CROP PRODUCTION

LEVEL-IV

Based on March, 2022 Version IV Occupational standard



Module Title: - Demonstrating Improved Crop Technologies and practices

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INTRODUCTION TO THE MODULE

This module covers the knowledge, skills and attitude required to understand demonstrations of new crop production technologies and practices. It includes problem identifications, need assessment, select appropriate crop technologies and practices, demonstration plots selection and establishment.

LG #37

LO #1- Preparing for Demonstration

Instruction sheet 1

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

- Identification of new crop technologies and practices
- Realizing participatory approaches of stakeholders
- Problem identification and need assessments
- Interpretation of technical manuals for new technology
- Assessing of new crop technologies and practices
- Selection of affordable and environmental sound technologies
- Preparing detail plan and implementation of technology
- Calculate resource requirements for new technology
- Preparing required inputs
- Conducting training and awareness creation activities

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Identify new crop technologies and practices
- Realize participatory approaches of stakeholders
- Identify Problem and need assessments
- Interpret technical manuals for new technology
- Assesse new crop technologies and practices
- Select affordable and environmental sound technologies
- Prepare detail plan and implementation of technology
- Calculate resource requirements for new technology
- Prepare required inputs
- Conduct training and awareness creation activities

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the information Sheets
4. Accomplish the Self-checks

Information Sheet 1

Introduction

On-farm demonstrations have been organized for at least two centuries, originally as a way to introduce farmers to innovation, but more recently also to share experiences in a farmer-to-farmer setting, and to support knowledge co-creation between farmers and other actors. Increasingly, farmers themselves are opening their farms to connect with their peers and the general public as part of business development strategies (e.g. short food supply chains, community supported agriculture).

Demonstration activities can range from one-off 'field day' events to multi-year 'monitor farms' where farmers, advisors and industry members come together at regular intervals to assess farming opportunities in situ, to permanent 'research farms' where researchers test and demonstrate innovative technologies and approaches. On-farm demonstrations thus follow a wide range of approaches, are planned with different objectives in mind, and are initiated and organised by a wide range of actors. Given this variety, there is no 'one-fits-all' approach for a successful on-farm demonstration event.

1.1. Identification of new crop technologies and practices

The identification of new crop technologies and practices is a crucial aspect of modern agriculture. According to a desk review conducted by the United States Agency for International Development (USAID), the process of identifying new agricultural technologies and practices involves answering the following questions:

1. What modern agricultural technologies and practices are currently available?
2. What modern agricultural technologies and practices have been adopted by producers, processors, and traders/exporters?
3. What are the factors that inhibit adoption of new technologies and practices?

1. What modern agricultural technologies and practices are currently available?

Modern agriculture has come a long way from traditional farming methods. Today, farmers have access to a wide range of **advanced technologies** that help them increase productivity, reduce costs, and minimize environmental impact. Some of the modern agricultural technologies and practices that are currently available include:

1. **Precision Agriculture**: This technology uses sensors, GPS, and other advanced devices to collect data on soil, weather, and crop growth. Farmers can use this data to optimize their use of water, fertilizer, and pesticides, and to target specific areas of their fields.
2. **Robotics**: Robots are used in agriculture for tasks such as planting, harvesting, and weeding. They can work around the clock, are more precise than humans, and can reduce labor costs.
3. **Aerial Imaging**: Drones and other aerial vehicles are used to capture images of crops. These images can be used to identify areas of the field that need attention, such as those with low moisture or nutrient levels.
4. **Biotechnology**: Biotechnology is used to develop crops that are more resistant to pests and diseases, and that require less water and fertilizer. This technology can also be used to improve the nutritional value of crops.
5. **Vertical Farming**: Vertical farming is a method of growing crops in vertically stacked layers, using artificial lighting and climate control. This technology allows farmers to grow crops in urban areas, with minimal land use and water consumption.

These are just a few examples of the many modern agricultural technologies and practices that are available today. With the help of these technologies, farmers can produce more food with fewer resources, and help feed the world's growing population.

2. **What modern agricultural technologies and practices have been adopted by producers, processors, and traders/exporters?**

Modern agricultural technologies and practices have been adopted by producers, processors, and traders/exporters to improve the efficiency and productivity of the agricultural sector. According to a report by the **Brookings Institution**, some of the modern agricultural technologies and practices that have been adopted include:

- **Precision agriculture**: This involves the use of technology such as GPS, drones, and sensors to optimize crop yields, reduce waste, and minimize environmental impact.
- **Smart irrigation**: This involves the use of technology to optimize water usage in agriculture. It includes the use of sensors, weather data, and other tools to ensure that crops receive the right amount of water.
- **Vertical farming**: This is a method of farming that involves growing crops in vertically stacked layers. It is a highly efficient way of farming that uses less water and land than traditional farming methods.

These are just a few examples of the many modern agricultural technologies and practices that have been adopted by producers, processors, and traders/exporters. These technologies and practices have helped to increase the efficiency and productivity of the agricultural sector, while also reducing waste and minimizing environmental impact.

The review also highlights the importance of understanding the barriers to adoption of new technologies and practices.

In recent years, there has been a growing interest in the use of advanced technologies such as the Internet of Things (IoT) and unmanned aerial vehicles (UAVs) in agriculture. These technologies have the potential to revolutionize the way crops are grown, harvested, and processed.

Organic farming is another area where new technologies and practices are being developed to improve crop production and quality. Precision farming practices such as GPS and yield monitors are also being used to enhance crop growth, lower costs, and reduce environmental degradation.

Overall, the identification of new crop technologies and practices is an ongoing process that requires collaboration between researchers, farmers, and other stakeholders. By adopting new

technologies and practices, farmers can increase their yields, reduce costs, and improve the quality of their crops.

1.2. Realizing participatory approaches of stakeholders

Realizing participatory approaches of stakeholders in agricultural technology is a crucial step towards sustainable and equitable development of the agricultural sector. Participatory approaches involve the active involvement of all stakeholders, including farmers, researchers, extension workers, policymakers, and other relevant actors, in the design, implementation, and evaluation of agricultural technologies.

