Crop production and marketing management

Level-IV

Based on March 2018, Version 3 Occupational standards

Module Title: Interpreting and documenting crop production data

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LG #77	LO #1- Collect and organize production data

Instruction sheet-1

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

- Collecting and organizing   information
- Assessing information
- Identifying methods of collecting data
- Using business equipment
- updating, modifying , maintaining and storing information

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:

- Collect and organiz information
- Assess information held by the production unit
- Identify methods of collecting data
- Use business equipment
- update, modify , maintain and store information

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". Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them.
4. Accomplish the "Self-checks" which are placed following all information sheets.
5. Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks).
6. If you earned a satisfactory evaluation proceed to "Operation sheets
7. Perform "the Learning activity performance test" which is placed following "Operation sheets" ,
8. If your performance is satisfactory proceed to the next learning guide,

9. If your performance is unsatisfactory, see your trainer for further instructions or go back to "Operation sheets".

1.1. Introduction

In order to maximize yield potential, farmers must consider myriad variables including weather, timing, soil quality, moisture and nutrient levels, seed placement, and frequency and dosage of fertilizer and pesticide application to name just a few.[1] Over the past two plus decades, Deere has been transforming from a pure equipment manufacturer into a data-driven technology company to deliver more value to farmers, helping them to collect data and harness it for improved farm management. The value created for farmers is improved productivity, increased efficiency, decreased downtime, and reduced costs to ultimately maximize profitability. The more data that is collected, the more valuable it becomes to all stakeholders – farmers benefit from analyzing data collected over time and from other farmers' data to inform decisions
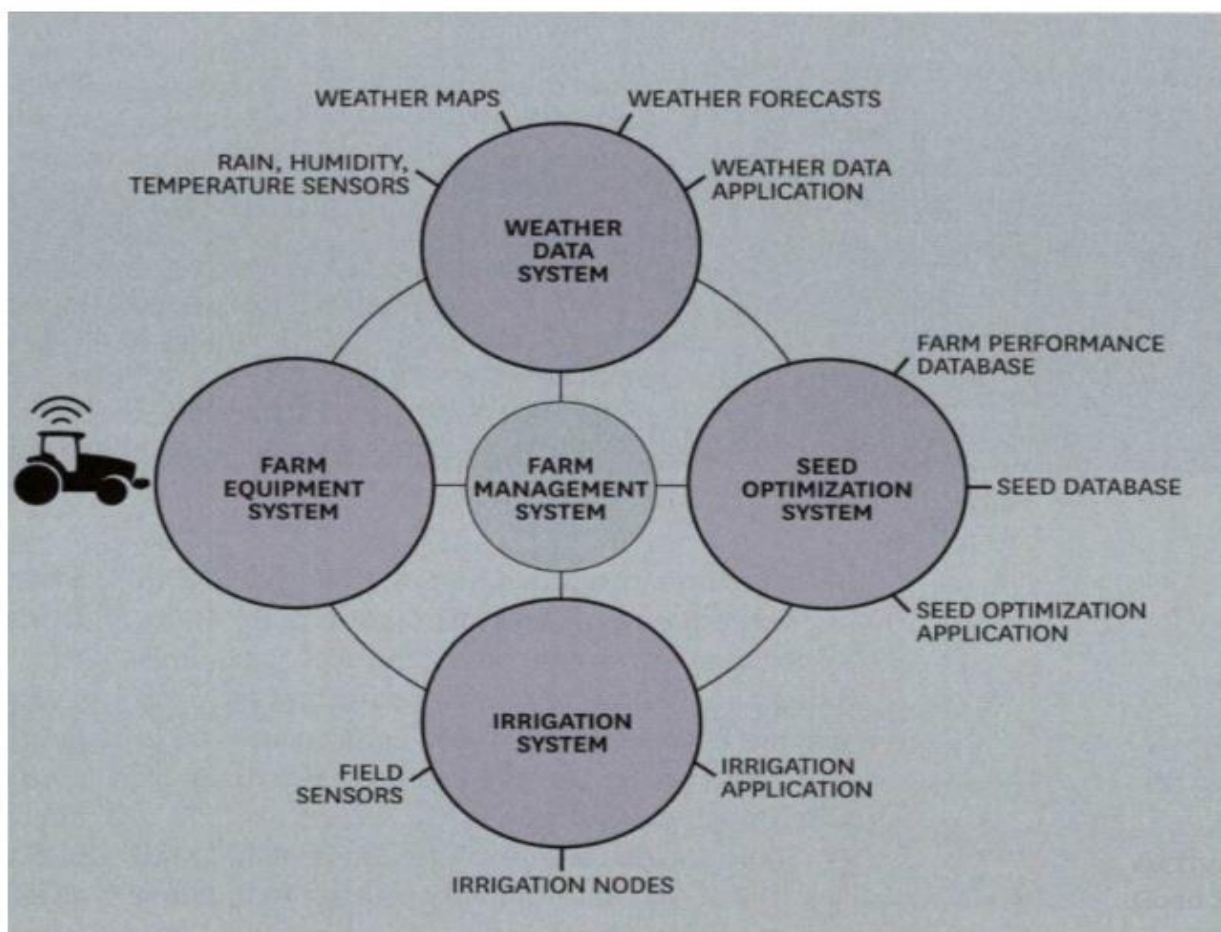
Figure 1.1. Deere farm management through data (Source: Michael E. Porter and James E. Heppelmann, "How Smart, Connected Products Are Transforming Competition," Harvard Business Review, November 2014.)

Data, including agronomic (crop management) data and machine operation data (e.g., fuel level, location, machine hours, engine RPM) is collected primarily from sensors embedded both in the machines and in the field (soil), but also pulls from external sources (e.g., weather prediction data, commodity pricing).

Nominal Data: These are data which classify or categorise some attribute they may be coded as numbers but the numbers has no real meaning, its just a label they have no default or natural order. *Examples:, town of residence, colour of car, male or female (this lat one is an example of a dichotomous variable, it can take two mutually exclusive values.*

Ordinal Data: These are data that can be put in an order, but don't have a numerical meaning beyond the order. So for instance, the difference between 2 and 4 in the example of a Lickert scale below might no be the same as the difference between 2 and 5. *Examples: Questionnaire responses coded: 1 = strongly disagree, 2 = disagree, 3 = indifferent, 4 = agree, 5 = strongly agree. Level of pain felt in joint rated on a scale from 0 (comfortable) to 10 (extremely painful).*

Interval Data: These are numerical data where the distances between numbers have meaning, but the zero has no real meaning. With interval data it is not meaningful to say than one measurement is twice another, and might not still be true if the units were changed. *Example: Temperature measured in Centigrade, a cup of coffee at 80°c isn't twice as hot a one at 40°c.*

Ratio Data: These are numerical data where the distances between data and the zero point have real meaning. With such data it is meaningful to say that one value is twice as much as another, and this would still be true if the units were changed. *Examples: Heights, Weights, Salaries, Ages. If someone is twice as heavy as someone else in pounds, this will still be true in kilograms.*

More restricted in how they can be analysed

Less restricted in how they can be analysed

Activate

Figure 1.2. Types of data

Statistical needs for agricultural planning and policy-making are very broad. The primary needs are for current agricultural statistics produced on a regular basis, such as crop and livestock production, and most economies have established an ongoing system for the collection of these data. Current agricultural statistics are usually collected through administrative reporting systems and/or through sample surveys. Current agricultural statistics are needed to monitor current agricultural and food supply conditions and to provide information to help governments and others in short-term decision-making.

One feature of a census of agriculture is that it involves the collection of data at the individual holding level. Many economies compile current agricultural statistics based on reports from local officials because they do not have the resources to collect data directly from farmers in sample surveys. This reporting method of data collection is cheap and easy, but data quality often suffers because of poor reporting and the lack of sound statistical concepts and procedures. In these circumstances, a census of agriculture can be invaluable in providing a statistically sound source of agricultural statistics.

