an important job for this particular concern(Boud et al., 2016). The positive attitudes of the future teacher engaged in the teaching and learning of any subject are central for influencing the teaching – learning process. The current situation uncovers an absence of accomplishment to the motivation of overdues in case of agriculture specially in schools. This study observed the attitudes of student teachers and their basic knowledge in the field of agriculture.

The sight of this study is to investigate the experiences of PST's who are participating in an introductory path, which is designed to excite the development of a positive attitude towards agronomy-based skill. The study also focused to inspire for the development of research knowledge and skills among the B.Ed. PST's who are the future teacher of our country. Agriculture must be exceptionally emphasized in schools as a subject since it changes the nation into a modern country as a result of its essential jobs. According to the responses of the student teachers, the introductory knowledge in agriculture contributed to the development of both a positive attitude towards the research, knowledge and skills. The PST's indicated that knowledge in science and technology and the authentic way of cropping and working properly contributed to the development of their attitude, knowledge and skills. This article presented through the reality which allows for improved spatial view of PST's who have faced the difficulties in the field of agrarian system of knowledge. The goals of instructing agriculture in this manner is to impart skills to the future teachers, which makes an inspirational attitude. In future by this way agriculture sector, welcomes the jobs for national improvement and pupils accept agriculture as a profession throughout everyday life positively.

Review of Related Literature

The present study begins with search of secondary research literature related to the attitude towards agronomy. It is essential to look into the contemporary development in the concerned area it is emphasized that latest developments of the subject or published in research journals and more stress was made to search research paper published in different innovative ideas based on the theoretical background is trying to derive and it is due for the further discussions.

Bhattacharyya and Mukherjee (2019) conducted an expressive study entitled Importance of Skill Development in Indian Agriculture and investigate about the problem of Indian agricultural sector. They concluded that, possible solution to this problem can be solved through the proper skill development. Where school should take an important part for skill development as formal education and trainings imparted at field level.

Diise, Zakaria& Mohammed (2018) in their study entitled Challenges of Teaching and Learning of Agricultural Practical Skills: The case of Deploying Project Method of Teaching among Students of Awe Senior High School in the Upper East Region, Ghana. The study focused on the discoveries of particular investigation concerning the difficulties of conveying the scheme for showing between agricultural science understudies of Awe Senior High School

in the Navrongo Municipality of the Upper East Region of Ghana. The researchers used Action Research methodology where they have selected 100 sample randomly. The results and discussion of the action research through empirically conducted to expose agricultural students of Awe SHS in the Navrongo Municipality to project method of teaching agricultural skills and to measure from their viewpoint and that of their teachers about the practical constraints in deploying project teaching method in the teaching of agricultural skills.

In the study entitled Skills development in the agricultural sector: a multiple case study approach Rensburg (2014) expressed on the issues of the abilities to improve an urgent component in improving the adequacy of families work in the current worldwide field. In this study multiple case study-based method has been used. Findings of the study is distinguished with the significant writing and last of the structure of the factors was refreshed to reflect new data which became visible during this examination. The study focused on the individual and organisational levels. The investigation indicated the awareness crushing and one of a kind setting in this division and the job inhabit yourself in the arrangement and the executives of preparing and improvement up to now.

Khairul B.M. Noor & et.al (2011), Say about the impact of training on farmers perception collected data from 323 formers respondents, researchers said that impact were seems as increased in work quality increased inform products. Cost savings, time saving and increase family saving and income with increase in networking. This study was conducted in Malaysia country where rural farming is major source of livelihood where technical advice training and demonstration for rural farmers was in good practice to introduce new technologies, skills and methods.

From the above collected review it is concluded that proper skill development can meet the contemporary challenges, and it should be practiced from school as formal education and trainings should be imparted at field level. And this could be emerged as insight from teacher, therefore the study finds a gap and instigate to employ agronomy skills for PST's to know the practical constraints in deploying agronomy skill teaching method in the regular teaching and learning process which is also emphasised as vocational education in National Education Policy 2020.

Statement of Problem

Practical experience has played an important role in the field of agriculture where performance always took a crucial role. A dilemma arises, however, in regard to the means for providing these experiences for a diverse group of PST's. Furthermore, the knowledge in agronomy is important for them who are specially who are from agriculture-based family

back ground(Schneider et al., 2011). Attitude towards irrigation constantly faced with this same situation. It appears to be authoritative that group of instruction be used to deal with the knowledge of agronomy and attitude towards irrigation took the vital role and responsibilities under these circumstances.

Thus the questions arise where the knowledge of the PST's related to agronomy and attitude towards irrigation is positive or negative.Hence the problem may be stated as **“Assessing Pre-Service Teachers Knowledge towards Agronomy skills and Irrigation system. A study for self-sustainability”**.

Objectives of the Study:

The main reason of the study was to examine the knowledge in agriculture and attitude of the PST's towards irrigation. This research paper is based on the responses of the PST's to the questions related to knowledge in agronomy and attitude towards irrigation. The researcher tried to find out the basic knowledge and skill related to these particular issues and it is important that the researcher planned to measure it because by this experience of practical knowledge or hands on experience in these fields should be implemented to the students who are basically from the rural background. The materials and methods for this paper are identical and described. Objective of this paper is to measure the basic knowledge of the PST's in the field of agriculture.

The objectives of the study are

- To understand the status and Knowledge of Pre-Service Teachers of Indira Gandhi National Tribal University about agronomy.
- To identify the attitude of Pre-Service Teachers towards irrigation and its skills.

Methods and Materials

The percentage analysis method was used in this study to assess the knowledge of agronomy skill and the attitude of irrigation system from the responses of PST's of Indira Gandhi National Tribal University through online mode by using google forms during this pandemic situation of COVID 19. Percentage analysis is one of the uncomplicated statistical tools which is widely used in analysis and interpretation of data. It deals with the number of respondent's response to a particular question is percentage arrived from the total population selected for the study. It is one of the straightforward analysis which is immensely

undemanding for anyone to comprehend the outcome of the research. It is normally used by commercial research organisation and pictorially presented with different presentation.

Population and Sample

The population used in this research study included the PST's of Indira Gandhi National Tribal University, Madhya Pradesh. The study was conducted to the fifty PST's and fifty responses has been taken as sample. The study also comprised the selected variables like gender, family back ground and locality as variables independently.

Agronomy knowledge and attitude towards irrigation Questionnaire

The researchers developed a questionnaire named agronomy knowledge and attitude towards irrigation system to assess the knowledge of PST's in agronomy and it support to perceive the attitude towards irrigation system in agriculture. The questionnaire was distributed to the PST's through online mode using what's app by creating a google forms and link was provided and their responses towards agricultural knowledge and irrigation system was recorded. The questionnaire was developed with two major dimensions for understanding the knowledge of PST's in agronomy and attitude towards irrigation. The questionnaire contained first nine items relating to knowledge in agronomy and its characteristics. And the remaining sixteen items is specifically about attitude towards irrigation in the field of agriculture.

