AGRICULTURE MOOCS

LEARNINGS FROM FIVE AGMOOCS

IIT Kanpur and the Commonwealth of Learning delivered five agriculture based massive open online courses (MOOCs). This report provides insights on learners' feedback on the course pedagogy and its relevance, content, convenience and ease of use of the technological medium, and overall perceptions of learners towards the delivered courses.

TABLE OF CONTENTS

Contents

TABLE OF CONTENTS

EXECUTIVE SUMMARY

KEY FINDINGS

COURSES

The agMOOCs are useful to the learners and they expect that such courses are continued in future. The courses helped them to enhance their knowledge and skill set. Most learners prefer to share the gained knowledge with their peers, friends, students and colleagues.

PLATFORM

The platform was mainly accessed through computers. The learners found the platform easy to use and accessible. However, few users with less Internet bandwidth found it difficult to access the agMOOCs platform. Users didn't find mobile phone based version much comfortable to use as it lacked features seen on the full-fledged computer version.

CONTENT

The learners found the content useful and engaging. However, the learners are of the view that the content can enriched by adding resources like reading materials, research papers, links to websites, and other video and audio content related to the course topics. In addition, use of visuals, images and practical/field based content is recommended. Content may be added for learners who prefer to learn about a topic in a greater depth.

LEARNERS' PERCEPTION

Overall, there is a positive opinion of the learners about agMOOCs. They have recommended many new courses which may be considered for future agMOOCs. The participation level of learners is high and they have voiced their opinions, through survey, to make future agMOOCs better. Learners have suggested to increase frequency of quizzes and assignment. In addition, they also suggest that flexibility should be there for assignment/quiz submission as slow Internet is a problem in some cases. Learners feel that notification through email or SMS alerts may be provided for any new content addition, quiz and assignment deadlines.

INTRODUCTION

Purpose of the Report

The report functions to provide an evaluation of the feedback of five agMOOCs, Weather Forecast in Agriculture and Agro-advisory, Integrated Pest Management (IPM), Basic Crop Production Practices (in hindi language), GIS in Ag-Essentials and Applications and Nutrition, Therapeutics and Health, designed by the Commonwealth of Learning, the Indian Institute of Technology, Kanpur and NPTEL.

The report will provide insights to various stakeholders of agMOOCs in regards to the learners feeback on the five agMOOCs. The report will share insights on the user experiences of agMOOCs content, platform, instructors and participants. The inputs may be used for desing of other agMOOCs in future, and to advance understanding about the utility of agMOOCs in the broader space of skill enhancement in agriculture domain. The report will also be useful to other individuals or organizations who may consider participating in agMOOCs as a designer, instructor or learner in future.

The report begins with a description of agMOOCs. The report includes aims, duration, intended learners and content of each agMOOC. In addition, the report presents the results of the questionnaire which was sent to learners after the courses were over. The report includes qualitative and quantitative data analysis to provide insights on the course design features and course platform features. The report also includes analysis of the feedback data on individual courses. In the end a summary of the report and a series of recommendations are furnished.

Sources of information

The report is based on the qualitative and quantitative data. Dr. V. Balaji from CoL, made the data available to the author for analysis. The data was collected through a questionnaire which was sent via electronic mail to all the users of agMOOCs after the completion of the course. The responses were collated from each multiple choice/rating

question and responses of all open questions. Information was also obtained from the agMOOCs website (http://www.agmoocs.in/) and from various CoL publications (http://oasis.col.org/)

THE COURSE

Context: Massive Open Online Courses (MOOCs) are a new occurrence in the area of asynchronous learning in higher education. MOOCs are seen as 'disruptive innovation' in higher education. MOOCs may be used for online learning in postsecondary institutions, professional development, and corporate e-learning (Kennedy 2014). MOOCs have the potential to provide cutting edge courses that could drive down the cost of university-level education and potentially disrupt the existing models of higher education (Yuan and Powell 2013). In line with this philosophy, Commonwealth of Learning, Indian Institute of Technology (IIT), Kanpur, India and National Programme on Technology Enhanced Learning (NPTEL), India initiated MOOCs, known as agMOOCs, in the agriculture domain as Agriculture plays a crucial role in growth of the Indian economy. Enhancing skills, competencies and capacity of the human resources on a mass scale is important in addressing the multiple challenges facing Indian agriculture (Devakumar et al. 2014). To address the need of skill and capacity building in agriculture, a consortium of leading institutions has launched Massive Open Online Courses called agMOOCs.

agMOOCs is an online platform designed to help students, professionals and organizations to acquire and enhance knowledge and skills in the agriculture domain. The platform provides free access to numerous high quality courses online offered by renowned faculty from the premier institutes of the country.

Course Topics: To enhance skills in agriculture domain, five agMOOCs courses were offered from 11th January 2016. Participation and Competency certificates were awarded to qualifying students based on their involvement and performance. The certificates were jointly issued by the Centre for Development of Technical Education, IIT Kanpur and NPTEL.

The five AgMOOCs offered were:

1. **Weather Forecast in Agriculture and Agro-advisory**: The course focused on risks affecting crop production. The course talks about the three crop production risks, i.e. inherited risk, transferable risk; risk due to introduction of new technologies. In this context, the course covered topics related to weather forecast in agriculture and formulation of agro-advisory to reduce the crop production risks.

   Intended learners: The course was intended for Agriculture students, Faculty of Agriculture Universities, Agriculture Scientists, NGOs in Agriculture, Farming Community, Agricultural Produce Marketing Officials and Agricultural Input Dealers.

2. **Integrated Pest Management (IPM):** This course covered the basics of insects and their dominance in nature, insects as pests, reasons for their outbreak resulting in crop loss, types of pests, and mode of surveillance, sampling methods and economic damage levels of pest populations. The course also explained about the principles and concepts of pest management and different components of IPM: legal, ecological, physical, cultural, mechanical, behavioral, biological, botanical, chemical and biotechnological approaches. In addition, this course discussed on Integration of different IPM tactics, their pros and cons and Implementation of AESA - Agro-ecosystem Analysis in pest management. Successful IPM cases in Cereals (Paddy), Commercial Crops (Cotton, Sugarcane), Pulses (Redgram, Soybean), Oilseed Crop (Groundnut), Vegetable Crops (Cabbage, Tomato) and Fruit Crops (Mango, Grapes) were covered during the course duration.

   Intended learners: The course was intended for Agriculture students, Faculty of Agriculture Universities, Agriculture Scientists, NGOs in Agriculture, Field Officers of Department of Agriculture / Horticulture, KVK Subject Matter Specialist in Crop Protection and Progressive Farmers/ Farming Community

3. **Basic Crop Production Practices (in hindi):** The course aimed to familiarize learners with basic principles of crop production, the production of agricultural crops and their management can be successfully. Under this course, the importance of crops, classification, irrigation management, processes of crop production for grains, pulses, oilseeds, vegetable and fruit crops were included.

   Intended learners: The course was primarily for Agriculture students and crop growers

4. **GIS in Ag-Essentials and Applications:** This course offerered an overview of GIS and its applications in agriculture. The leaners could understand geospatial information made available by many agencies and individuals, and can start knowledge based smart agriculture practices.

   Intended learners: Students, faculty and researchers working on agriculture related aspects (land–water–agriculture–climate). Practicing and prospective cultivators and people associated with water and food security.