Data on farms should be geo-referenced, to enable the superposing of information on soils and land coming from other datasets. The same applies to data on weather patterns. In addition, basic information on the type of soils should also be collected. Information on practices affecting the environment, such as manure management or pest control, can also be sought. Collecting and presenting data for different types of agro ecological zones, the definition of which may be more or less sophisticated depending on data availability, is necessary for making assessments and comparisons of yields, revenue or input use between different typologies of natural environments and production conditions.

Variable is a characteristic that varies from one individual member of population to another individual.Variables such as height and weight are measured by some type of scale, convey quantitative information and are called as quantitative variables. Sex and eye colour give qualitative information and are called as qualitative variables.
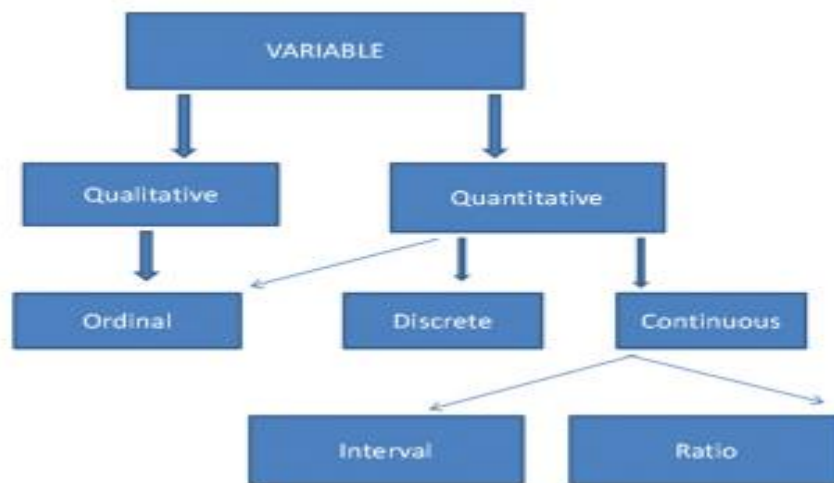
Figure 1.3. variable tree

1.2. Data requirements for land productivity measurement

- Output data:
  - ✓ Crop production, including secondary/minor crops and by-products, in quantities and values;
  - ✓ Number of animals by species;
  - ✓ Livestock production by product in quantities and values.
- Input data:
  - ✓ The total area of land planted for each crop;
  - ✓ The average annual per unit cost of land;
  - ✓ Total area of land available for cropping, namely the sum of cultivated land for all crops and fallow land;
  - ✓ The share of land used for pasture;
  - ✓ Management system for livestock.

In addition, information on the environment and production conditions, as described above, should be made available.

- **Production**: the ultimate objective of all economic activity is the satisfaction of human wants, so any activity or process that satisfies a human desire either directly or indirectly, presently or in the future can be considered as production.or It is a process by which resources are transformed into products or services that are usable by consumer.

- **Data-:** are facts which may or may not be processed (edited, summarized or refined) and have no direct effect on the user. Data is any information collected as part of a

research proposal and expressed as numbers. In practice, most measurements are classified into qualitative or quantitative data. Data refers to raw material such as facts and figures that could be collected by an information system.

- **Data collection:** helps your team to assess the health of your process. To do so, you must identify the key quality characteristics you will measure, how you will measure them, and what you will do with the data you collect. What exactly is a key quality characteristic? It is a characteristic of the product or service produced by a process that customers have determined is important to them. Key quality characteristics are such things as the speed of delivery of a service, the precision with which an electronic component is calibrated, or the effectiveness of an administrative response to a tasking by higher authority. Every product or service has multiple key quality characteristics. When you are selecting processes to improve, you need to find out the processes, or process steps, that produce the characteristics your customers perceive as important to product quality. Data Collection is nothing more than planning for and obtaining useful information on key quality characteristics produced by your process. However, simply collecting data does not ensure that you will obtain relevant or specific enough data to tell you what is occurring in your process. The key issue is not: How do we collect data? Rather, it is: How do we obtain useful data?

- **Data collection strategies**

You have a number of ways to collect data but there is no one single best way. The decision about which approaches to use depends upon:

- ✓ what you need to know
- ✓ where the data reside
- ✓ resources and time available
- ✓ complexity of the data to be collected
- ✓ frequency of data collection

- **Data collection general rules**

The following are general rules to help you with data collection.

- ✓ Use available data if you can.
- ✓ If using available data be sure to find out how earlier evaluators:
  - ❖ collected the data
  - ❖ defined the variables

❖ ensured accuracy of the data.

✓ If you must collect original data:

❖ establish procedures and follow them (protocol)

❖ maintain accurate records of definitions and coding

❖ Pre-test, pre-test, pre-test

❖ verify accuracy of coding, data input

- **Key issues about measures of data collection**

When you collect data, you will need to keep these key issues in mind:

✓ Are your measures credible?

✓ Are your measures valid?

✓ Are your measures measuring what counts?

✓ Are your measures reliable?

✓ Are your measures precise?

1.3. **Information:** refers to analyzed data, often presented in a form that is specifically designed for a given decision-making task, and transmitted to/received by decision makers. Information- is the pattern people impose on the phenomena they are able to observe. Much of the information needed to solve farmers' problems with their decision making will come from research, although some will come from others farmers and from policy makers. Example .information related to subsidies, price, forecasts, etc

- **Knowledge**: refers to the subsequent absorption, assimilation, understanding and appreciation of that information.
- **Sources of information (Knowledge):** farmers use many different sources to obtain the knowledge and information they need to manage their farms well. These sources include;
  ✓ Others farmers' organizations and their staff members
  ✓ Government extension organizations
  ✓ Private companies selling inputs, offering credit and buying products
  ✓ Farm journals, radio .television and other mass media ,etc

1.4. Agricultural data

The process of gathering information such as profit margins per horticultural crop type and cultivars, pest and disease infestation, weather and climate information, costs, economic conditions etc and analyzing it to be able to find patterns that will help as work more efficiently, sustainably and profitably on a farm.

1.5. Characteristics of agricultural information

1) **Relevance:** the information that a person uses must be relevant to the current problem at hand. If the information is not relevant it would not help to solve the problem at all.

2) **Completeness:** good agricultural information is complete. This means that it provides intended users with all the information that is necessary to fulfill their information needs and requirements. Completeness also suggests that all necessary information is included in any report that the organization produces. The assumption is that there would be no error of omission in the information. If the information is not complete and only partial information is received, it may lead to wrong decisions being made as only half of an entirety of the information is known.

3) **Accuracy**: the information must be accurate as inaccurate information would lead to many different major problems. It leads individuals to wrong decisions. Agricultural information should be accurate. This does not suggest that you must always state figures and facts down to the last penny or detail. What it means is that information should be accurate enough for its intended purpose (or user), without being unnecessarily detailed. Inaccurate information cannot provide a valid representation of reality and can limit the effectiveness or worth of decisions based on it.

4) **Timely (Current):** the information must be current as a fact of yesterday may not be a fact of today. For example, the price of banana per kilo today may not be the same with tomorrows. As the stock market is ever changing, current information is really a must. Since information has an objective, there are usually periods within which these objectives operate. Good information neither is produced too frequently nor is it compiled after it is needed most. For instance, information that reaches a decision-maker after the decision is of limited use in the context of the decision-making process.

5) **Economical:** the information used must be of economical use to farmers, different organizations, companies that use them. If the information used is not economical it would result in users making losses. That is why economical information is important.