Participatory approaches can help to ensure that agricultural technologies are tailored to the specific needs and contexts of the local communities, and that they are socially acceptable, economically viable, and environmentally sustainable. Participatory approaches can also help to build trust and collaboration among stakeholders, and to promote the empowerment of marginalized groups.

There are various participatory approaches that can be used in agricultural technology development, such as

1. Participatory Communication (PC),
2. Participatory Video (PV),
3. Participatory Learning and Action Research (PLAR),
4. Farmer Participatory Research (FPR), and
5. Informal-Mobile Learning Research (IMLR).

1. Participatory Communication (PC)

Participatory communication is an approach based on dialogue, which allows the sharing of information, perceptions and opinions among the various stakeholders and thereby facilitates their empowerment. It is a process of dialogue based on respecting and recognizing others, on equity, social justice and the participation of all people. Participatory communication is used in development projects to facilitate the empowerment of marginalized groups and have wider social and political effects.

The participatory communication program cycle consists of four key phases:

- **Participatory Communication Assessment (PCA)**: Issues are researched and analyzed through exploratory two-way communication. For these tasks to be successful, it is necessary to establish an open or common space where key stakeholders can interact freely with each other.
- **Strategy Design**: Based on the results of the PCA, a strategy is designed that includes objectives, target audiences, messages, and communication channels.
- **Implementation**: The strategy is implemented through a range of activities, including training, capacity building, and the development of communication materials.
- **Monitoring and Evaluation**: The effectiveness of the communication strategy is monitored and evaluated to ensure that it is achieving its objectives.

Participatory communication is not just the exchange of information and experiences: it is also the exploration and generation of new knowledge aimed at addressing situations that need to be improved. It tends to be associated with community-driven development, but it could be used at any level of decision making (local, national, international) regardless of the diversity of groups involved. By actively engaging stakeholders from the start and by seeking a broader consensus around development initiatives, participatory communication has begun to be considered a crucial tool.

2. Participatory Video (PV)

Participatory Video (PV) is a form of participatory media in which a group or community creates their own film. The idea behind PV is that making a video is easy and accessible, and is a great way of bringing people together to explore issues, voice concerns, or simply to be creative and tell stories. PV is primarily about process, though high-quality and accessible films (products) can be created using these methods if that is a desired outcome. This process can be very empowering, enabling a group or community to take their own action to solve their own problems, and also to communicate their needs and ideas to decision-makers and/or other groups and communities. As such, PV can be a highly effective tool to engage and mobilize

marginalized people, and to help them to implement their own forms of sustainable development based on local needs.

The PV process involves participants rapidly learning how to use video equipment through games and exercises. Facilitators help groups to identify and analyze important issues in their community by adapting a range of Participatory Rural Appraisal (PRA)-type tools with participatory video techniques (for example, social mapping, action search, prioritizing, etc.). Short videos and messages are directed and filmed by the participants. Footage is shown to the wider community at daily screenings. A dynamic process of community-led learning, sharing, and exchange is set in motion. Completed films can be used to promote awareness and exchange between various different target groups. PV films or video messages can be used to strengthen both horizontal communication (e.g. communicating with other communities) and vertical communication (e.g. communicating with decision-makers).

Examples of PV include Insight Share Participatory Video, Children as Media Producers (CAMP), China Villager Documentary Project, Deccan Development Society, Participatory Documentary Center of the IF China Original Studio, and Video Volunteers.

3. Participatory Learning and Action Research (PLAR)

Participatory Learning and Action Research (PLAR) is a type of qualitative research that is used to gain an in-depth understanding of a community or situation, and is always conducted with the full and active participation of community members. It is a participatory methodology that emphasizes the need for outsiders to learn about situations from insiders, and seeks to reverse power relations between communities and outsiders. The fundamental idea of PLAR is that communities are supported to analyze their own situation, make decisions about how to best tackle their problems, and feel empowered to take action.

The PLAR process consists of four key phases:

- **Participatory Learning and Action Assessment (PLAA)**: Issues are researched and analyzed through exploratory two-way communication. For these tasks to be successful,

it is necessary to establish an open or common space where key stakeholders can interact freely with each other.

- **Strategy Design**: Based on the results of the PLAA, a strategy is designed that includes objectives, target audiences, messages, and communication channels.
- **Implementation**: The strategy is implemented through a range of activities, including training, capacity building, and the development of communication materials.
- **Monitoring and Evaluation**: The effectiveness of the communication strategy is monitored and evaluated to ensure that it is achieving its objectives.

PLAR is designed to seek out multiple perspectives and embrace diversity. It is based around group analysis and learning, and is designed to be flexible, adaptive, and innovative, rather than conforming to top-down or rigid methods of data collection and analysis. The main purpose of PLAR is to support people within communities to analyze their own situation, rather than have it analyzed by outsiders, and to ensure that any learning is then translated into action.

4. Farmer Participatory Research (FPR)

Farmer Participatory Research (FPR) is an approach that involves farmers in the research process. It is a collaborative approach between farmers and scientists, where farmers are encouraged to engage in experiments in their own fields so that they can learn, adopt new technologies, and spread them to other farmers. The scientist acts as a facilitator, and farmers and scientists work together from the initial design of the research project to data gathering, analysis, final conclusions, and follow-up actions. This approach is also known as "innovation evaluation" and is essential for communication as well as for initiating diffusion. The main advantage of this approach is that farmers "learn by doing," and decision rules are modified on the basis of direct experience. To shape learning, interpretations of experience must provide information about what happened, why it happened, and whether what happened was satisfactory or unsatisfactory. New information, technologies, and concepts may be better communicated to farmers through the FPR approach.