5. **Nutrition, Therapeutics and Health:** The course dealt with the introduction to nutrition which includes the relationship between food, nutrition and health, digestion,

absorption and utilization of nutrients and the recommended dietary allowances. In additon, the course covered the the role of different nutrients, their food sources, requirements and deficiencies which will help in recognizing the deficiency of nutrients in the diet and help in corrections.

Intended learners: The course was mainly intended at Paramedical professionals, Counselors, Coaches, Teachers, Health professionals, Students of health sciences and social sciences, Civil society organizations engaged in fighting endemic and hidden hunger and General public.

COURSE	CONTENT	DURATION
Weather Forecast in Agriculture and Agro-advisory	Basic concepts of atmosphere, climate& weather, Agro-advisory, Weather elements Farm Decisions, Three weather codes, Crop Weather Interaction, Weather forecast, Weather Thumb Rules	8 weeks
Integrated Pest Management (IPM)	Pest, definition and categories, Principles of pest management, Components of IPM, IPM integration tactics, Agro-ecosystem analysis, Successful IPM cases	8 weeks
Basic Crop Production Practices (in hindi)	Importance of crop production, crop production cycle, Irrigation management, Basic production practices of pulses, oilseeds, fruits and vegetables	6 weeks
GIS in Ag-Essentials and Applications	Agriculture practices & use of GIS for course correction, Integration of agriculture related information, Geographical Information system, Weather Cloud reading & rainfall analysis in irrigation schedule, GIS in estimation of water availability for effective planning, Implications of Water availability - deficit on agriculture, Drought vulnerability assessment & short & long term developments, Village / Land information system, Sustainable resources management and agriculture	8 weeks

Nutrition, Therapeutics and Health	Relationship between Food, Nutrition and Health, Recommended Dietary Allowances, Digestion, Absorption and Utilization of Nutrients, Importance of Various Nutrients, Meal Planning and Food Sanitation and Hygiene, Principles of Therapeutic Nutrition, Therapeutic Adaptation of Normal Diet, Dietary Guidelines for Various Disorders	8 weeks

Learner Demography

The total number of feedbacks received are around 1168. There are about 79% male and 31% female respondents. Maximum number of respondents lie in the age range 25-34 years. They constitute apporximately 41% of the total respondents followed by repondents in the age range 17-24, which constitute around 37% of the total respondents as seen in Fig 1.
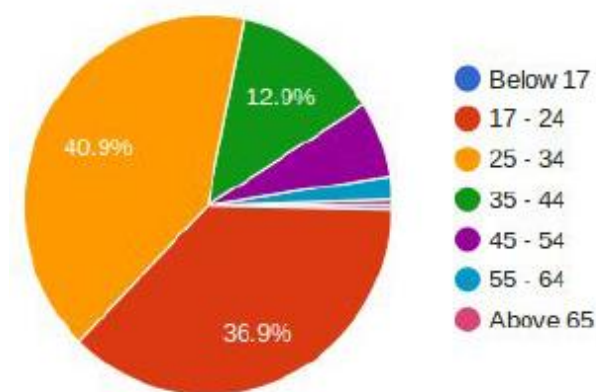

Figure 1: Age groups of learners

Around 61% of the learners are students followed by faculty which are approx. 15% of the total respondents. Majority of learners i.e. around 65% belong to Agriculture College/University. Interestingly, 28% of the respondents are not affiliated to any College or University in the areas of agriculture, veterinary, animal science, forestry and horticulture. These data show that the AgMOOCs are most popular amongst student community of agriculture colleges and universities. In addition, the data shows that there is interest shown in AgMOOCs by people who are not associated with agriculture or its allied areas, either as a student, faculty, researcher or an extension agent.

Learner AgMOOCs Awareness

The feedback data shows that friends or peers played a significant role in awareness creation about AgMOOCs. Approximately for 52% people, friends and colleagues were the main source of information about AgMOOCs. Second important source of information is ICAR. Approximately, 22% people came to know about the courses through Indian Council of Agriculture Research (ICAR). Indian Council of ICAR is an organization attributed to

agriculture education and research in India. Hence, it is likely that for the agriculture community, ICAR is the main source of information for AgMOOCs.
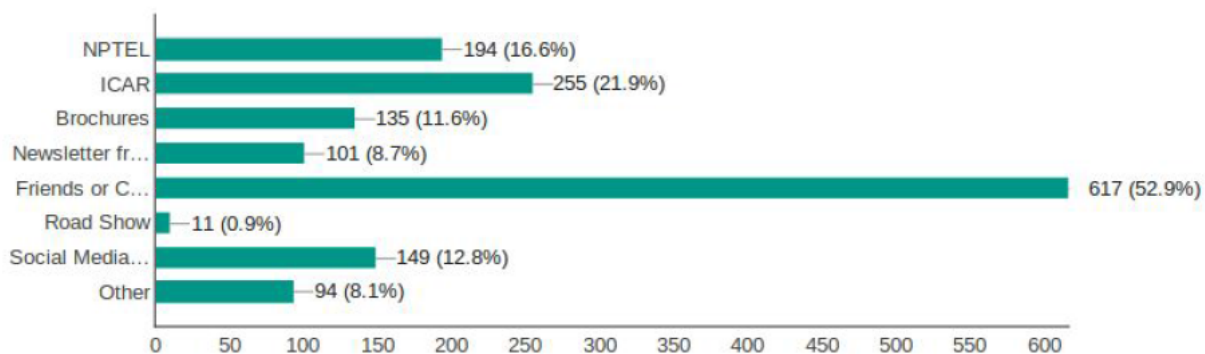

Figure 2: AgMOOCs awareness

Learner ICT use

The main ICT used to access AgMOOCs are personal laptops and desktops. Over 57% respondents used laptops and around 38% used desktops to access the courses. Mobile devices such as tablet and smartphone were not used much when compared to laptops and desktops. Use of laptops, due to its portability, provided the convenience to access to courses anywhere and anytime. The courses were accessed mainly from home. About 50% people accessed the courses from home at their convenience. However, office (workplace) was the second preference of the people with respect to access of the course platform. Home and workplace offers better internet connectivity compared to at other places. Hence, it is highly likely that people prefer to use home and workplace to access such course platforms. This argument is supported by the fact that around 60% people used broadband to access the course platform compared to mobile GPRS (2G/3G) as shown in Fig. 2.
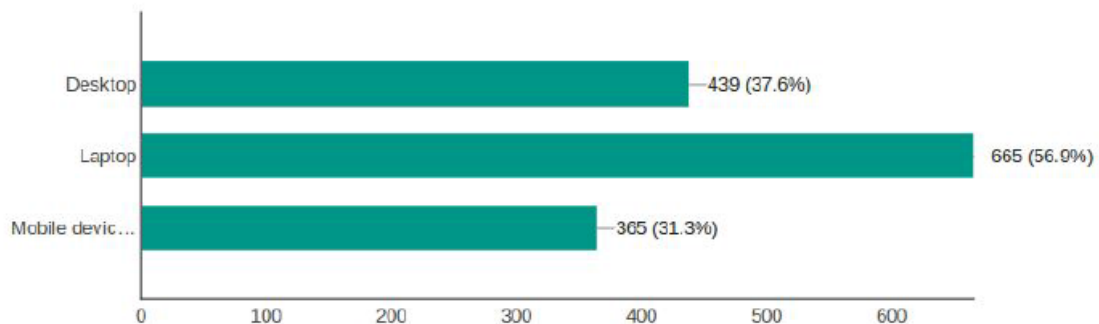
Figure 3: ICT used for AgMOOCs

Learner Need for AgMOOCs

Responses from the learners reveal that the main reason for taking various AgMOOCs is to increase knowledge and awareness about the subject. In addition, around 42% people feel that the courses help in professional development and adds value to their *curriculum vitae*. Curiosity to learn new topics was important to 39% respondents. Some learners completed the courses for a certificate, while a few want (faculty) to use the content of the AgMOOCs to design courses for their students.