1.5.1. Information as an aid to decision making

The process of decision making comprises four steps:

- Intelligence
- Design
- Choice and
- Review

The intelligence stage encompasses collection, classification, processing, and presentation of data relating to the organization and its environment. This is necessary to identify situations calling for decision. During the decision stage, the decision maker outlines alternative solutions, each of which involves a set of actions to be taken. The data gathered during the intelligence stage are now used by statistical and other models to forecast possible outcomes for each alternative. Each alternative can also be examined for technological, behavioral, and economic feasibility. In the choice stage, the decision maker must select one of the alternatives that will best contribute to the goals of the organization. Past choices can be subjected to review during implementation and monitoring to enable the manager to learn from mistakes. Information plays an important role in all four stages of the decision process. Figure (1.1) indicates the information requirement at each stage, along with the functions performed at each stage and the feedback loops between stages.
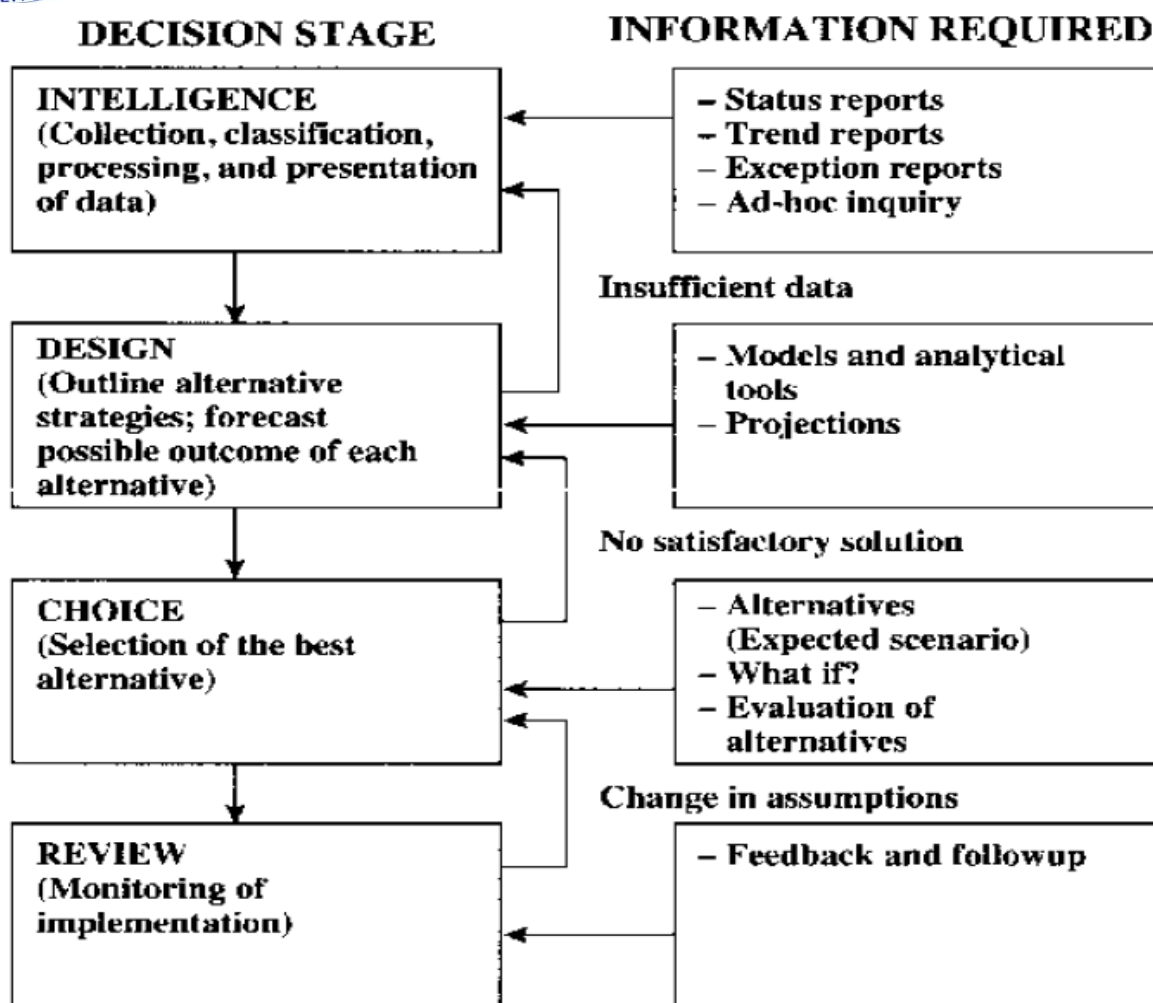
Figure 1.3 Role of information in the decision process.

1.6 Organizing (collecting) information

Ideas expressed in paragraphs, letters, memos, or reports should be organized in some logical, efficient order. Collected data has to be organized in a suitable form to understand the information gathered (organization of data) .

- **Methods of information collection**
- ✓ **Inductive and**
- ✓ **Deductive**

Here are four other possible plans plus additional information on the inductive and deductive methods of organizing information.

- ✓ Chronological
- ✓ Geographical/spatial

✓ Value/size

✓ Simple to complex

I . Chronological

Chronological information presented in time sequence, either forward or backward, is chronological. This organization pattern works well in explaining events over time such as monthly sales figures for the past year. Chronological ordering is also desirable to describe history or development such as background leading to a personnel or management disagreement. Chronological sequencing of ideas is necessary to show time relationships. However, it is overused by individuals who sequence their writing to reflect their thinking about a problem. Whatever was thought about first is written about first. Such organization prevents flexibility in the writing process and ignores the techniques of emphasis. An important thought may be submerged in a pool of chronologically listed ideas.

II. Geographical/Spatial

Within a large business building, custodial services might be assigned according to location—first floor, second floor, and so forth. Another form of geographical organization is illustrated by the division of a business into sales by state, county, or city. Geographical sequencing of ideas is less usable than other methods because of its rigidity; moreover, relatively few topics lend themselves to such organization.

III. Value/Size

The logical order for some topics begins with the most valuable or the largest item first. E.g. A report on entrepreneur, might discuss its largest-volume franchise first, followed in descending order by others. Realtors have found that listing their properties from the most expensive to the least expensive (or vice-versa) is helpful to buyers and sellers. Imagine how frustrating it would be to find properties in the same price range if they were listed chronologically.

Iv. Simple to Complex.

For difficult, technical, or abstract topics, the best plan of organization is often from simple to complex. Good teachers, for example, begin with simple, basic concepts and proceed to more complex topics. More complex ideas can follow the foundation built on simple concepts. Whenever readers or listeners are unfamiliar with a subject or when the topic is theoretical, simple-to-complex organization is effective.

A. Inductive (indirect).

This ways supplies examples, facts, or reasons first and then draws conclusions from them or from specific to general. Inductive organization is useful when readers are uninformed or when resistance or antagonism is expected. For example, a report written to convince management to fund an employee fitness program might begin with the advantages of a fitness program: improved job satisfaction, reduced absenteeism and turnover, improved productivity, and lower health care costs. After describing the benefits, the report writer could draw the conclusion that a company-sponsored fitness program is a wise investment. Starting with the main idea first risks the chance that readers opposed to the idea will read no further. Persuasive memos, letters, and reports often follow the indirect plan.

B . Deductive (direct)

This organizational plan presents the main idea or conclusions and recommendations first. Examples, reasons, and clarification follow or from general to specific. Most business writing is deductive because this method presents information clearly and openly. Use this plan for routine messages, such as those that convey favorable or neutral information. For example, to inform students of campus parking regulations, a straightforward announcement should be made. But if students must be persuaded to pay an extra fee for parking in preferred locations, a letter describing the proposal might be written inductively with the assessing the spatial distribution of crop production using a generalized cross-entropy approach .