Data collection

The questionnaire was administered to PST's with the help of research assistants. Prior to administer the test an orientation session was held to acquaint research assistants with the knowledge, skills and attitudes required for data collection. The responses have been collected from the PST's through online mode with the support of google forms. Online questionnaires are easy to access, handle, and manage, provided there is an internet connection. From the responses of the PST's the researcher used percentage analysis from the positive responses by which the researcher can understand their knowledge in agronomy and attitude towards irrigation.

Data analysis

Maximum population in India have been involved in agriculture from ages. This practice of agriculture is linked with farming where by products from the crops are sold for profit making. Hence the study undertaken two-fold in character, where data were collected with the help of the questionnaire and responses given by the PST's. The data have been collected from the PST's of Education Department, Indira Gandhi National University,

Anuppur Districts of Madhya Pradesh state. The study is quantitative in nature and the responses of the PST's were analysed using percentage (%) analysis. The average scores have been showed in percentage form where the dimension of the study like knowledge in agronomy and attitude towards irrigation has been examined. In this study the researcher has been selected the variables independently like gender, family background and locality among the student teachers.

Results and Discussion:

Agronomy Knowledge

At present scenario there was a need to integrate agronomic education as per the universal pressure to cater the needs of the increasing population, several research proves its success too and hence it is necessary to incorporate agronomic As global pressures increase the demands on agronomic education and its knowledge also needed to be increased based on this concept the study tries to assess the agronomy knowledge based on gender and the result is tabulated in table 1, (Thien et al., 2008).

Table 1: Agronomy Knowledge based on Gender

Gender	No of Pre-service teachers (PST's)	Percentage of correct responses
Male	29	70.49
Female	21	58.73

Table1 shows that among the 50 responses from PST's 29 PST's are male and 21 correct responses are female against their responses on knowledge in agronomy. From this correct responses the average percentage of correct responses came from the male PST's is 70.49% and from the female PST's is 58.73%. The result shows that agronomy knowledge for male PST's are stronger than the female PST's.

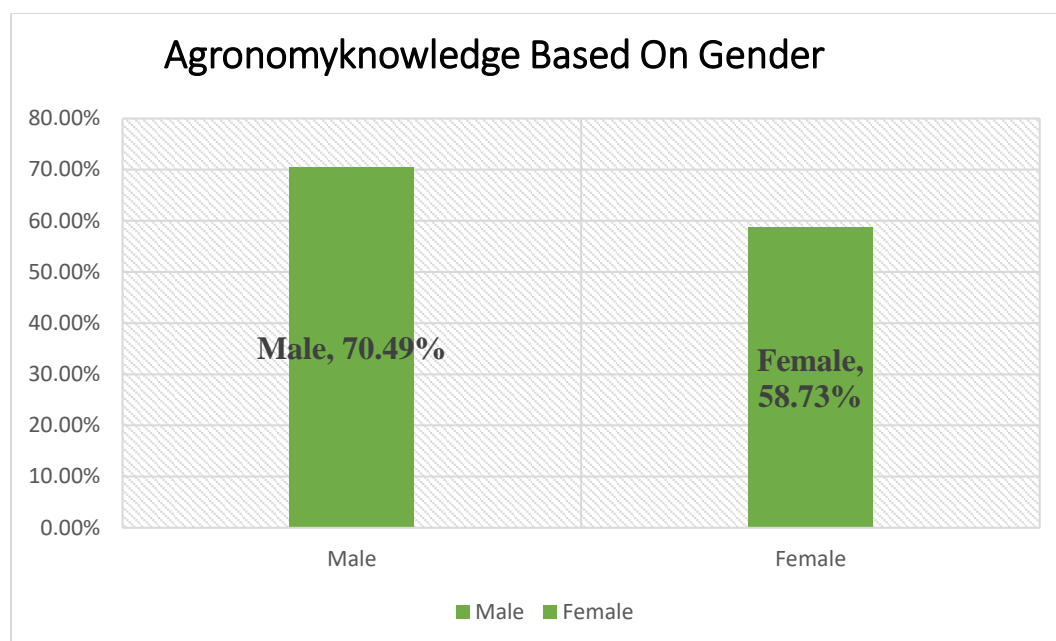


Figure 1: Agronomy Knowledge based on gender

Figure 1 graphically represents the agronomy knowledge for male PST's are stronger than the female PST's. Therefore the study suggest that it is essential to integrate agronomy skill education in the regular education system to improve the agricultural knowledge.

Agronomy Knowledge based on Family background

Beyond the opportunity provided in the classroom students also learn from outside based on this aspects the study tends to assess the agronomy knowledge of the PST's based on the family background(Dailey et al., 2001). The PST's from both agricultural and non-agricultural background are considered for this study and the results is tabulated in table 2.

Table :2 Agronomy Knowledge based on Family background

Family background	No of Pre-service teachers (PST's)	Percentage of correct responses
Agricultural background	38	66.08%
Non-agricultural background	12	63.88%

The results from Table 2 show that among the 50 PST's 38 are from agricultural family back ground where their family members are directly involved in agriculture as occupation or main sources of income which is came from agriculture. The other 12 PST's are from non-agriculture family who are mainly from urban sector and their family is not involved in agriculture. The result of table 2 shows that knowledge in agronomy among rural PST's who

are belongs from the agricultural family background are stronger than the urban PST's who are not directly involved in agriculture. Where the average percentage of correct responses came from the rural agricultural family is 66.08% and the average responses came from the urban PST's or non-agricultural family background is 63.88%. The result is graphically represented as below in Figure 2.