Learner Use of AgMOOCs

It is evident from the above section that learners of AgMOOCs seek knowledge on new topics and want to upgrade their knowledge on various topics. To the question on how the learners intend to use the acquired knowledge through AgMOOCs, most learners, i.e. approx. 54%, want to share the knowledge gained with their friends and colleagues.
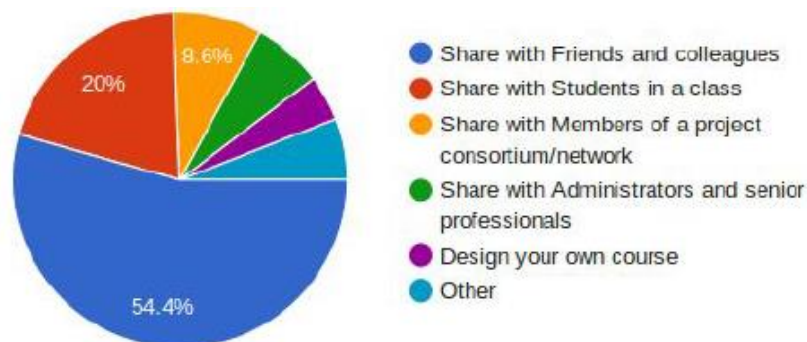

Figure 4: Use of AgMOOCs by learners

Navigation

For learner, navigation of course content is a crucial element. For effective learning navigation of the course platform should be easy. The learners of AgMOOCs were asked whether the course platform was easy to navigate on a scale of five (five being strongly agree). The average rating is 4.3, which shows that most learners believe that the learning platform was easy to navigate.

Accessibility

Another important factor for learners is the platform accessibility. Here accessibility relates to a learners' ability to access the platform on different ICTs such as laptops, smartphone etc. To the question on the ease of accessibility of the platform on a scale of five (five being strongly agree), a rating of 4.4 was obtained. This shows that the learners were able to access the platform on different ICTs. For example, mobile app was used on smartphones to access learning platform. The usage pattern on mobile apps can be seen in the figure below.
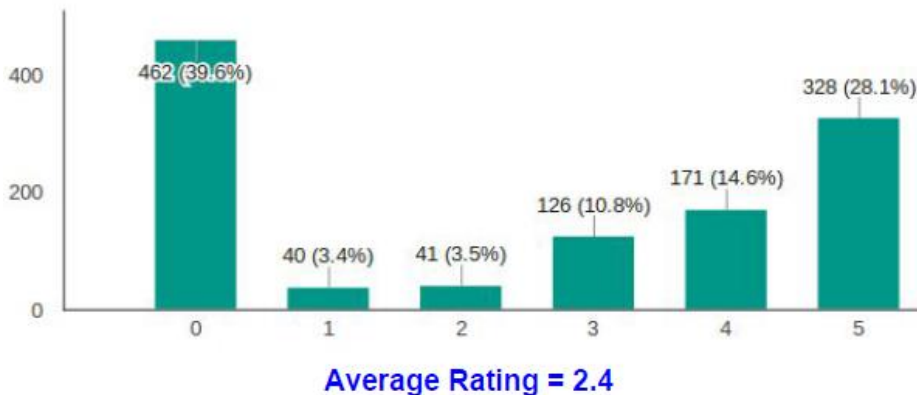

Figure 5: Use of Mobile app for AgMOOCs platform access

Qualitative analysis of the platform

The learners were asked about the need of new features in the platform through an open ended question- Any other feature you would like to see in the platform? There were 298 responses to the question. The new features which most users prefer

Accessibility

It is evident from the figure 6 that the PDF and Video formats were most preferred by the learners. PDF format provide learners the capability to read the content based on their convenience. Learners used combination of Video and PDF formats to access content. Therefore, it can be inferred that learners use different formats for learning based on their convenience and learning environment. They do not depend on single learning format.
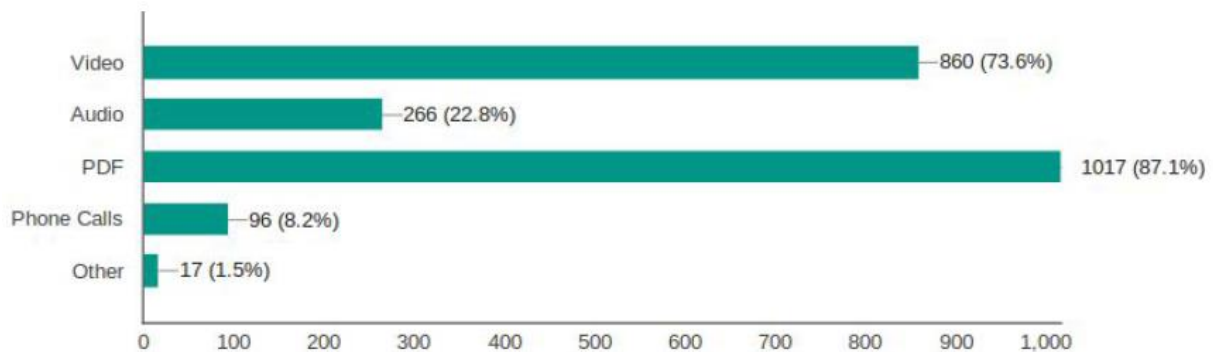

Figure 6: Access of Content

Fig 7 shows that the videos were mainly accessed from the platform itself. And it is also evident that learners did not download videos much. Hence, most learners prefer to see videos whenever they are online. The main reason for downloading videos by few learners is that they want to re-watch videos when the course is not available online. Only about 16% learners used the YouTube platform to watch videos. It reflects that the AgMOOCs platform was convenient to the learners to watch video content.
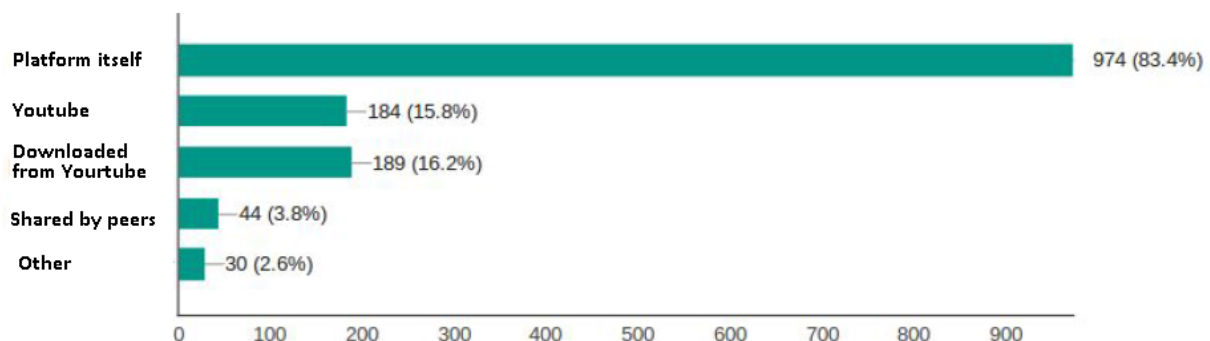