5. Informal-Mobile Learning Research (IMLR)

Informal-Mobile Learning Research (IMLR) is a field of study that focuses on the use of mobile devices for informal learning. According to a paper published in the 2020 International Conference on Information Science and Education, IMLR is defined as "a kind of off-campus learning" that has gained traction in recent years. The paper also discusses the advantages of informal learning and introduces two mobile device-based informal learning methods, along with their prospects and problems.

Another paper published in 2013 proposes a theoretical framework for conducting IMLR in the context of agriculture. The paper suggests that interactive mobile-learning environments can encourage participatory attitudes, excite interest and commitment among learners, and thus become important in adult learning.

IMLR is an interdisciplinary field that has the potential to revolutionize the way we learn. It is a promising area of research that can help us understand how mobile devices can be used to facilitate informal learning in a variety of contexts.

These approaches have been shown to have a significant impact on the effective use of ICTs in rural farming communities and the agricultural domain in general. Among these participatory approaches, IMLR and PLAR have shown to be more effective because of their availability and interactive mobile learning environments that excite interests, commitments, and encourage participatory attitudes among farmers and researchers.

Realizing participatory approaches of stakeholders in agricultural technology is essential for the development of sustainable and equitable agricultural systems. It is important to involve all stakeholders in the design, implementation, and evaluation of agricultural technologies to ensure that they are tailored to the specific needs and contexts of the local communities, and that they are socially acceptable, economically viable, and environmentally sustainable. Participatory approaches can help to build trust and collaboration among stakeholders, and to promote the empowerment of marginalized groups.

1.3. Problem identification and need assessments

Problem identification and need assessments are crucial steps in the development of agricultural technology. The Agricultural Technology Assessment Tool developed by CEGA provides a

framework for assessing the potential scalability of an agricultural technology and to facilitate decision-making discussions by NGOs, donors, governments, technology developers, and other stakeholders.

The tool is broken into three sections:

- Section one helps identify the problem that the technology seeks to address and to identify alternative solutions.
- Section two offers a rubric for estimating the magnitude and certainty of a technology's benefits to small-holder farmers, their communities, and to other actors in the agricultural value chain.
- Section three provides a framework of potential pitfalls to consider.

The tool is designed to assess the utility and appropriateness of an agricultural technology for farmers and other actors in the value chain. It is important to consider multiple interlinked factors such as the potential for risk exposure, the availability of complementary inputs, and the reliability of delivery institutions when introducing or promoting a new technology.

Problem identification and need assessments are essential for the development of sustainable and equitable agricultural systems. The Agricultural Technology Assessment Tool developed by CEGA provides a framework for assessing the potential scalability of an agricultural technology and to facilitate decision-making discussions by NGOs, donors, governments, technology developers, and other stakeholders. Participatory approaches such as IMLR and PLAR can also help to ensure that agricultural technologies are tailored to the specific needs and contexts of the local communities, and that they are socially acceptable, economically viable, and environmentally sustainable.

1.4. Interpretation of technical manuals for new technology

Interpretation of technical manuals for new agricultural technology is an important aspect of ensuring that the technology is used effectively and efficiently. Technical manuals provide detailed information on how to use the technology, including instructions on installation, operation, maintenance, and troubleshooting.



Fig. 1: Drones used to sow seeds in agricultural farm

To interpret technical manuals effectively, it is important to have a basic understanding of the technology and its components. This can be achieved through training and education programs, which can help farmers and other stakeholders to develop the necessary skills and knowledge to use the technology effectively.

Interpretation of technical manuals for new agricultural technology is essential for the effective use of the technology. Training and education programs can help farmers and other stakeholders to develop the necessary skills and knowledge to use the technology effectively.

1.5. Assessing of new crop technologies and practices

Assessing new agricultural crop technologies and practices is an important step towards sustainable and equitable development of the agricultural sector. The adoption of technology has been important to production agriculture for decades. Through the adoption of technology and improved managerial practices, aggregate agricultural U.S. farm output in the United States tripled from 1948 to 2017 with almost no corresponding increase in aggregate input.

The Agricultural Technology Assessment Tool developed by CEGA provides a framework for assessing the potential scalability of an agricultural technology and to facilitate decision-making discussions by NGOs, donors, governments, technology developers, and other stakeholders. The

tool is designed to assess the utility and appropriateness of an agricultural technology for farmers and other actors in the value chain. It is important to consider multiple interlinked factors such as the potential for risk exposure, the availability of complementary inputs, and the reliability of delivery institutions when introducing or promoting a new technology.

Assessing new agricultural crop technologies and practices is essential for the development of sustainable and equitable agricultural systems. The Agricultural Technology Assessment Tool developed by CEGA provides a framework for assessing the potential scalability of an agricultural technology and to facilitate decision-making discussions by NGOs, donors, governments, technology developers, and other stakeholders. Participatory approaches such as IMLR and PLAR can also help to ensure that agricultural technologies are tailored to the specific needs and contexts of the local communities, and that they are socially acceptable, economically viable, and environmentally sustainable.

1.6. Selection of affordable and environmental sound technologies

Selecting affordable and environmentally sound agricultural technologies is crucial for sustainable and equitable development of the agricultural sector. Environmentally Sound Technologies (ESTs) are technologies that have the potential for significantly improved environmental performance relative to other technologies. ESTs protect the environment, are less polluting, use resources in a sustainable manner, recycle more of their wastes and products, and handle all residual wastes in a more environmentally acceptable way than the technologies for which they are substitutes.

The United Nations Environment Programme (UNEP) provides a framework for assessing the potential scalability of an agricultural technology and to facilitate decision-making discussions by NGOs, donors, governments, technology developers, and other stakeholders. The framework emphasizes the importance of rational environmental management, which means making the best use of resources to meet basic human needs without destroying the sustaining and regenerative capacity of natural systems. The framework also implies the adoption and use of alternative, environmentally sound development strategies and related technologies.