Examples of enterprise requirements include; quality assurance and/or procedures manuals**,** biosecurity requirements**,** animal welfare, procedures for updating records, OHS policies, procedures and programs, production plans systems, and processes, and defined resource parameters.

Self-check 1	Written test

Name……………………………………… ID……………………… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Short Answer Questions

1. List the four steps of decision process making?(2pts)

2. List the sources of information (Knowledge**)**?(2pts)

Test II: Write true if the statement is correct and false if statement is incorrect

1. For difficult, technical, or abstract topics, the best plan of organization is often from simple to complex. (2pts)

2. Ideas expressed in paragraphs, letters, memos, or reports should be organized in some logical, efficient order.?(2pts)

Note: **Satisfactory rating - 8 points   Unsatisfactory - below 8 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Name: _____   Date: _____

Score = _____

Rating: _____

Test I

1._____

2._____

Test II

1._____

2._____

Information Sheet 2- Assessing information

2.1. Introduction

Information has received a wide range of acceptance as an essential resource of this century. It has been described as a simulating creativity, resulting in new outcomes and processes. All human societies depend very much on information for existence that is information is life. The proper identification and use of information sources are prerequisites for objective decision making. Consequently, the possession of awareness and use of appropriate information guarantee individual and organizational functioning. The major function of information is to increase the knowledge of the user, to reduce his level of uncertainty or reduce the varieties of choices available to the users of information. For information to be effective, it must be accurate, timely and relevant.

Information is also an essential resource for individual growth and survival. An informed mind is an enriched mind and if one is not informed he will be deformed. Information is a common term. It is often in the mouth of people, attracting diverse and ambivalent meanings and interpretations. Anything human beings interact with or observe can be a source of information.

The information source is a medium in which knowledge and/or information is stored. In other words, it is understood as something that contains and/or stores information. Sources of information are tools that can possibly meet the information needs of different categories of users. They are the information carriers. There are different sources of information but what matters are 'what' sources are available and relevant to the different categories of users and what sources of information are useful for their different seeking behaviour, and mainly for utilization in order to accomplish tasks/needs.

2.2. Information sources

These are various means by which information is recorded for use by an individual and organization. Sources of information are: radio, television, extension workers, cooperative societies, friends and colleagues, newspapers and magazines, books/leaflets, phones, libraries and institutes. Also, observation of people organizations, speeches, documents, picture and art work can also be described as information sources. Information services are the activities performed to facilitate any stage of the life cycle of information. The life cycle includes the creation, organization, use and disuse. Information services can be defined as services which provide (serves) data, knowledge, and information that are of interest to users. The interaction is that an information service collects (retrieves), manages (structures) and stores data.

Productivity is measured as the ratio of agricultural input to output however; individual products are measured by weight and their densities. Measuring overall agricultural output are difficult because the output is usually measured as market value of final product; which excludes intermediate materials that goes to production such as corn feed used in the meat industry. Agricultural productivity may also be measured by what is termed total factor productivity (TFP). This method of calculating agricultural productivity compares an index of agricultural input to an index of output. Productivity therefore measures changes in efficiency with which input is transformed into output. The indices for measuring are land, input hire, labourer energy input agricultural chemical input, pesticides consumption, fertilizer and capital.

Self-Check – 2	Written test

Name……………………………………… ID………………………… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Short Answer Questions

1. List the importance of assessing information held by the production unit? (5 points.)
2. What are the soiurces of information?(5 points)

Note: **Satisfactory rating - 10 points**   **Unsatisfactory - below 10 points**

You can ask you teacher for the copy of the correct answers.

Score = _____

Rating: _____

Answer sheet

1._____

2._____

Information Sheet 3- Identifying methods of collecting data

3.1. Introduction

Every process improvement effort relies on data to provide a factual basis for making decisions. Data collection enables a team to formulate and test working assumptions about a process and develop information that will lead to the improvement of the key quality characteristics of the product or service. Data collection improves your decision-making by helping you focus on objective information about what is happening in the process, rather than subjective opinions. The purpose of collecting will determine which data have to be analyzed, interpret and presented.

3.2 Methods of collecting production data

The researcher should clearly identify and indicate on what specific key variables data are required, the method(s) of measurement and the unit of measurement. The selection of the variables should depend on what is to be done in the study. The researcher should also pay due attention to the nature of data (quantitative and /or qualitative), the kinds of data (secondary and /or primary) data, the sources of data and how to collect the data. The choice of methods of data collection is largely based on the efficiency and accuracy with which the information will be collected and its practicability of the methods or techniques to the respondents.

- **Nature of data**

A. Quantitative data; when the variables being studied in a numerical form and it can be ranked or ordered. So it said to be quantitative data.

Example ; height , body temperature , money , age weights ,numbers of students in the class ,distance from Addis to Holeta.

Quantitative data collection methods :rely on random sampling and structured data collection instruments that fit diverse experiences into predetermined response categories. They produce results that are easy to summarize, compare, and generalize.

Quantitative research is concerned with testing hypotheses derived from theory and/or being able to estimate the size of a phenomenon of interest. Depending on the research question, participants may be randomly assigned to different treatments. If this is not feasible, the researcher may collect data on participant and situational characteristics in

order to statistically control for their influence on the dependent, or outcome, variable. If the intent is to generalize from the research participants to a larger population, the researcher will employ probability sampling to select participants.

Typical quantitative data gathering strategies include:

- ✓ Experiments/clinical trials.
- ✓ Observing and recording well-defined events (e.g., counting the number of patients waiting in emergency at specified times of the day).
- ✓ Obtaining relevant data from management information systems.
- ✓ Administer surveys with closed-ended questions (e.g., face-to face and telephone interviews, questionnaires etc).

I. Interviews

In quantitative research (survey research); interviews are more structured than in qualitative research. In a structured interview, the researcher asks a standard set of questions and nothing more and uses different types of Interviews. These are the followings:

a) Face -to -face interviews has a distinct advantage of enabling the researcher to establish rapport with potential participants and therefore gain their cooperation. These interviews yield highest response rates in survey research. They also allow the researcher to clarify ambiguous answers and when appropriate, seek follow-up information. Disadvantages include impractical when large samples are involved time consuming and expensive.

b) Telephone interviews are less time consuming and less expensive and the researcher has ready access to anyone on the planet that has a telephone. Disadvantages are that the response rate is not as high as the face-to- face interview as but considerably higher than the mailed questionnaire. The sample may be biased to the extent that people without phones are part of the population about whom the researcher wants to draw inferences.

c) Computer Assisted Personal Interviewing (CAPI): is a form of personal interviewing, but instead of completing a questionnaire, the interviewer brings along a laptop or hand-held computer to enter the information directly into the database. This method saves time involved in processing the data, as well as saving the interviewer

from carrying around hundreds of questionnaires. However, this type of data collection method can be expensive to set up and requires that interviewers have computer and typing skills.

II. Questionnaires

a). Paper-pencil-questionnaires can be sent to a large number of people and saves the researcher time and money. People are more truthful while responding to the questionnaires regarding controversial issues in particular due to the fact that their responses are anonymous. But they also have drawbacks. Majority of the people who receive questionnaires don't return them and those who do might not be representative of the originally selected sample.

b). Web based questionnaires: A new and inevitably growing methodology is the use of internet based research. This would mean receiving an e-mail on which you would click on an address that would take you to a secure web-site to fill in a questionnaire. This type of research is often quicker and less detailed. Some disadvantages of this method include the exclusion of people who do not have a computer or are unable to access a computer. Also the validity of such surveys is in question as people might be in a hurry to complete it and so might not give accurate responses.