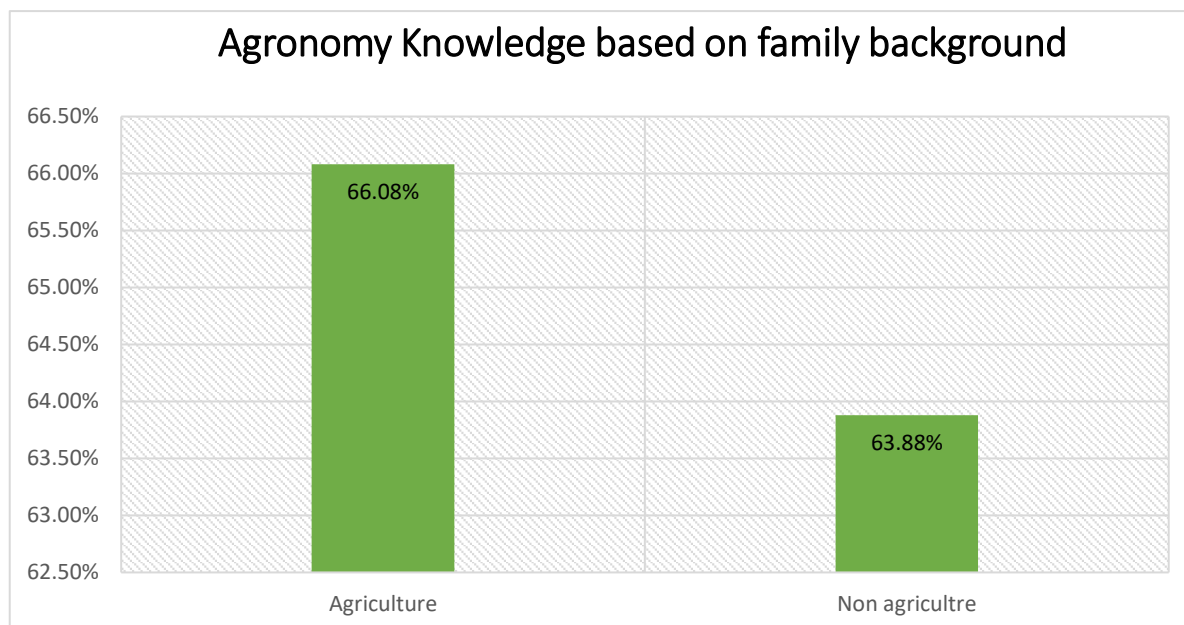


Figure 2: Agronomy Knowledge based on family background

Figure 2. Shows that the agricultural family back ground PST's have more knowledge in the field of agronomy but the non-agricultural family back ground PST's also aware for this particular issue.

Agronomy Knowledge based on Locale

(Spaling & Vander Kooy, 2019) According to this research farming depends on the nature of soil system, climatic conditions, literature of the farmers and the surroundings. Similarly in this study surroundings also suggests the improved performance of the PST's towards the agronomy knowledge and its result is tabulated in table 3.

Table: 3 Agronomy Knowledge based on Locale

Locale	No of Pre-service teachers (PST's)	Percentage of correct responses
Urban	12	63.88%
Rural	38	57.89%

From the 50 PST's response 12 were from urban and 38 were from rural locale. The factor contributes to the variable on the average respond knowledge in agronomy where urban PST's responses is 63.88% and rural PST's responses is 57.89% and so the result of the table shows that both the rural and urban PST's were aware about the basic agronomy base skill. The average percentage of opinion came from the urban PST's is stronger than the rural PST's.

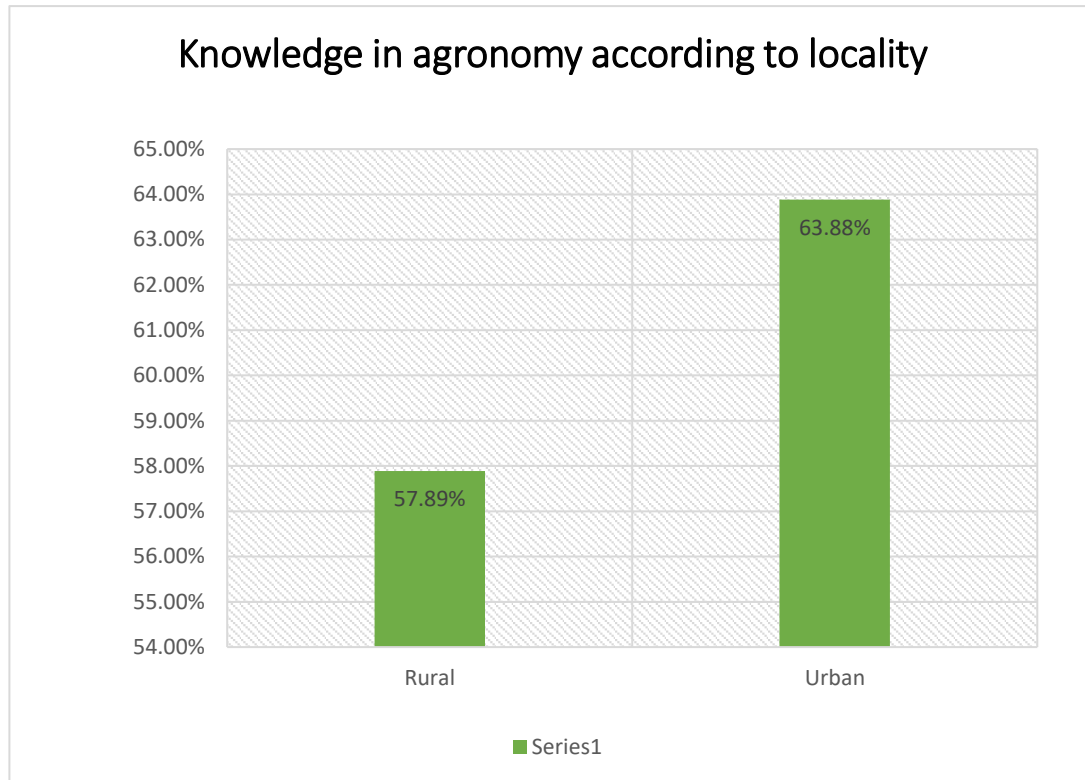


Figure: 3 Agronomy Knowledge based on Locale

Agronomy Knowledge

In this study the importance was given to agronomy knowledge in the first part and nine items was framed based on agronomy knowledge and PST's responses were recorded and analysed which is shown in Table:4. The agronomy knowledge covers the importance of agriculture, soil system, land needed for agriculture, quality crop production, scientific method involved and widely grown crops are covered in the first part of the study.

Table: 4 Questions based on Agronomy Knowledge

S.No	Questions	No. of Correct response	% of Correct response	No. of Incorrect response	% of Incorrect response
1.	What does agronomy mean?	44	88%	06	12%
2.	Do you think that agronomy knowledge is important?	46	92%	04	8%
3.	What is the purpose of Agronomy?	21	42%	29	58%
4.	Do your family directly involved in agriculture?	25	50%	25	50%
5.	What are the main steps for agricultural practices ?	19	38.8%	31	61.2%
6.	Do you know that soil testing is very essential for production of crops?	47	94%	03	6%
7.	Have you ever tested the soil of your agricultural land? If yes, after how many years you have tested the soil of your agricultural land?	15	30%	35	70%
8.	The process of producing quality crops is known as?	04	08%	46	92%
9.	Which crops have been produced by using modern agricultural science technique and gained its particular aim?	45	90%	5	10%

According to this study, about 88% of PST's of Education department have responded correctly for the question 1 which assess the knowledge and meaning of agronomy. Nearly 92% of PST's agreed to the statement that the agronomy knowledge is important as a PST they would like to update and improve their knowledge in agriculture through information. They can know about how to grow and care for plants and soils in certain environments. The factors such as climate, roots, moisture, weeds pests, fungi and erosion can pose significant challenges which is important for the student teachers as a part of knowledge in agronomy. This agreement is highly correlated with the previous questions.