In addition to the UNEP framework, there are various digital innovations that can be used to promote sustainable and resilient agricultural systems. These innovations include fully automated application of inputs, the detection and control of weeds within fields and feeding systems as well as the use of robots and other autonomous operating devices. These innovations can help to improve efficiency of resources (materials and energy), reduce pollution and waste from different sectors, and manage pollution and waste that is generated during extraction of resources and production and consumption of goods and services.

Selecting affordable and environmentally sound agricultural technologies is essential for the development of sustainable and equitable agricultural systems. Environmentally Sound Technologies (ESTs) are technologies that have the potential for significantly improved environmental performance relative to other technologies. The UNEP framework provides a framework for assessing the potential scalability of an agricultural technology and to facilitate decision-making discussions by NGOs, donors, governments, technology developers, and other stakeholders. Digital innovations such as fully automated application of inputs, the detection and control of weeds within fields and feeding systems as well as the use of robots and other autonomous operating devices can also help to promote sustainable and resilient agricultural systems.

1.7 Preparing detail plan and implementation of technology

Preparing a detailed plan and implementation of technology is an essential step towards successful adoption of new technology. An implementation plan is a document that outlines the steps your team should take to accomplish a shared goal or initiative. It combines strategy, process, and action and will include all parts of the project from scope to budget and beyond.

Here are six steps to create an implementation plan:

1. Define goals: Determine what you hope to accomplish when your project is complete.
2. Identify stakeholders: Identify all stakeholders who will be involved in the project.
3. Develop a timeline: Develop a timeline for the project that includes all key milestones and deadlines.

4. Allocate resources: Allocate resources such as personnel, equipment, and funding to the project.
5. Monitor progress: Monitor progress throughout the project to ensure that it stays on track.
6. Evaluate results: Evaluate the results of the project to determine whether it was successful and identify areas for improvement.

In addition to these steps, there are various digital innovations that can be used to promote sustainable and resilient agricultural systems. These innovations include fully automated application of inputs, the detection and control of weeds within fields and feeding systems as well as the use of robots and other autonomous operating devices. These innovations can help to improve efficiency of resources (materials and energy), reduce pollution and waste from different sectors, and manage pollution and waste that is generated during extraction of resources and production and consumption of goods and services.

Preparing a detailed plan and implementation of technology is essential for the successful adoption of new technology. An implementation plan is a document that outlines the steps your team should take to accomplish a shared goal or initiative. Digital innovations such as fully automated application of inputs, the detection and control of weeds within fields and feeding systems as well as the use of robots and other autonomous operating devices can also help to promote sustainable and resilient agricultural systems.

1.8 Calculate resource requirements for new technology

Calculating resource requirements for new agricultural technology is essential for the development of sustainable and equitable agricultural systems. The Agricultural Technology Assessment Tool developed by CEGA (Center for Effective Global Action) provides a framework for assessing the potential scalability of an agricultural technology and to facilitate decision-making discussions by NGOs, donors, governments, technology developers, and other stakeholders. The tool is designed to assess the utility and appropriateness of an agricultural technology for farmers and other actors in the value chain. It is important to consider multiple interlinked factors such as the potential for risk exposure, the availability of complementary inputs, and the reliability of delivery institutions when introducing or promoting a new technology.

In addition to the Agricultural Technology Assessment Tool, there are various digital innovations that can be used to promote sustainable and resilient agricultural systems. These innovations include fully automated application of inputs, the detection and control of weeds within fields and feeding systems as well as the use of robots and other autonomous operating devices. These innovations can help to improve efficiency of resources (materials and energy), reduce pollution and waste from different sectors, and manage pollution and waste that is generated during extraction of resources and production and consumption of goods and services.

Digital innovations such as fully automated application of inputs, the detection and control of weeds within fields and feeding systems as well as the use of robots and other autonomous operating devices can also help to promote sustainable and resilient agricultural systems.

1.9 Preparing required inputs

To prepare the required inputs for agricultural technology, it is important to consider the specific needs of the technology in question. According to the Food and Agriculture Organization of the United Nations (FAO), the introduction, application, and utilization of agricultural technologies need to be supported by capable and well-organized extension services and other service providers.

The Global Forum on Food Security and Nutrition suggests that the process of introducing new agricultural technologies is complex and challenging, and carries with it many unknowns and risks. Factors that influence the acceptance of new technologies include

- Gender
- Age
- Education level of the farmer
- Farm size
- Access to information
- Land ownership
- Off-farm income, and
- Infrastructure.

To have a positive and long-term impact on fostering food security and to be broadly accepted by stakeholders, technologies need to be introduced with care, be readily adaptable to the demands of a particular setting, and be easy to understand and use.

Agriculture technicians and policy-makers have a key role in preparing the approach required for the distribution and/or application of novel technologies; to provide for exposure and to encourage take-up.

1.10 Conducting training and awareness creation activities

Conducting training and awareness creation activities is an essential part of introducing new agricultural technologies. According to the Global Forum on Food Security and Nutrition, the process of introducing new agricultural technologies is complex and challenging, and carries with it many unknowns and risks. To raise awareness about a particular technology, it is important to develop an awareness-raising strategy that includes the following components:

- Issuing press releases, briefings, and commentaries
- Disseminating reports, studies, and publications
- Making written or oral submissions to parliamentary committees and inquiries
- Working with the media
- Holding public meetings and events
- Convening conferences and workshops
- Creating and contributing to educational materials

In addition to these components, demonstrating improved crop technologies and practices can be an effective way to raise awareness and promote adoption of new technologies. The Food and Agriculture Organization of the United Nations (FAO) suggests that demonstration plots can be used to showcase the benefits of new technologies and practices to farmers and other stakeholders.

To conduct training and awareness creation activities in demonstrating improved crop technologies and practices, it is important to consider the specific needs of the technology in question. The FAO e learning Academy offers a course on climate-smart crop production that

explores the principles and practices for sustainable and profitable production of annual and perennial crops to meet food, feed, energy, and fiber needs and foster economic growth in a variety of contexts and crop systems.

Agriculture technicians and policy-makers have a key role in preparing the approach required for the distribution and/or application of novel technologies; to provide for exposure and to encourage take-up.