Questionnaires often make use of checklist and rating scales. These devices help simplify and quantify people's behaviors and attitudes. A checklist is a list of behaviors, characteristics, or other entities that researcher is looking for. Either the researcher or survey participant simply checks whether each item on the list is observed, present or true or vice versa. A rating scale is more useful when a behavior needs to be evaluated on a continuum.

B. Qualitative data: When variables being studied in a non numeric form it is called qualitative data. Examples -color , religious preferences , sex and ,etc

Qualitative data collection methods play an important role in impact evaluation by providing information useful to understand the processes behind observed results and assess changes in people's perceptions of their well-being. Furthermore qualitative methods can be used to improve the quality of survey-based quantitative evaluations by

helping generate evaluation hypothesis; strengthening the design of survey questionnaires and expanding or clarifying quantitative evaluation findings.

These methods are characterized by the following attributes:

- ✓ They tend to be open-ended and have less structured protocols (i.e., researchers may change the data collection strategy by adding, refining, or dropping techniques or informants)
- ✓ They rely more heavily on interactive interviews; respondents may be interviewed several times to follow up on a particular issue, clarify concepts or check the reliability of data
- ✓ They use triangulation to increase the credibility of their findings (i.e., researchers rely on multiple data collection methods to check the authenticity of their results)
- ✓ Generally their findings are not generalization to any specific population, rather each case study produces a single piece of evidence that can be used to seek general patterns among different studies of the same issue.

Regardless of the kinds of data involved, data collection in a qualitative study takes a great deal of time.The researcher needs to record any potentially useful data thouroughly,accurately and systematically using field notes, sketches, audiotapes, photographs and other suitable means. The data collection methods must observe the ethical principles of research.The qualitative methods most commonly used in evaluation can be classified in three broad categories:

1. In-depth interview- is a technique designed to elicit a vivid picture of the participant's perspective on the research topic. During in –depth interviews the person being interviewed is considered the expert and the interviewer is considered as the student. Researchers engage with participants by posing questions in a neutral manner, listening attentively to participants' responses, and asking follow –up questions and probes based on those responses. In- depth interviews are usually conducting face- to face and involve one interviewer and one participant. In- depth interviews are useful for learning about the perspectives of individuals, as opposed to, for example, group norms of a community, for which focus groups are more appropriate. They are an effective qualitative method for getting people to talk about their personal feelings, opinions, and experiences. They are also an opportunity for us to gain insight into how people interpret and order the world.

2. **Observation methods** –is a fundamental and highly important method in all qualitative inquiry. Observation entails the systemic nothing and recording of events, behaviors and artifacts (objects) in the social setting chosen for study. The observation record is frequently referred to as field notes-detailed, nonjudgmental, concrete descriptions of what has been observed.

3. Document review :documentation (to document) - is the term used in several different ways. Generally, it refers to the process of providing evidence. Documentation include;

- Written information for any read, projection or technical performing,
- Data media of any format and for any reproduction,
- Other content.

Different ways of collecting evaluation data are useful for different purposes, and each has advantages and disadvantages. Various factors will influence your choice of a data collection method: the questions you want to investigate, resources available to you, your timeline, and more.

Self-Check – 3	Written test

Name……………………………………………… ID……………………… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Short Answer Questions

1. Why do we need to collect data?(3pts)

2. List different types of interviews?(2pts)

Test II: write true when the statement is correct and false when incorrect

1. In Quantitative research (survey research); interviews are more structured than in Qualitative research.(2pts)

2. When variables being studied in a non numeric form it is called qualitative data.(2pts)

Note: **Satisfactory rating - 9 points**   **Unsatisfactory - below 9 points**

You can ask you teacher for the copy of the correct answers.

Score = _____

Rating: _____

Answer sheet

Test I

1._____

2._____

Test II

1._____

2._____

Information Sheet 4- Using business equipment

4.1. Applications of artificial intelligence in agriculture

The industry is turning to Artificial Intelligence technologies to help yield healthier crops, control pests, monitor soil, and growing conditions, organize data for farmers, help with the workload, and improve a wide range of agriculture-related tasks in the entire food supply chain.

- **Use of weather forecasting:** with the change in climatic condition and increasing pollution it's difficult for farmers to determine the right time for sowing seed, with help of Artificial Intelligence farmers can analyze weather conditions by using weather forecasting which helps they plan the type of crop can be grown and when should seeds be sown.

- **Soil and crop health monitoring system**: the type of soil and nutrition of soil plays an important factor in the type of crop is grown and the quality of the crop.

Due to increasing, deforestation soil quality is degrading and it's hard to determine the quality of the soil.

✓ A German-based tech start-up PEAT has developed an AI-based application called Plantix that can identify the nutrient deficiencies in soil including plant pests and diseases by which farmers can also get an idea to use fertilizer which helps to improve harvest quality. This app uses image recognition-based technology. The farmer can capture images of plants using smart phones. We can also see soil restoration techniques with tips and other solutions through short videos on this application.

✓ Similarly, trace Genomics is another machine learning-based company that helps farmers to do a soil analysis to farmers. Such type of app helps farmers to monitor soil and crop's health conditions and produce healthy crops with a higher level of productivity.

✓ **Analyzing crop health by drones:** sky squrrel technologies has brought drone-based Ariel imaging solutions for monitoring crop health. In this technique, the drone captures data from fields and then data is transferred via a USB drive from the drone to a computer and analyzed by experts.

This company uses algorithms to analyze the captured images and provide a detailed report containing the current health of the farm. It helps the farmer to identify pests and bacteria helping farmers to timely use of pest control and other methods to take required action

- **Precision farming and predictive analytics:** AI applications in agriculture have developed applications and tools which help farmers inaccurate and controlled farming by providing them proper guidance to farmers about water management, crop rotation, timely harvesting, type of crop to be grown, optimum planting, pest attacks, nutrition management.

While using the machine learning algorithms in connection with images captured by satellites and drones, AI-enabled technologies predict weather conditions, analyze crop sustainability and evaluate farms for the presence of diseases or pests and poor plant nutrition on farms with data like temperature, precipitation, wind speed, and solar radiation.

Farmers without connectivity can get AI benefits right now, with tools as simple as an SMS-enabled phone and the sowing app. Meanwhile, farmers with Wi-Fi access can use AI applications to get a continually AI-customized plan for their lands. With such IoT(Internet of Things)- and AI-driven solutions, farmers can meet the world's needs for increased food sustainably growing production and revenues without depleting precious natural resources.

In the future, AI will help farmers evolve into agricultural technologists, using data to optimize yields down to individual rows of plants

- **Agricultural Robotics:** AI companies are developing robots that can easily perform multiple tasks in farming fields. This type of robot is trained to control weeds and harvest crops at a faster pace with higher volumes compared to humans.

These types of robots are trained to check the quality of crops and detect weed with picking and packing of crops at the same time. These robots are also capable to fight with challenges faced by agricultural force labor.

- **AI-enabled system to detect pests:** Pests are one of the worst enemies of the farmers which damages crops.

AI systems use satellite images and compare them with historical data using AI algorithms and detect that if any insect has landed and which type of insect has landed like the locust, grasshopper, etc. And send alerts to farmers to their smartphones so that farmers can take required precautions and use required pest control thus AI helps farmers to fight against pests.

Artificial Intelligence in agriculture not only helping farmers to automate their farming but also shifts to precise cultivation for higher crop yield and better quality while using fewer resources.

Companies involved in improving machine learning or Artificial Intelligence-based products or services like training data for agriculture, drone, and automated machine making will get technological advancement in the future will provide more useful applications to this sector helping the world deal with food production issues for the growing population.

4.2. Business equipments

Equipments used to access , organize and monitor data in accordance with organizational requirements include Photocopier, computer (including handheld electronic loggers), email, internet, software programs, answering machine, fax machine, telephone and radio communication systems.