Figure 7: Access of Video content

Use of Social Media

The use of social media such as Twitter and Facebook for discussion purpose was not much in the AgMOOCs. Most learners did not know about the existence of such features in the AgMOOCs platform. As seen in the figure below, 17% learners used the social media for discussion of course contents.
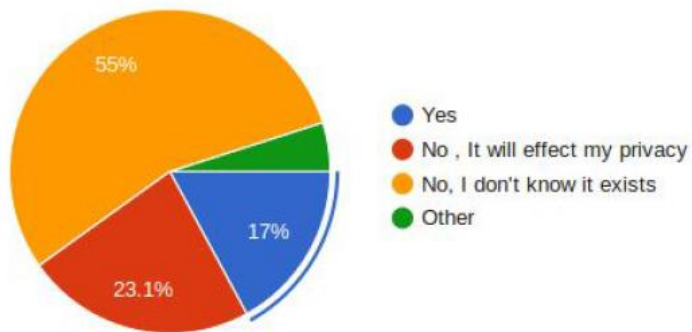

Figure 8: Use of Twitter/Facebook for discussions in courses

COURSE FEEDBACK- QUANTITATIVE DATA

Data was also collected on various agMOOCs individual courses. The data collected related to the course and instructor quality, importance of quizzes and assignments, pace of the course and motivation of learners. The following questions about the courses were asked to the agMOOCs learners:

- Question 1: Course material was of good quality?
- Question 2: Assignment was relevant and helped you acquire new skills?
- Question 3: Quizzes were relevant and helped to test your knowledge?
- Question 4: Quizzes and assignments can be more frequent?
- Question 5: Pace of the course was comfortable for your learning?
- Question 6: Course management met the learning objectives?
- Question 7: Instructors have good knowledge about the subject?
- Question 8: You are satisfied with the content?
- Question 9: You would have taken the course if no certificate was offered?
- Question 10: You will recommend the course to others?

The learners had four options for each question, i.e. Disagree, Neutral, Agree and Strongly Agree. In the coming paragraphs an analysis is done for each question covering responses from all the five courses.
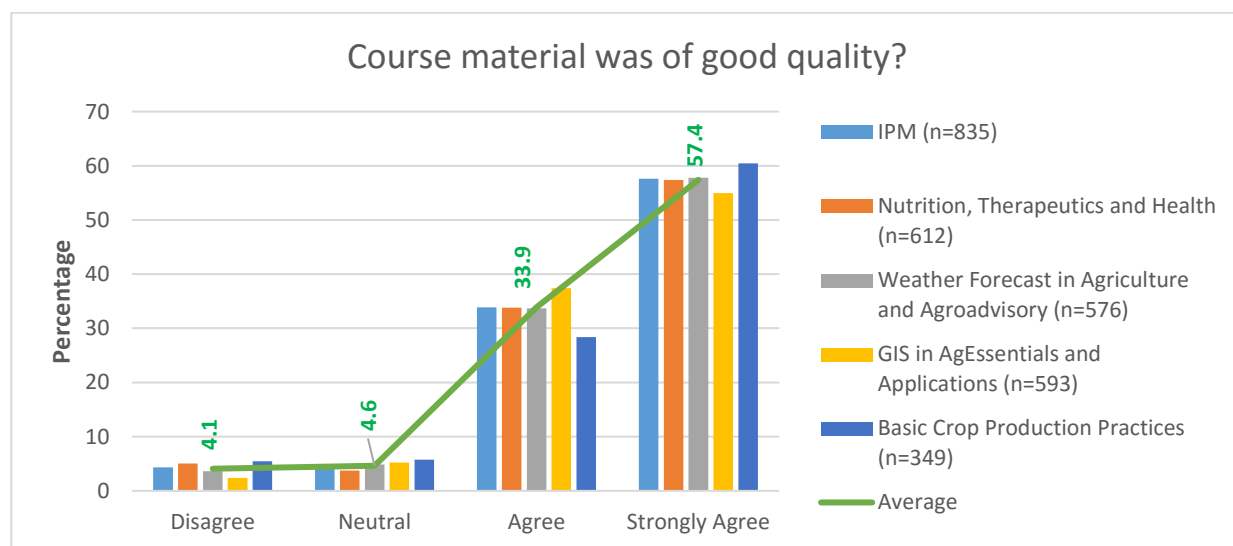

Figure 9: Response to Question 1

Question 1: This question aimed to understand the learners' perception towards the quality of course materials used in agMOOCs. Figure 9 shows learners' perception towards the course

materials. It is evident that the learners have very positive opinion on the quality of all the five courses. Of all the courses, Basic Crop Production course shares the highest percentage in the 'strongly agree' option. Approx. 91% agree that the courses were of high quality. Only 4.1% respondent do not agree to the high quality nature of the courses.
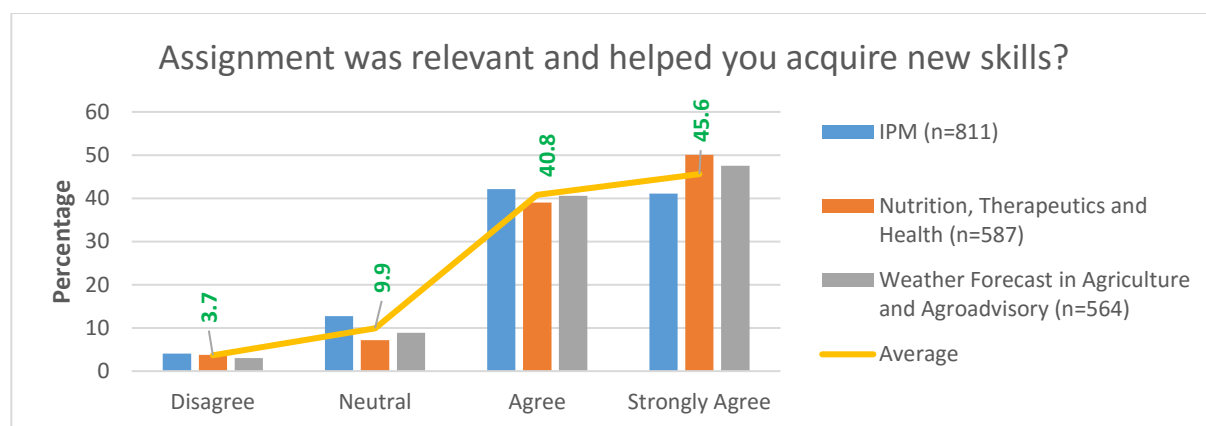