1.11 Preparing and recording demonstration data

Preparing and recording demonstration data for agricultural technology is an important step in the process of introducing new technologies. According to the International Rice Research Institute (IRRI), field demonstrations are an effective way to raise farmer awareness about new options and validate and demonstrate new technologies.

To establish a field demonstration, researchers and/or extension workers should collaborate with farmers to identify problems, their root causes, and farmer acceptable options for overcoming the problems. Characteristics of good field demonstration sites include easy access, visibility from the road, clear demonstration of differences between the new practice and existing farmer practice, and large enough plots to be believable.

During the field demonstration, researchers and/or extension workers should visit the sites the day before the field demonstration day and provide refreshments if necessary. Farmers should present at least some of the results from their fields to other farmers during the field day.

Recording data from the field demonstration is important to evaluate the effectiveness of the technology and to identify areas for improvement. The Kansas State University Research and Extension suggests that data collection should be planned in advance and should include the following information:

- Field location and size
- Soil type and fertility
- Crop variety and planting date
- Fertilizer and pesticide application rates and dates

- Irrigation and drainage practices
- Harvest date and yield
- Weather conditions

The Sustainable Agriculture Research and Education (SARE) program offers a guide on how to collect and analyze data from on-farm research and demonstration projects.

Video link: - https://youtu.be/5T0xSnHBATo (date accessed 20/01/2024)

Self-check 1	**Written test**

Directions: Answer all the questions listed below.

I. True or False Questions:

1. Participatory approaches involve the active involvement of all stakeholders in the design, implementation, and evaluation of agricultural technologies.
2. PV is primarily about the product, not the process.
3. Technical manuals are not important for the effective use of new agricultural technology.
4. The Agricultural Technology Assessment Tool developed by CEGA provides a framework for assessing the potential scalability of an agricultural technology.
5. Assessing new agricultural crop technologies and practices is not important for the development of sustainable and equitable agricultural systems.

II. Multiple Choice Questions:

1. What is the purpose of on-farm demonstrations?
   a. To introduce farmers to innovation
   b. To share experiences in a farmer-to-farmer setting
   c. To support knowledge co-creation between farmers and other actors
   d. All of the above
2. What is the main advantage of Farmer Participatory Research (FPR)?
   a. Farmers learn by doing
   b. Decision rules are modified on the basis of direct experience
   c. Farmers and scientists work together from the initial design of the research project to data gathering, analysis, final conclusions, and follow-up actions
   d. All of the above
3. What is Participatory Communication (PC)?
   a. An approach based on dialogue, which allows the sharing of information, perceptions and opinions among the various stakeholders
   b. A form of participatory media in which a group or community creates their own film
   c. A type of qualitative research that is used to gain an in-depth understanding of a community or situation
   d. An approach that involves farmers in the research process
4. What is the purpose of the Agricultural Technology Assessment Tool developed by CEGA?
   a. To identify the problem that the technology seeks to address and to identify alternative solutions
   b. To estimate the magnitude and certainty of a technology's benefits to small-holder farmers, their communities, and to other actors in the agricultural value chain
   c. To provide a framework of potential pitfalls to consider
   d. All of the above
5. What is the purpose of Interpretation of technical manuals for new agricultural technology?
   a. To ensure that the technology is used effectively and efficiently

b. To provide detailed information on how to use the technology, including instructions on installation, operation, maintenance, and troubleshooting

c. To have a basic understanding of the technology and its components

d. All of the above

I. Short Answer Questions

1. Define briefly Environmentally Sound Technologies (ESTs)?
2. Mention the factors that influence the acceptance of new technologies?
3. List the six steps to create an implementation plan of technology?

LG #38	LO #2- Demonstrating Crop Technologies and Practices

Instruction sheet 2

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

- Selection and preparation of demonstration plots and best practice
- Establishing new technology or practice
- Undertaking required managemental practices
- Solving problem and reporting

Taking, preparing and forwarding test samples for analysis This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Select and prepare demonstration plots and best practice
- Establish new technology or practice
- Undertake required managemental practices
- Solve problem and reporting

Learning Instructions:

5. Read the specific objectives of this Learning Guide.
6. Follow the instructions described below.
7. Read the information written in the information Sheets
8. Accomplish the Self-checks

Information Sheet 2

2.1. Selection and preparation of demonstration plots and best practice

To demonstrate improved crop technologies and practices, it is important to select and prepare demonstration plots that are representative of the target area. According to a study published in PLOS ONE, demonstration plots are an effective model for enhancing improved technology adoption and are further increased when those inputs are available within a 5km radius.

The International Rice Research Institute (IRRI) suggests that field demonstrations are an effective way to raise farmer awareness about new options and validate and demonstrate new technologies. Characteristics of good field demonstration sites include easy access, visibility from the road, clear demonstration of differences between the new practice and existing farmer practice, and large enough plots to be believable.

To establish a field demonstration, researchers and/or extension workers should collaborate with farmers to identify problems, their root causes, and farmer acceptable options for overcoming the problems.

Recording data from the field demonstration is important to evaluate the effectiveness of the technology and to identify areas for improvement. The Kansas State University Research and Extension suggests that data collection should be planned in advance and should include the following information:

- Field location and size
- Soil type and fertility
- Crop variety and planting date
- Fertilizer and pesticide application rates and dates
- Irrigation and drainage practices
- Harvest date and yield
- Weather conditions

The Sustainable Agriculture Research and Education (SARE) program offers a guide on how to collect and analyze data from on-farm research and demonstration projects.

2.2. Establishing new technology or practice

Establishing new agricultural technology or practice is a complex process that requires careful planning and execution. According to Plug and Play Tech Center, innovation is more important in modern agriculture than ever before, and the industry as a whole is facing huge challenges, from rising costs of supplies and labor shortages to changes in consumer preferences for transparency and sustainability.