The main purpose of agronomy is to increase the production of food and fibre crops 42% of PST's agreed with this and 58% of PST's responded incorrect therefore the study suggest it is necessary to implement the agronomy knowledge to increase the crop production.

It also shows 50% of PST's family is directly involved in agriculture from question number 4 and 38.8% of PST's have their own agricultural land for producing crops. Preparation of soil is the main steps for agricultural practices and 94% of PST's agreed with this statement. This was because majority of the PST's were aware of it and it is the most important part for producing crops. And it is to be noted that only 30% of PST's have correctly responded regarding soil maintenance and testing, so it is essential to incorporate the scientific method of soil testing and it has to be implemented. The study also shows that they have tested the soil of their agricultural land in every 2-3 years but 70% of them have responded that they are not familiar with this issue. The responses related to soil testing is not came from the student teachers too much positive because in India the farmers are not aware about this particular issue but modern agricultural system says that soil testing is very important for agriculture and its production of crops are dependent with this.

In the process of producing quality crops with question number 8 only 8% correct responses has come. Quality Rice and Wheat have been produced by using modern agricultural science technique and gained its particular aim with this statement 90% of PST's are agreed which is important particularly in agronomy knowledge.

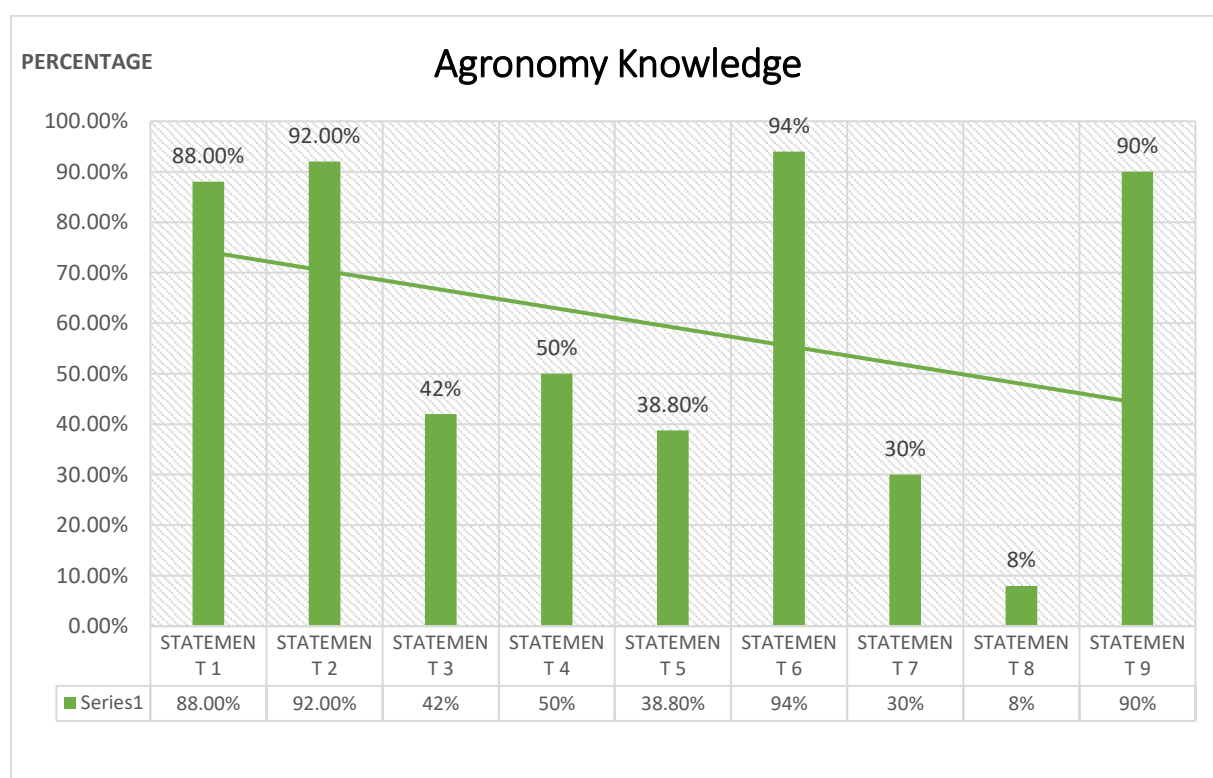


Figure: 4 Agronomy Knowledge item-wise analysis

Attitude towards irrigation

According to (May & Short, 2003) importance should be given to the PST's for skills like farming, cropping, irrigation system, pest management, weedicides, climatic conditions and knowledge about minerals and diseases. This study also interested in assessing the attitude of PST's towards irrigation system. Therefore in the second part of the questionnaire from item 10 to 25 were framed to find the attitude of PST's towards irrigation system. It was assessed based on the dimensions like gender, family background, locale and item-wise analysis.

Table :5 Attitude towards irrigation based on Gender

Gender	No of Pre-service teachers (PST's)	Percentage of correct responses
Male	29	60.22%
	21	59.04%
Female		

To determine the attitude of the PST's with regard to irrigation system in the field of agriculture, attitude was characterized. The factors where the average score of male PST's is 60.22% and female PST's is 59.04% positive attitude, which is favourable in this study. The results in table 5 indicated that the majority of the PST's had a favourable attitude towards irrigation. It shows a positive attitude towards justifiable agriculture knowledge from the values which is measured. The study shows that moderately positive attitude towards irrigation of the gender-based variable have it is shown diagrammatically in fig.5.