Figure 10: Response to Question 2

Question 2: This question related to the efficacy of assignments in acquiring new skills. It is evident from the above graph that the learners did found the assignment useful in developing new skills. Around 86% respondents are positive towards role of assignments in building new skills.
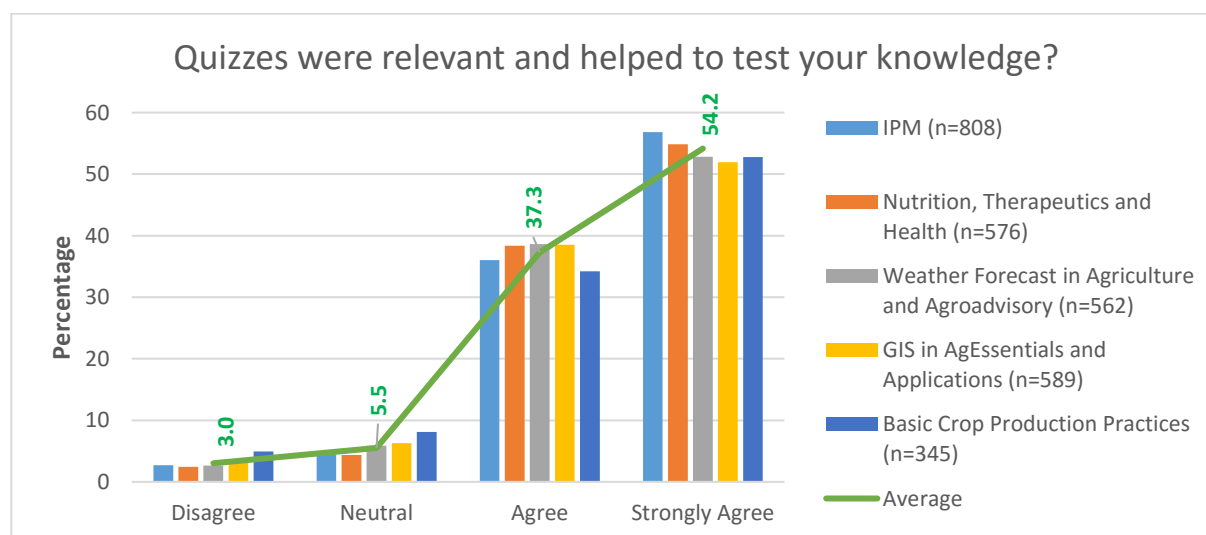

Figure 11: Response to Question 3

Question 3: The question aimed at understanding learners' perception towards quizzes and its relevance. In addition, the question focused on the role of quizzes in testing the acquired knowledge. From the figure 11, we can comprehend that for all the courses, learners feel that quizzes were important to them and helped in testing the acquired knowledge. About 91% learners are positive towards quizzes and its role in testing knowledge.

Question 4: The purpose of this question to know learners' perception towards frequency of quizzes and assignments during the course duration. The question intended to understand whether the learners prefer greater number of quizzes/assignments or not. The results show that leaners are keen to have greater number of quizzes and assignments. If seen in relation to the question 2, it can be said that the learners feel that a greater number of quizzes and assignment would help them to build new skills. The course on Basic Crop Production Practices records highest percentage in 'strongly agree' option for question 3. This shows that the learners feel that there is need of greater number of quizzes and assignment in the said course. The data shows that around 81% learners are positive towards higher number of assignments and quizzes in agMOOCs.
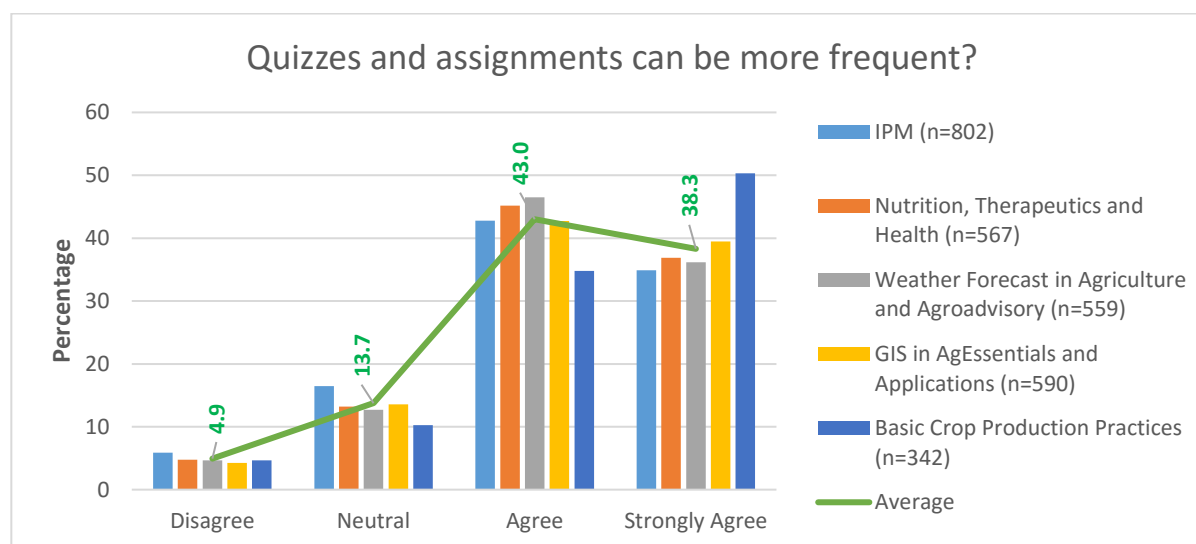

Figure 12: Response to Question 4

Question 5: This question's objective was to know learners' view on the pace of the courses delivered. For effective learning, course's delivery should not be too fast or too slow. The responses on this question, as seen in figure 13, suggest that around 90% learners feel that the courses were delivered at an acceptable pace.
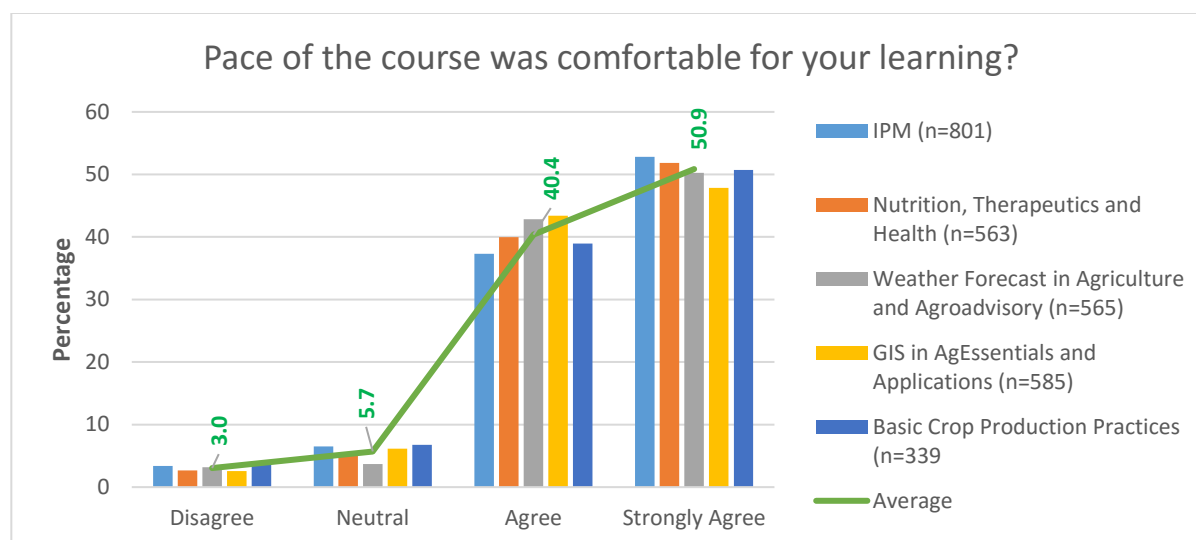
Figure 13: Response to Question 5