To successfully introduce new farming technology, Agri Webb suggests the following five steps:

1. Develop a roll-out plan
2. Bring staff on board
3. Get the necessary training
4. Implement and evaluate
5. Do your research

The Global Forum on Food Security and Nutrition suggests that the process of introducing new agricultural technologies is complex and challenging, and carries with it many unknowns and risks. Factors that influence the acceptance of new technologies include gender, age, education level of the farmer, farm size, access to information, land ownership, off-farm income, and infrastructure. To have a positive and long-term impact on fostering food security and to be broadly accepted by stakeholders, technologies need to be introduced with care, be readily adaptable to the demands of a particular setting, and be easy to understand and use.

The Cybersecurity and Infrastructure Security Agency (CISA) suggests that conducting training and awareness creation activities is an essential part of introducing new agricultural technologies. The process of conducting training and awareness creation activities involves several steps, including planning, developing, delivering, and evaluating training programs.

2.3. Undertaking required managemental practices

Undertaking required managemental practices is an important aspect of agriculture. According to Britannica, farm management involves making and implementing decisions involved in organizing and operating a farm for maximum production and profit.

To undertake required managemental practices, it is important to consider the specific needs of the farm and the crops being grown. The Science Learning Hub suggests that management practices include getting cows and stock off wet paddocks and capturing urine and effluent through the use of feed pads, stand-off pads or wintering herd shelters (or barns). A feed pad is a

firm surface used for short periods of time where stock are given supplementary feed. The feed pad collects and contains the effluent.

The Cybersecurity and Infrastructure Security Agency (CISA) suggests that effective policies and procedures are essential for implementing required managemental practices. When developing policies and procedures, it is important to consult with all relevant stakeholders, including health and safety representatives, contractors, and employees.

The EFRA G1 Business Conduct standard provides guidance on impact, risk, and opportunity management, corporate culture and business conduct policies, management of relationships with suppliers, prevention and detection of corruption and bribery, political influence and lobbying activities, and payment practices.

2.4. Solving problem and reporting

Solving problems and reporting on demonstrating improved crop technologies and practices is an important aspect of agriculture. According to the Global Forum on Food Security and Nutrition, the process of introducing new agricultural technologies is complex and challenging, and carries with it many unknowns and risks. To evaluate the effectiveness of the technology and to identify areas for improvement, it is important to record data from the field demonstration. The Kansas State University Research and Extension suggests that data collection should be planned in advance and should include the following information:

- Field location and size
- Soil type and fertility
- Crop variety and planting date
- Fertilizer and pesticide application rates and dates
- Irrigation and drainage practices
- Harvest date and yield
- Weather conditions

The Sustainable Agriculture Research and Education (SARE) program offers a guide on how to collect and analyze data from on-farm research and demonstration projects.

To solve problems related to demonstrating improved crop technologies and practices, it is

important to identify the root cause of the problem and develop a plan to address it. The Food and Agriculture Organization of the United Nations (FAO) suggests that the introduction, application, and utilization of agricultural technologies need to be supported by capable and well-organized extension services and other service providers.

Reporting on the success of the demonstration is important to evaluate the effectiveness of the technology and to identify areas for improvement. The International Rice Research Institute (IRRI) suggests that field demonstrations are an effective way to raise farmer awareness about new options and validate and demonstrate new technologies.

In addition to the resources you mentioned, there are many emerging technologies that can help farmers collect and analyze data to improve crop management. For example, digital agriculture uses sensors, drones, and artificial intelligence to collect crop data that can be used to enhance agricultural outcomes. Data analytics can also be used to monitor crop growth and optimize the use of resources.

Video link: - https://youtu.be/Qmla9NLFBvU (date accessed 20/01/2024)

Self-Check 1	**Written Test**

Directions: Answer all the questions listed below.

I. True or False Questions

1. Demonstration plots are an ineffective model for enhancing improved technology adoption.

2. Characteristics of good field demonstration sites include easy access, visibility from the road, and small plot sizes.
3. The process of introducing new agricultural technologies is simple and carries few unknowns and risks.
4. Effective policies and procedures are not essential for implementing required management practices.
5. Reporting on the success of the demonstration is not important to evaluate the effectiveness of the technology.

II. Multiple Choice Questions

1. **Which of the following is not a characteristic of good field demonstration sites?**

   A) Easy access

   B) Visibility from the road

   C) Small plot sizes

   D) Clear demonstration of differences between the new practice and existing farmer practice

2. **What is an essential step for introducing new agricultural technologies?**

   A) Avoiding training and awareness creation activities

   B) Conducting training and awareness creation activities

   C) Introducing technologies without stakeholder consultation

   D) Introducing complex and difficult-to-understand technologies

3. **What is important for evaluating the effectiveness of a technology in a field demonstration?**

   A) Not recording any data

   B) Recording data from the field demonstration

   C) Ignoring the success of the demonstration

   D) Conducting minimal data collection

4. **What can be used to monitor crop growth and optimize the use of resources?**

   A) Drones and artificial intelligence

B) Traditional farming methods only

C) Ignoring data analytics

D) Not collecting any data

5. **What is an example of an emerging technology that can help farmers collect and analyze data to improve crop management?**

   A) Traditional manual data collection

   B) Use of outdated sensors

   C) Digital agriculture using sensors, drones, and artificial intelligence

   D) Ignoring technological advancements

III. Short Answer Questions

1. **What are the characteristics of good field demonstration sites?**
2. **What are the essential steps for introducing new agricultural technologies?**
3. **Why is recording data from the field demonstration important?**
4. **What are some examples of emerging technologies that can help farmers collect and analyze data to improve crop management?**
5. **Why are effective policies and procedures essential for implementing required management practices?**

LG #39	LO #3- Monitoring and Evaluating Crop Demonstration

Instruction sheet 3

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

- Monitoring demonstration plots
- Organizing field days and group extension
- Pursuing feedback from participants
- Recording, analyzing, interpreting and reporting data
- Documentation and compilation of best practices (E.G)

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Monitor demonstration plots
- Organize field days and group extension
- Pursue feedback from participants
- Record, analyze, interpret and report data
- Document and compile best practices (E.G)

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the information Sheets
4. Accomplish the Self-checks

Information Sheet-3

3.1. Monitoring demonstration plots

Monitoring demonstration plots is an important aspect of agriculture. According to a presentation by World Vision, demonstration plots are the centerpieces of farmer field schools and are at the heart of knowledge and skills transfer. However, there are many challenges associated with the

management of demonstration plots, including the lack of guidelines on best practices and effectiveness of demo plots, limited success negatively affecting adoption, and paucity of resources.