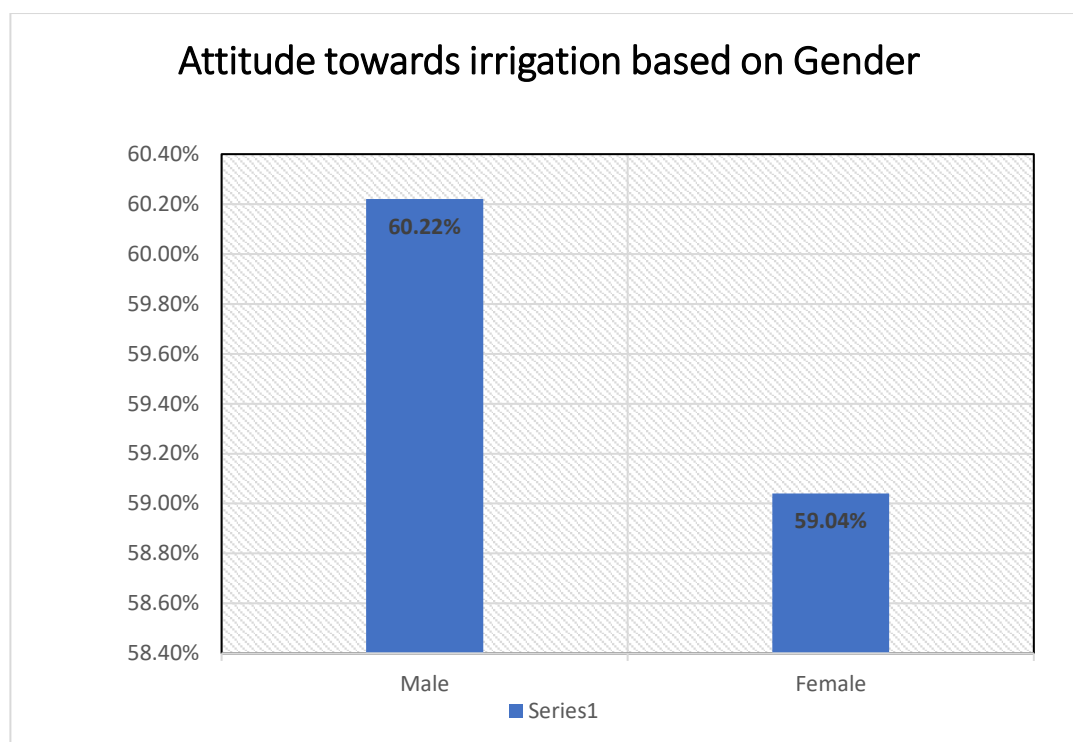


Figure: 5 Attitude towards irrigation based on Gender

Attitude towards irrigation based on family background

According to the family back ground 50 PST's responded attitude towards irrigation among them 38 respondent were from agricultural family back ground and their respond were 60% and 12 respondent were from non-agricultural back ground and their respond were 63.88%.

Table:6 Attitude towards irrigation based on family background

Family background	No of Pre-service teachers (PST's)	Percentage
Agricultural	38	60%
Non-agricultural	12	63.88%

The result of the respondent exemplify that according to family back ground the PST's who were from non-agricultural background have more attitude towards irrigation system. That implies that it is necessary that if it is integrated in the regular curriculum will improve their attitude towards irrigation and its skills and it will be reflected in the real life.

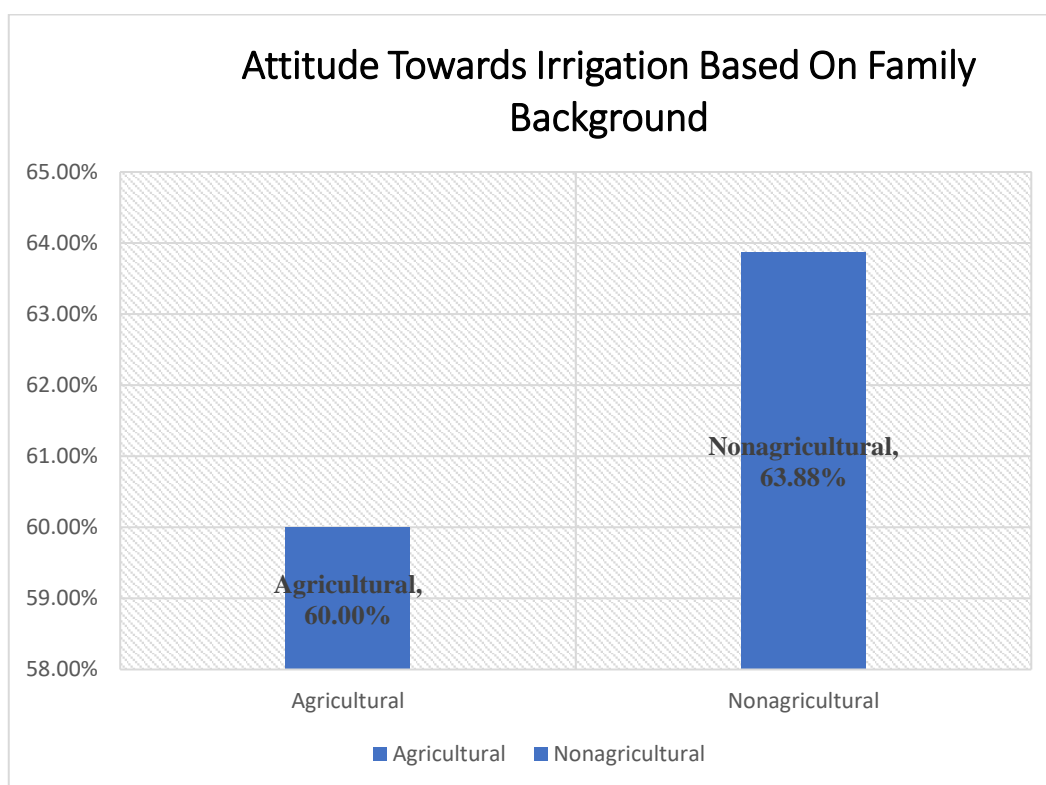


Figure: 6 Attitude towards irrigation based on family background

Attitude towards irrigation based on Locale

According to the locale 50 PST's responded attitude towards irrigation among them 38 respondent were from rural area and their respond were 60% and 12 respondent were from urban area and their respond were 66.66%. The result is tabulated in table 7.

Table :7 Attitude towards irrigation based on Locale

Locale	No of Pre-service teachers (PST's)	Percentage
Rural	38	60%
Urban	12	66.66%

The result of the respondent exemplify that according to locale the urban PST's respond was more strong than the rural PST's attitude towards irrigation and its skills. The study shows that although the rural student teacher were directly involved in agriculture but they are not advanced in the skill of modern technique of irrigation because of poor

infrastructure in their area. In the other hand the urban PST's attitude towards irrigation is more or advanced because various modern technology is available in their area by which they easily got the knowledge about the modern technique of irrigation this is the main reason for being urban PST's attitude high towards irrigation.