Figure :4.1. Example of combine that retrieves data through sensors and camera (Source: John Deere Investor Presentation August 2019)

Figure : 4.2. JD Mobile Connect monitors job quality when planting, spraying, and harvesting (Source: Deere.com)

Figure 4.3. Maps showing machine field coverage reduces over-application of inputs, leading to lower input costs (Source: Deere.com)

4.3. Business equipment insurance

Business equipment insurance will cover the equipment and tools you use for your business against damage, loss, destruction or theft. Firms that have to leave equipment on work sites are particularly vulnerable to theft and vandalism, so it is reassuring to know that equipment under these circumstances could be replaced and paid for by your insurer.

Name………………………………………… ID………………………… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Short Answer Questions

1. What are the importance of AI application in agriculture?(3 points)

2. What does business equipment insurance cover?(2pts)

3. What are business equipments? (5pts)

Note: **Satisfactory rating - 10 points   Unsatisfactory - below 10 points**

You can ask you teacher for the copy of the correct answers.

Score = _____

Rating: _____

Answer sheet

1._____

2._____

3._____

5.1. Introduction

Most database maintenance requires running the commands. You can also display information from a command.

For example

- Upgrade the data store
- Move the data in the data store to a different database server
- Migrate the data store from a microsoft access database to a microsoft server database
- Change the name of the file

With the exception of microsoft access connects to the data store, although some affect the data store. Citrix strongly recommends creating a backup copy of the data store. Without a backup, you must manually recreate all of the farm policies, settings, accounts, and other persistent data in the data store. If the data store fails, each farm server can run off the data in its local host cache indefinitely (provided it can contact the license server). However, you cannot make any modifications to the farm or use the Access Management Console or Advanced Configuration tool. To restore a backup database or migrate to a new server, use the migrate command. Setup to configure the data store. If you use the same name as the previous data store, you do not need to reconfigure the farm servers.

5.2. Updating information

Updating means making sure the information is the latest, most current version. Updating may include: placing the latest issue of a newsletter on the top of the newsletter file adding the name of a new staff member to a staff list changing the answering machine message to include new opening hours adding the latest specials to the price list and order form adding the latest sales figures to the sales target chart.

There may be serious consequences if the information an organisation uses is not current. For example, a new customer may be annoyed if they are not sent a catalogue and newsletter because their name has not been added tothe customer database. Or,

the sales team may be working towards an incorrect target if updated sales figures are not regularly forwarded to them.

If you receive more current information after you have already sent information to someone, make sure you also send the current information as soon as possible. For example, you may have found information on the Internet and sent it to your supervisor for a report they were preparing for management and, in the meantime, you were given more up-to-date information from a colleague.Your colleagues will expect the latest version of journals and other documents to be available, so make sure these are regularly filed in the library or filing system. Remember to include these regular tasks on your work plan, otherwise it is easy to forget them or leave them to the last moment.

5.3. Modifying information

Modifying means changing or altering information. It may involve reformatting, changing the content, adding information, deleting or moving information. You may need to modify information when existing information is no longer useful or needs to be used for a new purpose. Modifying may include:using an existing flyer as a template, and changing the text to advertise a new product adding headings, page breaks and pictures toa draft report removing all of last year's meeting minutes from the meeting minutes file changing a customer's address in the customer database.

5.4. Storing information

When you process information, you may be required to catalogue items in the filing system after you have collected, updated or modified them. You'll need to know: what information to keep the legal requirements of keeping the information your organisation's filing procedures the security issues surrounding the information.

5.5. Maintaining information systems for a business to function smoothly, it must maintain and keep its records and other information up to date. Any information that is collected and processed within an organisation must be accessible when it is required. This makes it easier for the organisation to make decisions, and ensures it is projecting a professional image. Customers will be confident that the organisation carries out its activities with confidence and efficiency.A poorly managed information-handling system hinders an organisation. It leads to inefficiency, mistakes and poor quality work, and can mean loss of business. For example: an out-of-date address list means that customers may not be contactable, and the organisation may lose business and waste money sending material to wrong addresses a disorganised filing system means time is wasted

looking for information thatshould be easy to find a disorganised filing system in which essential information is lost could have disastrous consequences for an organisation.

Self-Check – 5	Written test

Name……………………………………… ID……………………… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Write true if the statement is correct and false if its incorrect

1. If the data store fails, each farm server can run off the data in its Local Host Cache indefinitely (provided it can contact the license server).(2pts)

2. To restore a backup database or migrate to a new server, use the migrate command. (2pts)

Note: **Satisfactory rating - 4 points   Unsatisfactory - below 4 points**

You can ask you teacher for the copy of the correct answers.

Score = _____
Rating: _____

Answer sheet

1._____

2._____

Operation Sheet 1– Collecting and recording crop production data

Objectives; The learner will be understanding the way (methods) of collecting production data in crop production for the future with required knowledge and skill.

- Required tools and equipment
- ✓ PPE
- ✓ Pen/pencil
- ✓ Note/record book
- ✓ Sample bags
- Procedure of collecting production data

Step 1 Observe field/ site preparation

Step 2 Record the nursery or cultivation site agro-climate, topography and soil condition

Observe and record

- ✓ Growing media condition (organic or inorganic)
- ✓ Varieties selection (appearance, color, condition)
- ✓ Sowing or planting date
- ✓ Germination date
- ✓ Transplanting
- ✓ Planting date of seedlings
- ✓ Fertilization (organic or inorganic)
- ✓ Pest management (organic, biological, physical, chemical, ipm)
- ✓ Harvesting
- ✓ post-production operations

No	Crop type	Variety	Sowing date	Germination date	Transplanting date	Planting date	Fertilization	Irrigation technique	Harvesting time	Pests / diseases encountered		
										Insect	Fungi	
										insect type & its treatment	fungi type & its treatment	Quantityl ost
1		X	X		X	X	X	N		X	X	

LAP TEST	Performance Test

Name……………………………… ID…………… Date………………………………

Time started: _____ Time finished: _____

Instructions: Given necessary information, work site, tools and materials you are required to perform the following tasks within 4: hour.

Task: Perform crop production data collecting and recording

Instruction sheet-2

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

- Defining objectives of analysis

- Identifying methods of data analysis

- Justifying assumptions used in analyses

- Supporting conclusions

- Documenting processed data

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**:

- Define objectives of analysis

- Identify methods of data analysis

- Justify assumptions used in analyses

- Support conclusions

- Document processed data

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". Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them.

4. Accomplish the "Self-checks" which are placed following all information sheets.

5. Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks).

Information Sheet 1- Defining objectives of analysis

1.1. Data analytics

Data analytics is the science of analyzing raw data to make conclusions about that information. Many of the techniques and processes of data analytics have been automated into mechanical processes and algorithms(set of instructions) that work over raw data for human consumption. Data analytics is a broad term that encompasses many diverse types of data analysis. Any type of information can be subjected to data analytics techniques to get insight that can be used to improve things. Data analytics techniques can reveal trends and metrics that would otherwise be lost in the mass of information. This information can then be used to optimize processes to increase the overall efficiency of a business or system.

Data analytics is important because it helps businesses optimize their performances. Implementing it into the business model means companies can help reduce costs by identifying more efficient ways of doing business and by storing large amounts of data. A company can also use data analytics to make better business decisions and help analyze customer trends and satisfaction, which can lead to new—and better—products and services.

1.2. Objectives of production data analysis

- The objectives of data analysis
    - ✓ to determine a model that best describes the experimental results
    - ✓ to take all variables into account in a model
    - ✓ Obtaining information on the variables for the entire population may not be possible
- **Interpretation of data:** based on analyzed data conclusion have to be drawn, that conclusion is called interpretation.