To ensure the success of demonstration plots, it is important to monitor them regularly. The Food and Agriculture Organization of the United Nations (FAO) suggests that the introduction, application, and utilization of agricultural technologies need to be supported by capable and well-organized extension services and other service providers.

The Illustrative Checklist for Demonstration Plot by Action for Enterprise provides a useful guide for monitoring demonstration plots. The checklist includes the following items:

- Field location and size
- Soil type and fertility
- Crop variety and planting date
- Fertilizer and pesticide application rates and dates
- Irrigation and drainage practices
- Harvest date and yield
- Weather conditions

For on-farm demonstrations, the field location and size can vary depending on the objectives of the demonstration. The fields should be established to clearly demonstrate the differences between the new practice and existing farmer practice. The demonstration should be in a corner or alongside another field for comparison purposes. The plots should be large enough to be believable, for example, a minimum of **10 meters by 10 meters.**

For on-farm demonstrations, the soil type and fertility can be crucial factors in determining the success of the demonstration. The soil type can affect the growth of crops and the availability of nutrients. Soil fertility refers to the ability of the soil to provide an atmosphere that is in favor of plant growth and maximize crop yield.

To determine the soil type and fertility of a field, soil tests can be conducted. Soil tests can provide information about the pH level, nutrient content, and organic matter content of the soil. This information can be used to determine the appropriate fertilizers and soil amendments to use for the demonstration.

It is important to note that the soil type and fertility can vary depending on the location of the field. Therefore, it is recommended to conduct soil tests for each field before conducting a demonstration.

The choice of crop variety and planting date can be critical to the success of the demonstration. The crop variety should be selected based on the objectives of the demonstration. For example, if the goal is to identify a variety that resists a specific pest or disease, then the variety should be selected based on its resistance to that pest or disease.

The planting date can also affect the growth of crops and the availability of nutrients. The most advantageous planting date is not a fixed time but changes with respect to region, season, and cultivar. Recommendation of optimal planting date depends on the combination of several factors including plant variety, temperature suitability, and water availability.

It is important to note that the choice of crop variety and planting date can vary depending on the location of the field. Therefore, it is recommended to conduct soil tests for each field before conducting a demonstration.

The application rates and dates of fertilizers and pesticides can be crucial factors in determining the success of the demonstration. The appropriate application rates and dates depend on the crop variety, soil type, and fertility of the field.

To determine the appropriate application rates and dates, soil tests can be conducted. Soil tests can provide information about the pH level, nutrient content, and organic matter content of the soil. This information can be used to determine the appropriate fertilizers and soil amendments to use for the demonstration.

The application rates and dates of pesticides should be determined based on the pest or disease that is being targeted. The appropriate pesticide should be selected based on its effectiveness against the pest or disease and its impact on the environment.

It is important to note that the application rates and dates of fertilizers and pesticides can vary depending on the location of the field. Therefore, it is recommended to conduct soil tests for each field before conducting a demonstration.

The appropriate irrigation and drainage practices can vary depending on the objectives of the demonstration. The irrigation practices should be established to clearly demonstrate the differences between the new practice and existing farmer practice. The demonstration should be in a corner or alongside another field for comparison purposes. The plots should be large enough to be believable, for example, a minimum of **10 meters by 10 meters**.

The appropriate irrigation practices depend on the crop variety, soil type, and fertility of the field. To determine the appropriate irrigation practices, soil tests can be conducted. Soil tests can provide information about the pH level, nutrient content, and organic matter content of the soil. This information can be used to determine the appropriate fertilizers and soil amendments to use for the demonstration.

Drainage practices are also important for crop production. Poor drainage can lead to waterlogging, which can cause root damage and reduce crop yields. Drainage systems should be designed to remove excess water from the field while minimizing soil erosion.

It is important to note that the irrigation and drainage practices can vary depending on the location of the field. Therefore, it is recommended to conduct soil tests for each field before conducting a demonstration.

In addition to the above, the Management of agriculture demonstration plots presentation by World Vision suggests that clarity of purpose, appropriate signboards and record keeping, and consistency in evaluation and dissemination of results are also important factors to consider when monitoring demonstration plots.

3.2 Organizing field days and group extension

Organizing field days and group extension are important methods of agricultural extension. According to the Food and Agriculture Organization of the United Nations (FAO), the extension agent can employ two other extension methods in addition to mass communication methods: the individual method, in which the agent deals with farmers on a one-to-one basis, and the group method, in which the agent brings the farmers together in one form or another in order to undertake his extension work.

Field days are educational events held on-farm or on-ranch. They are organized and hosted by the producer, oftentimes in collaboration with agricultural educators. The Sustainable Agriculture Research and Education (SARE) program provides a useful guide for organizing a successful field day.

Here are some tips:

- Decide what size audience the field day can accommodate. Make sure it is small enough that all will feel engaged and can see and hear.
- Choose an inspiring title for the event.
- Create an interesting program that meets the audience's needs.

Group extension methods involve the agent in a face-to-face relationship with the farmer, and this relationship should be one of mutual confidence and respect. The agent, therefore, must think carefully about his use of individual or group extension methods and ensure that his relationship with the farmer is sensitively developed.

3.3 Pursuing feedback from participants

Pursuing feedback from participants is an important aspect of agriculture. According to the Community Tool Box, feedback from participants consists of reactions to or opinions about your effort from those who are affected by it. Feedback from participants can and should be used at every phase of the Deming Cycle, which consists of five phases: Plan, Do, Check, Act, Analyze.