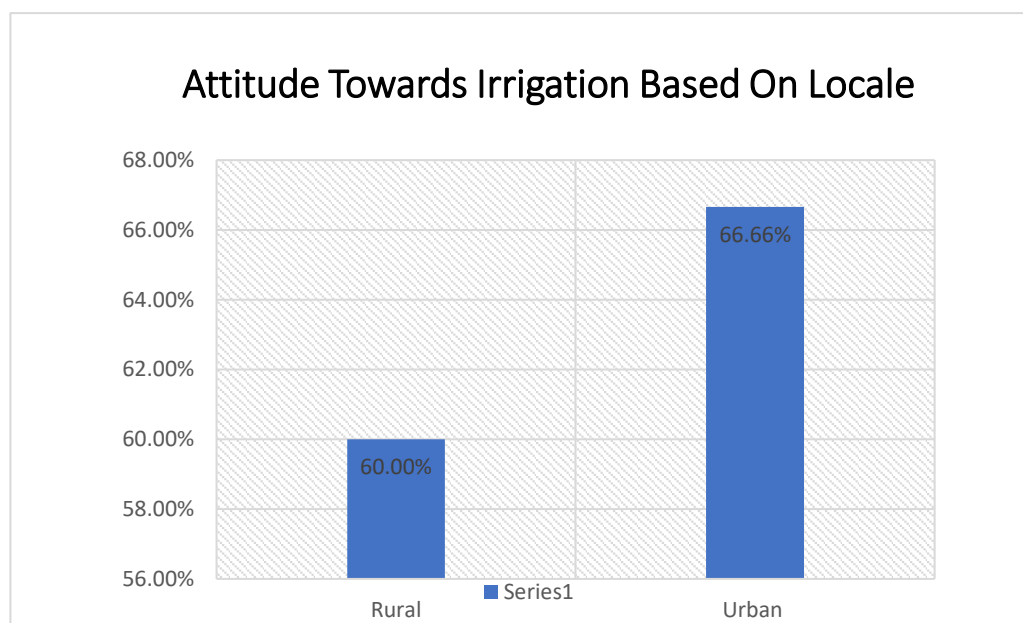


Figure: 7 Attitude Towards Irrigation Based On Locale

Attitude towards irrigation System

According to this study about 54 percent of PST's of Education department responses that modern system of irrigation has been used in their agricultural land for producing crops. All of them have responded that sources of water is important for proper irrigation system for effective crop production.

Table:8 Questions based on attitude towards irrigation system

S.No	Questions	No. of Correct response	% of Correct response	No. of Incorrect response	% of Incorrect response
1.	Is modern system of irrigation has been used in your agricultural land for crop production?	27	54%	23	46%
2.	Are there sources of water for irrigation in your agricultural land?	50	100%	0	0%
3.	Do you think irrigation is important for producing crops?	50	100%	0	0%
4.	In India irrigation land has been divided in how many parts?	25	50%	25	50%

5.	Do you have any knowledge about the process of irrigation according to the nature of soil?	12	24%	38	76%
6.	Are you follow the main sources for getting information related to agriculture and weather?	50	100%	0	0%
7.	In agriculture biological and engineering methods may be used for?	47	94%	03	06%
8.	Do you know drip irrigation has more advantage than the other drainage systems?	21	42%	29	58%
9.	Do you know with very less water the furrow irrigation is better to save water?	19	38%	31	62%
10.	Do you know water is essential for the paddy during tilling panicle initiation and flowering?	29	58%	21	42%
11.	Do you know for Wheat, the water is essential during crown root initiation, tilling to booting?	14	28%	36	72%
12.	Do you know about soil conservation?	36	72%	14	28%
13.	Soil conservation is divided into how many parts?	12	24%	38	76%
14.	Do you know the first phase of the process of growing the best quality crop in the field of agricultural science?	29	58%	21	42%
15.	Do you know that adopting modern techniques for the production of crops has been increased?	31	62%	19	38%
16.	If yes, according to you how much percentage is increased?	19	38%	31	62%

About 50 percent of PST's agree that in India irrigation land has been divided in two parts for better irrigation system. Where only 24% of PST's responded that they have proper attitude about the process of irrigation according to the nature of soil. Whereas 100% of the responses came that the PST's followed the newspaper, electronic media like TV, mobile apps or social media and friends, relatives as main sources for getting information related to agriculture and weather. About 94% of PST's responded that in agriculture biological and engineering methods may be used for the production of crops, means of irrigation and soil conservation. Nearly 42% of PST's agreed that drip irrigation has more advantage than the other drainage systems.

As a part of the study 38% of PST's has exposed that with very less water the furrow irrigation is better to save water. 58% of PST's agreed that water is essential for the paddy during tilling panicle initiation and flowering. The study reflects that 28% of PST's responded that they strongly agree for knowing the knowledge of production or cultivation of wheat, the water is essential and during crown root initiation, adapting to booting.

The findings of the present study show that 72% of PST's have positive attitude about soil conservation whereas about 24% of PST's have the knowledge that soil conservation is divided in two parts. 58% of PST's responded that selective breeding system is the first phase of the process of growing the best quality crop in the field of agricultural science. The study shows that 62% of PST's agreed for adopting the modern technique for the production of crops which has been increased with the support of proper irrigation among them 38% of PST's have given their positive opinion that by adopting modern technique the production of crops will be increased more than 25%.