Question 6: This question aimed at finding learners' views on overall course management and its effectiveness in meeting the learning outcomes. Figure 14 shows the responses to this question. Almost all the courses were able to meet the learning objectives through better course management practices.
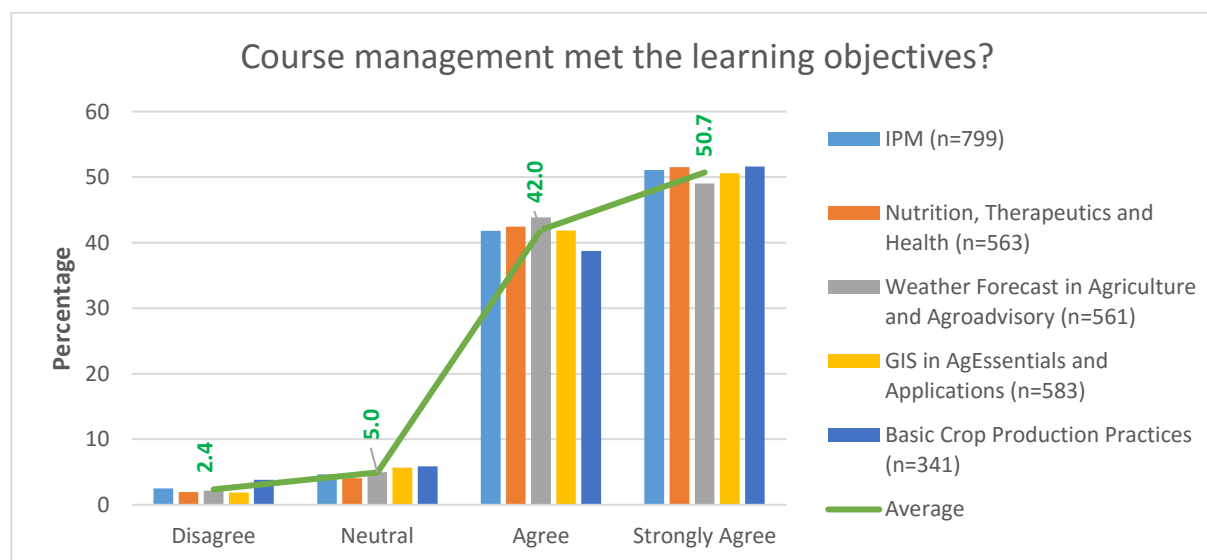
Figure 14: Response to Question 6

Question 7: This question intended to know the quality of the instructors. The question focused on the expertise of the instructors in their subjects. Based on the results, it can be comfortable

said that the learners believe that all the course instructors had good knowledge of the subject they were teaching. Around 94% learners are positive about the subject expertise of the instructors.

Instructors have good knowledge about the subject?

Legend:
- IPM (n=806)
- Nutrition, Therapeutics and Health (n=568)
- Weather Forecast in Agriculture and Agroadvisory (n=558)
- GIS in AgEssentials and Applications (n=586)
- Basic Crop Production Practices (n=341)
- Average

Average values: Disagree 2.5, Neutral 3.8, Agree 32.6, Strongly Agree 61.1
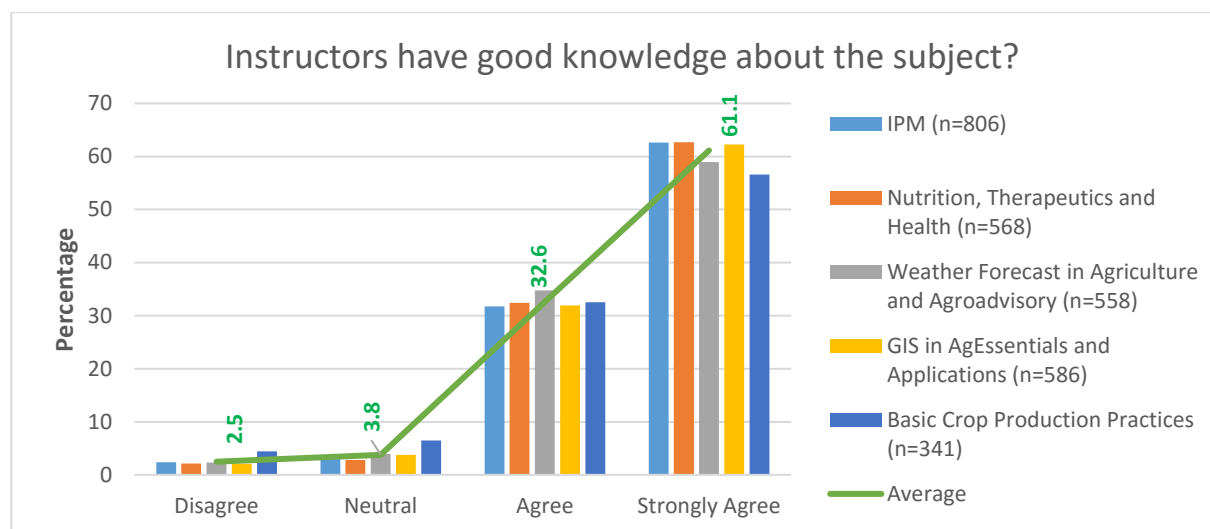
Figure 15: Response to Question 7

Question 8: This question aimed at understanding the satisfaction level of learners towards the course content. From the results, it is evident that all the agMOOCs contents were satisfactory in the eyes of the learners. Almost, 90% learners are satisfied with the course contents.

You are satisfied with the content?

Legend:
- IPM (n=802)
- Nutrition, Therapeutics and Health (n=568)
- Weather Forecast in Agriculture and Agroadvisory (n=562)
- GIS in AgEssentials and Applications (n=589)
- Basic Crop Production Practices (n=342)
- Average

Average values: Disagree 2.9, Neutral 5.8, Agree 37.7, Strongly Agree 53.6
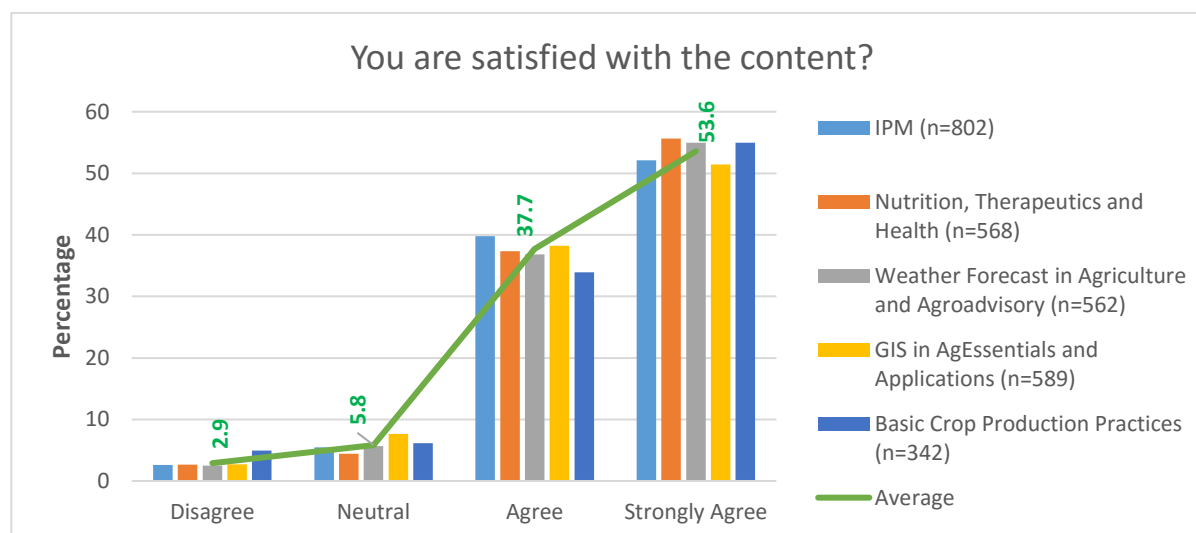
Figure 16: Response to Question 8

Question 9: The main aim of this question was to know the motivation level of the leaners for taking the courses. This question answers whether there was an intrinsic or extrinsic motivation to learn the subject. From the data, it can be concluded that approx. 77% leaners would have taken the course even if there was no certificate provided on course completion.