The Geo Farmer App is a user-friendly and flexible tool to gather field data for evidence building for implementation of agricultural development projects. The Geo Farmer app is designed to

support experience exchanges (positive or negative) between farmers. For agricultural development projects, Geo Farmer can facilitate two-way interaction and better follow-up with the farming community. Geo Farmer is a flexible tool that can be used for data collection, as a knowledge library, or for efficient monitoring and evaluation of agricultural technologies and practices implemented by farmers.

In addition to the above, the Food and Agriculture Organization of the United Nations (FAO) suggests that the introduction, application, and utilization of agricultural technologies need to be supported by capable and well-organized extension services and other service providers.

3.4 Recording, analyzing, interpreting and reporting data

Recording, analyzing, interpreting and reporting data is a crucial aspect of agriculture. According to SAS, data analytics can help extract valuable insights that can lead to better plant and animal health, crop yields, sustainable practices and more.

The National Academies of Sciences, Engineering, and Medicine recommends effective methods for collecting data and reporting information about American agriculture given the changes and increased complexity in farm business structure.

The Community Tool Box suggests that feedback from participants can and should be used at every phase of the Deming Cycle, which consists of five phases: Plan, Do, Check, Act, Analyze.

The University of Wisconsin-Madison Extension provides a useful guide for collecting and organizing farm records.

Effective data collection and analysis can help farmers make informed decisions, improve crop yields, and promote sustainable practices. The SAS website provides a comprehensive overview of how data analytics can be used in agriculture to achieve these goals. The National Academies of Sciences, Engineering, and Medicine offers recommendations for improving data collection and reporting in American agriculture, given the changing landscape of farm business structures. The Community Tool_Box provides guidance on how to use feedback from participants to improve the quality of data collection and analysis. The University of Wisconsin-Madison Extension offers a helpful guide for farmers on how to collect and organize farm records.

3.5. Documentation and compilation of best practices (E.G)

Documentation and compilation of best practices in agricultural technology is a crucial aspect of the agricultural industry. It involves the collection, analysis, and dissemination of information on the most effective and efficient ways to produce crops and livestock. The goal is to provide farmers with the knowledge and tools they need to increase their yields, reduce costs, and improve the quality of their products.

According to a report by the International Fund for Agricultural Development (IFAD), the adoption of improved agricultural technologies is a complex process that is subject to multiple uncertainties and market constraints. The report highlights the importance of documenting and sharing knowledge on what works and what doesn't work in the agricultural industry.

To document and compile best practices in agricultural technology, it is important to identify the most effective and efficient methods for producing crops and livestock. This can be done through research, experimentation, and collaboration with other farmers and experts in the field. Once the best practices have been identified, they should be documented and shared with other farmers and stakeholders in the industry.

The World Health Organization (WHO) has published a guide for documenting and sharing best practices in the health sector, which can be adapted for use in the agricultural industry. The guide emphasizes the importance of documenting what works and what doesn't work, how it works, and why it works or doesn't work. It also highlights the importance of sharing knowledge and information with others in the industry.

Documentation and compilation of best practices in agricultural technology is essential for the growth and development of the agricultural industry. By identifying and sharing the most effective and efficient methods for producing crops and livestock, farmers can increase their yields, reduce costs, and improve the quality of their products.

Video link: - https://youtu.be/s5ZwZ1aQfNY (date accessed 20/01/2024)

Self-Check 1	**Written Test**

Directions: Answer all the questions listed below.

I. True or False Questions

1. Monitoring demonstration plots is not an important aspect of agriculture.
2. The introduction, application, and utilization of agricultural technologies do not need to be supported by capable and well-organized extension services and other service providers.
3. Pursuing feedback from participants is not an important aspect of agriculture.
4. Recording, analyzing, interpreting, and reporting data is not a crucial aspect of agriculture.
5. Documentation and compilation of best practices in agricultural technology is not essential for the growth and development of the agricultural industry.

II. Multiple Choice Questions

1. **Which of the following is NOT included in the Illustrative Checklist for Demonstration Plot by Action for Enterprise?**

   A) Crop variety and planting date

   B) Livestock management practices

   C) Fertilizer and pesticide application rates and dates

   D) Weather conditions

2. **What are the phases of the Deming Cycle?**

   A) Plan, Check, Act, Reflect

   B) Plan, Do, Check, Act, Analyze

   C) Plan, Implement, Evaluate, Adjust

   D) Assess, Plan, Do, Review

3. **Which organization provides a guide for documenting and sharing best practices in the health sector, which can be adapted for use in the agricultural industry?**

   A) World Vision

B) Food and Agriculture Organization of the United Nations (FAO)

C) International Fund for Agricultural Development (IFAD)

D) World Health Organization (WHO)

4. **What are the two other extension methods, in addition to mass communication methods, that the extension agent can employ according to the Food and Agriculture Organization of the United Nations (FAO)?**

   A) Individual method and community method

   B) Individual method and group method

   C) Group method and community method

   D) Farmer method and group method

5. **Which organization provides a useful guide for organizing a successful field day?**

   A) World Vision

   B) Food and Agriculture Organization of the United Nations (FAO)

   C) International Fund for Agricultural Development (IFAD)

   D) Sustainable Agriculture Research and Education (SARE)

III. Short Answer Questions

1. What are the key items included in the Illustrative Checklist for Demonstration Plot by Action for Enterprise?
2. Why is it important to pursue feedback from participants in agriculture, and what tool can be used for this purpose?
3. What are the phases of the Deming Cycle, and how can feedback from participants be used in this cycle?
4. What are the key aspects of organizing a successful field day, and who provides a useful guide for this?
5. Why is the documentation and compilation of best practices in agricultural technology essential, and which organization has published a guide for documenting and sharing best practices in the health sector that can be adapted for use in the agricultural industry?

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