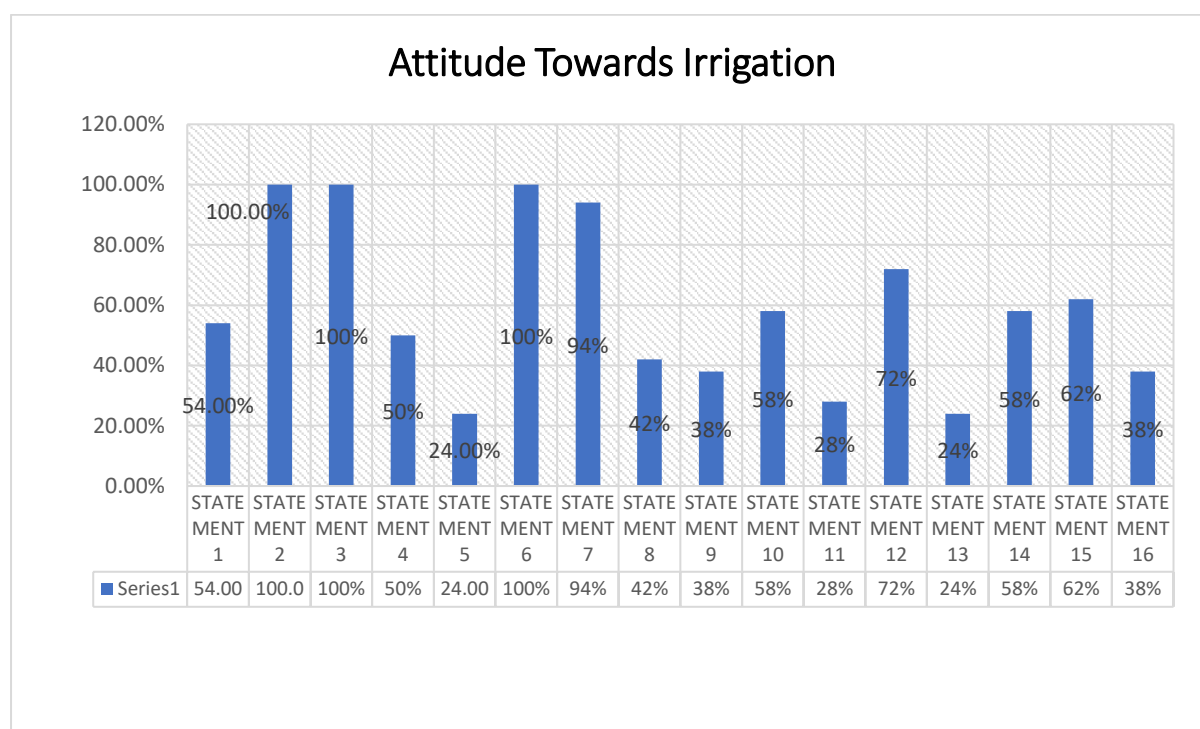


Figure: 8 Attitude Towards Irrigation item-wise analysis

Discussion and recommendation

This study on the agronomy knowledge and attitude towards irrigation system by PST's was limited to pre-service teachers of Amarkantak, Madhya Pradesh in Indira Gandhi National Tribal University and it can be replicated to other areas with different variables. The study was

conducted for small sample size 50 it can further taken for large sample. According to this study there is a need to develop genuine attitude towards agronomy skills for the effective crop production to increase cost effectiveness(Ingram, 2008). The study also suggests to organize orientation program in an periodic time to inculcate agronomy knowledge and to involve students in field work regularly by allotting a separate period like gardening or practical classes for skill development and projects and assignments should also be given to the students either by individual or in group, this will enhance their knowledge. According to (Charatsari & Lioutas, 2019) development in agronomy knowledge will enhance self- sustainability which is the main principle of this study

Conclusion

The significant objective of this study was to examine the agronomy knowledge and attitudes towards irrigation among the PST's. The study concludes the main findings and also discusses the implications and interconnection of results attained. PST's response shows that they themselves as have appropriated attitudes towards agriculture. In this regard, we conclude that their attitude about agronomy knowledge and irrigation system were especially high because maximum of them were aware about the present agricultural issues and its aspects and environmental and social dimensions, but knowledge is less towards food security and economic aspects therefore it is necessary to integrate the agronomy education in order to meet the practical challenges. As PST's valued agriculture not only for the practices were in harmony with nature and profitable and they perceived that farmers are only practicing with their indigenous knowledge without aware of components with determined factors.

Conflicts of Interest

The authors declare no conflicts of interest.

Acknowledgements

Subendhu Panda and Maria Josephine Arokia Marie acknowledges financial support of Indian Council of Social Science and Research (ICSSR) through Grant F.No IMPRESS/P1633/191/2018-19/ICSSR, Ministry of Human Resource Development, JNU Institutional Area, Aruna Asaf Ali Marg, New Delhi 1100676. All authors are thankful to Department of Education, Indira Gandhi National Tribal University, Amarkantak (M.P) India.

Dr. Maria Josephine Arokia Marie. S Corresponding Author works as Assistant Professor in Department of Education at Indira Gandhi National Tribal University, Amarkantak (M.P) India, her area of interest for research is Blended learning, Educational Technology, Agronomy skills, Teacher Education and Education and Extension activities. She completed her PhD in Education from Pondicherry University.

Mr. Subendhu Panda was a Research Assistant in ICSSR IMPRESS project in department of Education at Indira Gandhi National Tribal University, Amarkantak (M.P) India.

Hari Haran. R works as Assistant Professor in Department of Education at Indira Gandhi National Tribal University, Amarkantak (M.P) India, his area of interest for research is Teacher Education, Educational technology, agronomy skills, Research methodology and educational philosophy.

Shikha Banerjee works as Assistant Professor in Department of Education at Indira Gandhi National Tribal University, Amarkantak (M.P) India, her area of interest for research is Teacher Education, Educational Psychology, agronomy skills, Research methodology and Inclusive education.

Reference

- Bhattacharyya, & Mukherjee, (2019). Importance of Skill Development in Indian Agriculture. Retrieved from <https://www.researchgate.net/publication/333843371/link/5d08913592851cfcc61f7727/pdf>.
- Boud, D., Keogh, R., Walker, D., Reinhart, C., Wyatt, T., Vygotsky, L., Dewey, J., Young, M. G., Malisius, E., & Dueck, P., Utech, J. L., Maghuyop, A. Z., Sebastien, B., Team, T. E., Education, D. of, Furco, A., Innotech, Perin, D., Hare, R., Piaget, J., Zeidenberg, M., ... Dewey, J. (2016). Curriculum development in vocational and technical education: Planning, content, and implementation. *Brooklyn, NY: Workforce Strategy Center*. <https://doi.org/10.1088/1742-6596/895/1/012171>
- Casper, A. M. A., Fernández-Giménez, M. E., & Balgopal, M. M. (2020). A tool for measuring ecological literacy: coupled human-ecosystem interactions. *Journal of Agricultural Education and Extension*. <https://doi.org/10.1080/1389224X.2020.1780139>
- Charatsari, C., & Lioutas, E. D. (2019). Is current agronomy ready to promote sustainable