You would have taken the course if no certificate was offered?
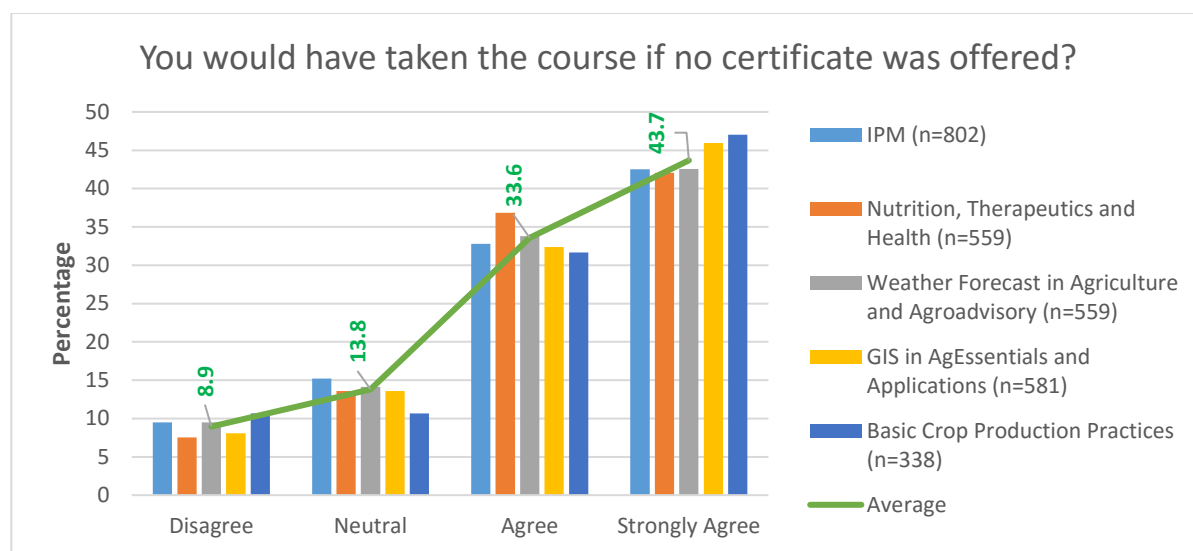
Figure 17: Response to Question 9

This shows that there was intrinsic motivation in learners for completing the courses. However, around 9% leaners would have not taken the course if there was no certificate as seen in the figure 10. Thus, learners have motivation to learn new skills to upgrade their knowledge.

Question 10: The objective of this question was to understand learners' attitude in promoting the agMOOCs. The idea is that if users find the courses useful then they might recommend the courses to their colleagues, peers etc. From the figure 18, it can be inferred that the learners are positive about recommending courses to others. This reflects that the courses were useful to the learners and they would like others to undertake the courses.

Figure 18: Response to question 10
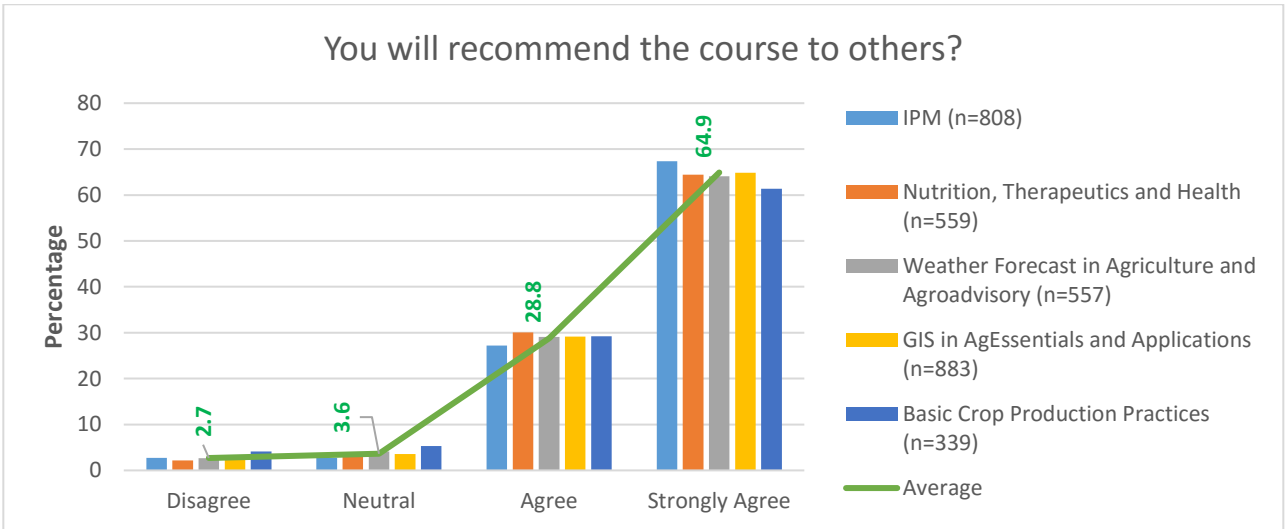
COURSE FEEDBACK- QUALITATIVE DATA

Qualitative methods of data collection were used to understand perceptions of the learners towards the courses. Five open ended questions were asked to the learners to gather inputs on the course platform, course content and other features related to the courses. The questions and number of responses obtained can be seen in the table below:

Table 1: Open ended questions of the survey

QUESTIONS	NUMBER OF RESPONSES
Question 1: Any other feature you would like to see in the platform?	298
Question 2: Was there a particular aspect of the course that you liked best? If so, what was it and why?	234
Question 3: What suggestions do you have for us to improve these courses (in its content, delivery, administration, or any other aspect)	291
Question 4: Was there a particular aspect of the course that you did NOT like? If so, what was it and why?	490
Question 5: What are the other courses are you expecting from us in the future?	253

For qualitative analysis, text based analysis was the prime approach. The texts from the survey were examined qualitatively by means of basic coding and interpretive analysis. The main themes which evolved under each question are discussed below.

New Features in the platform: The main additional features suggested by the learners are grouped under the following four headings:

Content

- Inclusion of photographs, visuals, animations showing events, happenings. This would help to understand theoretical aspects in a better way. For example, in courses like IPM, use of images or videos of pests will help in better understanding of the concepts

- Videos on field implementation of theoretical concepts in courses like crop production and GIS. For example, use of pheromone traps in field, live visuals of damages by pests and diseases, practical use of GIS software
- Availability of additional resources, links, study materials, research papers in relation to various topics in the courses.
- Increase in the number of videos

Platform

- Download of videos from the agMOOCs platform itself
- PDF download feature in mobile app
- Progress bar availability in the platform so that learners can see the topics/videos completed by them
- Notification about new lectures added in the platform on mobile phone/email through registered mobile number/email address
- Notification on individual progress in courses through email/mobile phone

Interaction

- Inclusion of hangouts, video chatting facility for open discussion with the instructors
- Need of increased response rate from course instructors in discussion forums and feedbacks

Quizzes/Assignments

- Increase the number of quizzes and assignments and with time limits
- Increase the number of questions in quizzes
- Grading of assignments before the course completion so that learners may improve then don't perform well

In addition to the above features, there are comprehension issues related to the quizzes and course content. Few learners found it difficult to understand quiz questions, while few were not comfortable with the English language as the medium of course delivery. However, there are concerns by few learners that the agMOOCs are for the international community, hence, the courses shouldn't be India specific only.