1.3. Data analysis steps

The process involved in data analysis involves several different steps:

1. The first step is to determine the data requirements or how the data is grouped. Data may be separated by age, demographic, income, or gender. Data values may be numerical or be divided by category.

2. The second step in data analytics is the process of collecting it. This can be done through a variety of sources such as computers, online sources, cameras, environmental sources, or through personnel.

3. Once the data is collected, it must be organized so it can be analyzed. This may take place on a spreadsheet or other form of software that can take statistical data.

4. The data is then cleaned up before analysis. This means it is scrubbed and checked to ensure there is no duplication or error, and that it is not incomplete. This step helps correct any errors before it goes on to a data analyst to be analyzed.

1.4. Types of data analytics

Data analytics is broken down into four basic types.

1. **Descriptive analytics:** This describes what has happened over a given period of time. Have the number of views gone up? Are sales stronger this month than last?

2. **Diagnostic analytics:** This focuses more on why something happened. This involves more diverse data inputs and a bit of hypothesizing. Did the weather affect beer sales? Did that latest marketing campaign impact sales?

3. **Predictive analytics:** This moves to what is likely going to happen in the near term. What happened to sales the last time we had a hot summer? How many weather models predict a hot summer this year?

4. **Prescriptive analytics:** This suggests a course of action. If the likelihood of a hot summer is measured as an average of these five weather models is above 58%, we should add an evening shift to the brewery and rent an additional tank to increase output.

Data analytics underpins many quality control systems in the financial world, including the ever-popular Six sigma program. If you aren't properly measuring something—whether it's your weight or the number of defects per million in a production line—it is nearly impossible to optimize it.

The term six sigma refers to a set of quality-control tools that businesses can use to eliminate defects and improve processes to help boost their profits.

Self-Check – 1	Written test

Name…………………………………………… ID………………………… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Short Answer Questions

1. Difine analysis of data?(3 points)
2. What are Objectives? (3 points)
3. What are the steps of data analysis ?(4 points)
4. Mention the types of data analysis(5 points)

Note: Satisfactory rating - 15 points   Unsatisfactory – below 15 points

You can ask you teacher for the copy of the correct answers.

Score = _____

Rating: _____

Answer sheet

1._____

2. _____

3._____

4._____

Information Sheet 2- Identifying methods of data analysis

2.1 Introduction

Quantitative research techniques generate a mass of numbers that need to be summarized, described and analyzed. Further analysis would build on findings, seeking patters and relationships in the data performing multiple regressions or analysis of variance perhaps.

- Stages of analyzing qualitative data
- ✓ Familiarization with the data through review, reading, listening ,etc
- ✓ Organization and indexing of data for easy retrieval and identification
- ✓ Coding (may be called indexing)
- ✓ Development of provision categories
- ✓ Report writing ,including excerpts from original
- **Stages in analysis**

1. Transcription–almost all qualitative research studies involves some degree of transcription the data may be tape recorded interviews, focus groups, video recordings or hand written field notes. It is not appropriate, usually to write up summery notes from a tape recording.

2. Organizing your data- after transcription, it is necessary to organize your data into easily retrievable sections. You may wish to give each interview a number or code or to break up field notes into sections identified by date, or by context.

3. Familiarization- by this we mean the researcher listening to tapes and watching video material, reading and re-reading the data, making memos and summaries before the formal analysis begins. It is important if the main researcher has not gathered all the data themselves.

4. Coding-this process of deciding how to conceptually decided up raw data. These sections contain data which the researcher is interested in the exploring and analyzing further.

5. Themes (categories) - a theme is generated when similar issues and ideas expressed by participants with in data are brought together by the researcher into a single categories or cluster.

Both qualitative and quantitative data analyzed –

- **Qualitative data** analyzed by description, interpretation , tabulation, figure and map.

- **Quantitative data** analyzed by simple statistical methods such as percentages , averages, means, mode and etc.

Name……………………………………… ID………………………… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Short Answer Questions

1. List the stage of analysis of qualitative data?(3pts)

2. Difine qualitative and quantitative data? (3pts)

Note: Satisfactory rating - 6 points   Unsatisfactory - 6 points

You can ask you teacher for the copy of the correct answers.

Score = _____

Rating: _____

Answer sheet
1._____
2. _____

3.1. Parametric and non-parametric tests

Numerical data (quantitative variables) that are normally distributed are analysed with parametric tests.Two most basic prerequisites for parametric statistical analysis are:

• The assumption of normality which specifies that the means of the sample group are normally distributed

• The assumption of equal variance which specifies that the variances of the samples and of their corresponding population are equal. However, if the distribution of the sample is skewed towards one side or the distribution is unknown due to the small sample size, non-parametric statistical techniques are used.

Non-parametric tests are used to analyse ordinal and categorical data.

Parametric tests :the parametric tests assume that the data are on a quantitative (numerical) scale, with a normal distribution of the underlying population. The samples have the same variance (homogeneity of variances). The samples are randomly drawn from the population, and the observations within a group are independent of each other. The commonly used parametric tests are the Student's t-test, analysis of variance (ANOVA) and repeated measures ANOVA

In statistical analysis, all parametric tests assume some certain characteristic about the data, also known as assumptions. Violation of these assumptions changes the conclusion of the research and interpretation of the results. Therefore all research, whether for a journal article, thesis, or dissertation, must follow these assumptions for accurate interpretation Depending on the parametric analysis, the assumptions vary.

The following are the data assumptions commonly found in statistical research:

- **Assumptions of normality:** Most of the parametric tests require that the assumption of normality be met. Normality means that the distribution of the test is normally distributed (or bell-shaped) with 0 mean, with 1 standard deviation and a symmetric bell shaped curve.
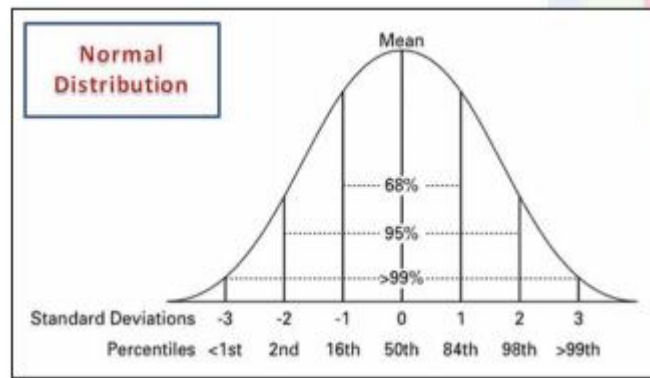
Figure 3.1. Normal distribution curve

To test the assumption of normality, the following measures and tests can be applied:

- ✓ **Skewness and Kurtosis:** To test the assumption of normal distribution, Skewness should be within the range ±2. Kurtosis values should be within range of ±7
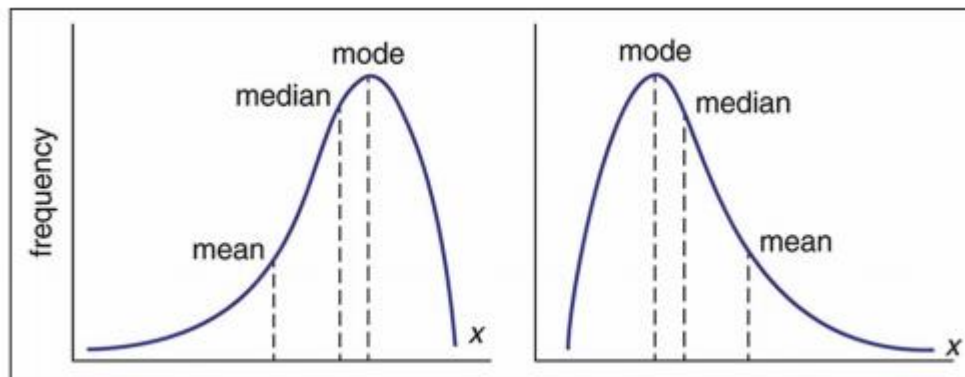
Figure 3.2.Curves showing negatively skewed and positively skewed distribution

- ✓ **Shapiro-Wilk's W test:** Most of the researchers use this test to test the assumption of normality. Wilk's test should not be significant to meet the assumption of normality.