- agriculture? Identifying key skills and competencies needed. *International Journal of Sustainable Development and World Ecology*.
<https://doi.org/10.1080/13504509.2018.1536683>
- Dailey, A. L., Conroy, C. A., & Shelley-Tolbert, C. A. (2001). Using Agricultural Education As The Context To Teach Life Skills. *Journal of Agricultural Education*.
<https://doi.org/10.5032/jae.2001.01011>
- Government of India - Ministry of Finance. (2013). Agriculture and Food Management. *Economic Survey 2012–13*.
- Gow, G., Chowdhury, A., Ramjattan, J., & Ganpat, W. (2020). Fostering effective use of ICT in agricultural extension: participant responses to an inaugural technology stewardship training program in Trinidad. *Journal of Agricultural Education and Extension*.
<https://doi.org/10.1080/1389224X.2020.1718720>
- Ingram, J. (2008). Agronomist-farmer knowledge encounters: An analysis of knowledge exchange in the context of best management practices in England. *Agriculture and Human Values*. <https://doi.org/10.1007/s10460-008-9134-0>
- Jellason, N. P., Conway, J. S., & Baines, R. N. (2020). Understanding impacts and barriers to adoption of climate-smart agriculture (CSA) practices in North-Western Nigerian drylands. *Journal of Agricultural Education and Extension*.
<https://doi.org/10.1080/1389224X.2020.1793787>
- Jeong, S. J., & Choi, S. J. (2020). Agricultural literacy in the context of agricultural education in South Korea: using hierarchical linear modeling. In *Journal of Agricultural Education and Extension*. <https://doi.org/10.1080/1389224X.2020.1748670>
- Landini, F. (2020). How do rural extension agents learn? Argentine practitioners' sources of learning and knowledge. *Journal of Agricultural Education and Extension*.
<https://doi.org/10.1080/1389224X.2020.1780140>
- May, G. L., & Short, D. (2003). Gardening in Cyberspace: A Metaphor to Enhance Online Teaching and Learning. *Journal of Management Education*.
<https://doi.org/10.1177/1052562903257940>
- Moreau, D., Pointurier, O., Nicolardot, B., Villerd, J., & Colbach, N. (2020). In which cropping systems can residual weeds reduce nitrate leaching and soil erosion? In *European Journal of Agronomy*. <https://doi.org/10.1016/j.eja.2020.126015>
- Okiror, J., Matsiko, B., & Oonyu, J. (2011). Just How Much Can School Pupils Learn from School Gardening? A Study of Two Supervised Agricultural Experience Approaches in Uganda. *Journal of Agricultural Education*. <https://doi.org/10.5032/jae.2011.02024>

- Puech, T., Schott, C., & Mignolet, C. (2020). Characterising the diversity and spatial differentiation of crop managements at a regional scale. *European Journal of Agronomy*. <https://doi.org/10.1016/j.eja.2020.126112>
- Schneider, U. A., Havlík, P., Schmid, E., Valin, H., Mosnier, A., Obersteiner, M., Böttcher, H., Skalský, R., Balkovič, J., Sauer, T., & Fritz, S. (2011). Impacts of population growth, economic development, and technical change on global food production and consumption. *Agricultural Systems*. <https://doi.org/10.1016/j.agsy.2010.11.003>
- Spaling, H., & Vander Kooy, K. (2019). Farming God's Way: agronomy and faith contested. *Agriculture and Human Values*. <https://doi.org/10.1007/s10460-019-09925-2>
- Thien, S. J., Buckley, M. E., & McFee, W. W. (2008). A century of agronomic education. *Agronomy Journal*. <https://doi.org/10.2134/agronj2006.0368c>
- Tzanopoulos, J., Kallimanis, A. S., Bella, I., Labrianidis, L., Sgardelis, S., & Pantis, J. D. (2011). Agricultural decline and sustainable development on mountain areas in Greece: Sustainability assessment of future scenarios. *Land Use Policy*. <https://doi.org/10.1016/j.landusepol.2010.11.007>

Appendix 1

Assessing Pre-Service Teachers Attitudinal Changes towards agronomy and irrigation system for self-sustainability

1. What does agronomy mean?
 - A. Science of utilizing plants
 - B. Animals and soils for food, fuel
 - C. feed and fibre
 - D. All of these
2. Why agronomy knowledge is important?
 - A. To know agricultural information
 - B. To know about how to grow & care for plants & soils in certain environments
 - C. To know factors such as climate, roots, moisture, weeds pests, fungi and erosion can pose significant challenges.
 - D. All A, B and C
3. What are the purpose of Agronomy?
 - A. Increase the production of food and fibre crops
 - B. Research in crop rotation, irrigation
 - C. Plant breeding, soil classification, soil fertility, weed control
 - D. Research in Animal husbandry

4. Do your family directly involve in agriculture?
A. Yes directly involved
B. Sometimes involved
C. Not directly involved
D. Don't have any agricultural land for farming
5. The main steps for agricultural practices include?
A. Preparation of soil
B. Sowing, adding manure and fertilizers
C. Irrigation, harvesting and storage
D. Collection of crops
6. What are the purpose of Agronomy?
A. Increase the production of food and fibre crops
B. Research in crop rotation, irrigation
C. Plant breeding, soil classification, soil fertility, weed control
D. All of these
7. Do you have the knowledge of soil testing? If yes, after how many years you have tested the soil of your agricultural land?
A. Between 1-2-year
B. Every 2-3 years
C. Every 3-5-year
D. No knowledge and ever tested
8. The process of producing quality crops is known as?
A. Crop imitation
B. Healthiness
C. Nourishment
D. Harvesting
9. Which crops have been produced by using modern agricultural science technique and gained its particular aim?
A. Quality Rice and Wheat
B. Corn
C. Various types of Dal
D. Potato
10. Which system of irrigation has been used in your agricultural land for producing crops?
A. Ancient
B. Medieval
C. Modern
D. Traditional
11. What is the main sources of water for irrigation of your agricultural land
A. River/Natural rain
B. Pond
C. well
D. Tube well/Deep tube well
12. Which process has been used for irrigation?
A. Flooding irrigation /Surface irrigation
B. Drip/Trickle irrigation
C. Sprinkling irrigation
D. Sub irrigation
13. In India irrigation land has been divided in how many parts?

- A. 1
C. 3
- B. 2
D. 4
14. Do you have any idea about the process of irrigation according to the nature of soil?
A. Known
C. Unknown
- B. Partially known
D. Least known
15. What is the main sources for getting information related to agriculture and weather?
A. Newspaper
C. Mobile Apps or social media
- B. Electronic media like TV
D. Friends, relatives
16. In agriculture biological and engineering methods may be used for?
A. The production of crops
C. Soil conservation
- B. The means of irrigation
D. Both A,B&C
17. Drip irrigation has more advantage than the other drainage systems?
A. Known
C. Unknown
- B. Partially known
D. Least known
18. With very less water the furrow irrigation is better to save water?
A. Known
C. Unknown
- B. Partially known
D. Least known
19. Do you know water is essential for the paddy during tillering panicle initiation and flowering?
A. Known
C. Unknown
- B. Partially known
D. Least known
20. Do you know for Wheat, the water is essential during Crown Root Initiation, Tillering to Booting?
A. Known
C. Unknown
- B. Partially known
D. Least known
21. Do you know about soil conservation?
A. Known
C. Unknown
- B. Partially known
D. Least known
22. Soil conservation is divided in how many parts?
A. 1
C. 3
- B. 2
D. 4

23. What is the first phase of the process of growing the best crop in the field of agricultural science?
- A. Selective breeding system B. Biological breeding system
C. Excessive breeding system D. Biodiversity system
24. Do you know that by adopting modern technique the production of crops has been increased?
- A. Yes Known B. Partially known
C. Unknown D. Least known
25. If yes, according to you how much percentage is increased?
- A. 5-10% B. 10-15%
C. 15-20% D. More than 25%