Best aspects of the agMOOCs: The responses from the learners are grouped under the following headings:

Delivery method

- Way of presentation and material compilation was easy to understand
- Use of videos, audios and presentation slides was beneficial during learning
- Use of pdf materials and transcripts was found advantageous
- Clarity on study objectives

Content

- Use of quality materials in courses
- Content is simple to understand and therefore can be used by a beginner or layman
- The course organization was easy to follow
- Informative course content

Quizzes/Assignments/forums

- Quizzes and assignments useful in evaluating an individual
- Quizzes and assignments helped to gain knowledge
- Quizzes were interesting and helped in keeping pace with the course
- Forums and discussion useful in feedback from others

Instructors

- Instructors were knowledgeable
- Instructors were excellent in the way of delivering lectures
- Instructors used simple language in delivering lectures

Improvements required in the agMOOCs: The information on the required improvements in agMOOCs with respect to the content, delivery, administration, or any other aspect is as follows:

Content

- Increase in course content
- Availability of links, readings, resources for further reading
- Availability of presentation slides
- Increased content in the pdf related to presentations
- Use of animated videos

- Increased practical oriented content and inclusion of images. For example, one learner said "in the course abc[1], emphasis was not laid on showing pictures of crop and how crop bed preparation is carried out".
- FAQs may be included for individual courses
- Duration of course should be more than 8 weeks

Assignment/quizzes

- Increased number of quizzes
- Increased time for submission of assignments and quizzes as for few learners slow internet is an issue
- Increased questions in quizzes
- Alert messages for quizzes should be sent through emails

Platform

- Video on how to use the agMOOCs platform
- Video access links may be sent through email also

Negative aspects in agMOOCs: This type of information would eliminate any disadvantageous aspects for the future agMOOCs. Almost 80% of the respondents are happy with the delivered agMOOCs, however, the remaining 20% listed the following not so good aspects of the courses:

Course content

- Limited content in some topic
- Non-availability of video transcripts in some courses
- Non-involvement of course instructors in forums, feedback and hangouts
- Lack of pictorial illustrations during in video content

Quizzes/Assignment

- Difficulty in submission of quizzes and assignment
- No option to rewrite quizzes and assignments
- Limitation on time for submission of assignments

Technical Issues

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[1] Name of course is not written to maintain anonymity

- Difficulty in downloading videos
- Poor sound quality in few videos
- App and website slow to respond in certain cases

New courses suggested for MOOCs:

Inputs were taken from the learners on the courses which they would like to recommend to various agMOOCs stakeholders

Areas	Courses
Agriculture	Organic farming, Plant Disease Management, Integrated Disease Management
	Soil Testing, Soil Science, Crop Modelling
	Entomology, Pesticides Management and Biocontrol, Climate Change and Agriculture, Commercial Crops and their Export, Integrated Plant Nutrient Management, Production of Bio-fertilizers, Aqua-culture, Urban and Roof Top Agriculture, Drought Mitigation, Fodder cultivation, Precision Farming,, Genetics and Plant Breeding,, Agriculture Extension, Bio-fuel Production , Crop Physiology, Nano-technology in Agriculture
Forestry	Agro-forestry, Forest Biology, Forest Resource Management.
Animal Husbandry	Livestock Management
Water Management	Water Conservation, Irrigation Scheduling with Micro irrigation System, Exploration of Groundwater, Irrigation Management
Horticulture	Post-harvest handling of Horticultural produce
Economics	Agriculture Economics, Agriculture Market and Commodities, Agricultural finance and Budgeting, Agriculture Crop Insurance
Management	Entrepreneurship Development , Small Scale Industry and Enterprises, Farm Business Management, Agricultural Marketing, Personality Development and Communication Skills, Mushroom Cultivation, Bee-keeping (Apiculture), Lac-production, Production of Bio-control agents, Agri-clinics, Green House Cultivation, e-marketing, Human Resource Management
Agriculture Engineering	Farm Machinery
Food Technology	Fruits and Vegetables Processing, Post-Harvest Technology, Grain Storage Management, Metabolism aspect of different kind of food, Food Packaging Technology, Non-Thermal Technology in Food processing, Food Quality Control, Food Microbiology
GIS	Cartography, Photogrammetry & Remote Sensing, UAV Applications for Agriculture.
Statistics	Experimental Design and ANOVA, Agricultural Statistics, Statistical Software
Biotechnology and Bio-informatics	BT Crops, GMO, RNA interference studies, Virus vector interactions
Biochemistry	Toxicology and Pesticide Residue, Brief Content Of HPR, Pharmacology, Toxicology, Environmental Chemistry, Fundamentals in Biochemistry
Health	Public Health, Ayurvedic Concepts and Diets, Diabetes and Thyroid Diet, Health & Environment, Public Health and Disease, Principles of Human Health and Nutrition, Food and Drug Interaction, Balanced Diet and its importance

Information Technology	Big Data and its Applications in Agriculture, Use of Sensors
Others	Intellectual Property Rights, Sustainable Growth and Development, Open Access Journals & Sources of Open Access Tools & Techniques, Ecology

SUMMARY AND RECOMMENDATIONS

From the analysis of quantitative and qualitative data it is evident that the agMOOCs were useful to the learners in the following ways:

- The learners found the course useful in updating their knowledge
- The learners perceive that the courses would help them in employment opportunities
- The learners are of the view that they would share gained knowledge amongst their peers
- Few learners indicated to use the gained knowledge in their teaching and research.

With respect to content, the learners feel that the course content is lucid and appropriate. However, they believe that the content can be enriched by adding reading materials, use of visuals and links to other useful resources related to topics. In addition, the content can be made application oriented if practical examples or in-field practices   are embedded in the content. Learners have a positive opinion quizzes and assignments as they believe that it helped them in evaluating their knowledge. The learners prefer to have increased number of questions in quizzes. Further, the number of assignment and quiz may be increased for a greater user engagement. However, learners are of the view that timings be flexible with respect to assignment/quiz submission.

With respect to the course platform, the learners were comfortable in accessing and using it. However, users have highlighted the need to download videos from the platform itself. In addition, features like course progress, email or mobile phone notification for new content, quiz and assignment deadline may be added in the platform. The access of the course platform through mobile phones is less. Poor internet connection on mobile phones, expensive internet (for example, 3G and 4G connections) are the likely reasons for the less access of the platform through mobile phones. Some users highlighted that the course's mobile app do not have similar features in comparison to the full-fledged computer platform.

Recommendations: Based on the analysis, the following points may be considered in designing the future agMOOCs:

1. Prominence to images, slides, visual content than to the instructor
2. Possibility of having in-depth content on course topics for those who would like to get information in a greater detail
3. Provision of alerts on mobile phone or emails for addition of content, assignment and quiz deadlines

4. Enrichment of the content can be done by adding additional reading materials, links, good practices etc.

5. Inclusion of downloadable video/audio transcripts and presentation slides in the course platform

6. Videos on real implementation of the concepts discussed in courses

7. Flexibility with respect to quiz and assignment submission

8. Features to download videos, pdf and other resources from the course platform for computer and mobile phones. Links may be sent through email to the registered users

9. Thought should also be given on how learners can be involved in content creation based on their interests. For example, if a learner wishes to share some good practice in a particular area through a video, audio or visuals

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