- ✓ **Kolmogorov-Smirnov test:** In the case of a large sample, most researchers use K-S test to test the assumption of normality. This test should not be significant to meet the assumption of normality.

For example A t-test is a statistic method used to determine if there is a significant difference between the means of two groups based on a sample of data.

- The test relies on a set of assumptions for it to be interpreted properly and with validity.
- Among these assumptions, the data must be randomly sampled from the population of interest and the data variables must follow a normal distribution.

Self-Check – 3	Written test

Name…………………………………… ID………………………… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Short Answer Questions

1. What is Assumptions?(3)

Note: Satisfactory rating - 3 points   Unsatisfactory – below 3 points

You can ask you teacher for the copy of the correct answers.

Score = _____

Rating: _____

Answer sheet
1._____

Information Sheet 4- Supporting conclusions

4.1. Introduction

Assumption testing helps you to ensure that you are not drawing false conclusions from your analysis. As you develop your results chapter you will be tasked with numerous steps to develop a solid, scholarly dissertation. Testing your assumptions is just one of those steps. Hopefully this helps underscore the value of assumption testing and helps you proceed smoothly through your dissertation journey.

Good production data should satisfy the criteria of:-

- They should serve a definite purpose

- Be easy to complete

- Be up to date

So that any action needed can be taken as early as possible

Evidences and comments of findings

 The evidence guide provides advice assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and assessment for business objectives. Business equipment and technology can be used to process information efficiently and appropriately. You must try to select themost appropriate equipment for the task. Be aware of and follow your organisation's policies and procedures relating to processing information. Confidential information must be handled according to organisational guidelines. This might mean that files should not be takenout of the office, must not be copied, must not be made public or that a special password is required for access. Keeping to time lines is crucial. Use planning tools to organise your workload and keep on track. Make sure the information you receive and deliver is the latest, most current version. You may need to modify information on a regular basis to ensure it is accurate. This may involve reformatting, changing the content, adding information, deleting or moving information. You need to know the legal requirements for retaining certain information. Information must be filed according to organisational requirements. This means using the organisation's electronic or paper-based filing systems correctly.Information may need to be prepared before distribution. This might mean collating and binding a document.

Dispatch information according to requirements.You might use mail, telephone, email, hand-delivery, fax or a courier. Keep notes on the procedures for handling different types of information in your workplace. You need to know how to handle each type of information, how to file it, who to advise and where to record it.

Name………………………………………… ID………………………… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Short Answer Questions

Write the criteria of good production data?(2)

Test II:Write true if the statement is correct and false if the statement is incorrect

1. Assumption testing helps you to ensure that you are not drawing false conclusions.(1pts)

Note: Satisfactory rating - 3 points   Unsatisfactory - below 3 points

You can ask you teacher for the copy of the correct answers.

Score = _____

Rating: _____

 Answer sheet

Test I

1._____

Test II

1._____

2._____

3._____

5.1.Benefits of documenting data in farm management

Descriptive documentation of a farmer's data is essential for identifying, finding, accessing, and using the data in the future. Documentation is not only important for other researchers who may use the data, but also for the farmer. Data documentation helps in remembering the details of your project that may otherwise be forgotten with time. Data documentation is easier and much less time consuming if it is performed at each stage of the process instead of waiting until the end.

Often, farmers use data to make most of their informed decisions. For instance, soil fertility data is used to know more about the type of soil and the need for fertilizer application. The use of farming data recording techniques is refinement to the existing fertilizer application. Big Data is the trending data collection; management and analysis tool which help farmers achieve productivity, efficiency and profitability. Big Data is a collection of data sets which can be analyzed and offer and create sensible and meaningful information to farmers.

From experts' point of view, there are many sources where farmers can capture data. These are; from the seeding, soil, scouting, weather, harvest, marketing, emergence and so forth. What are the advantages of recording data? The assumption is always that more and precise data improve information efficiency, profitability and productivity, which will eventually result to good competition. Data can is essential in building knowledge base for a farmer, and knowledge is power.

Data recording can be used in making decisions such as which crops to plant and when and where. Combining this recorded information with the soil moisture data, can help in varying the amount of fertilizer to be used in different parts of the farm or a field. The cumulative big data recorded will also inform the farmer to plant a certain type of seed in some section of the field and a different one in another corner for optimum yield.

Data collection and recording is a modern way of smart farming. It emphasizes the use of information technology in the cyber-physical farm management cycle. The large

volumes of different data captured, can be analyzed and used for decision-making. This provides predictive insights in the farming operations, design farming processes, and redefining business process. According to research, it was suggested that farm data is already causing major shifts among different players in food production and supply chain networks.

During harvest seasons, modern yield monitor captures yields several times every minute. The sensors for harvesting tools can generate millions of megabytes per acre. If farmers can utilize these data, it could result to great efficiency and profitability. On large farms, Big Data can test different types of fertilizers and variety of seeds across hundreds of land fields, climates and soil. This data could be used to develop better field-specific recommendations to farmers based on different productivity zones.

At times, farmers may not be able to analyze the data by themselves, especially if it's a big data set. Advance tools may be required for deeper analyses, which will the result to extraction of sensible information. Tools such as Trimble, and Farmers Edge were developed to collect, aggregate and analyze data in real time. It is also worth noting that, new affordable startup firms like Farmers Business Network work with farmers in the US to help them use make their data to use by extracting real value.

- Advantages of keeping good records or case notes
  - ✓ It provides accurate records of the farm's contact with other workers in a farm and aid in continuity in case of change in management between co-workers
  - ✓ It aids jog the memory as over time it can be difficult to recall the specifics of each case
  - ✓ Lend credibility – this particularly helps if one is called to give evidence of a particular fact or matter in farming.
  - ✓ Data documentation add credence to a claim by a farmer
  - ✓ Data documentation largely contributes to crops and animal research. This results to further development in the agricultural industry.
  - ✓ An organized documented data can be also a source of income to the farmer.

5.2. Striking a balance

Ideally one tries to strike a balance when documenting farm's records and only record relevant matters or information. It is important to note that there's nothing lost when keeping data. The good news is that these thoughtful new digital technologies has now made it possible to collect and leverage huge amounts of critical farm data at minimal costs saving farmers their hard earned money; and as such, making a these fields operations more objective-driven, and potentially more productive and efficient. The agricultural industry is already seeing value in data and they have started to invest in the digital technologies such as microscopic data collection, for farmers to be able to produce diagnostics specific to relevant fields or even a single plants.

Name………………………………………… ID………………………… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Short Answer Questions

  1. Why data is documented?(5 points)

Test II:Write true if the statement is correct and false if the statement is incorrect

1.There are many sources where farmers can capture data.(2points)

Note: Satisfactory rating - 7 points   Unsatisfactory - below 7 points

You can ask you teacher for the copy of the correct answers.

Score = _____

Rating: _____

 Answer sheet

Test I

1._____

Test II

1._____

LG #79	LO #3- Present data

Instruction sheet-3

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

- Preparing data

- Clearing and confirming structure and format of reports

- Reporting and distributing findings

- Obtaining feedback and comments on suitability and sufficiency of findings

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:

- Prepare data

- Clear and confirm structure and format of reports

- Report and distribut findings

Obtaining Feedback and comments on suitability and sufficiency of findings

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". Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them.

4. Accomplish the "Self-checks" which are placed following all information sheets.

5. Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks).

1. 1. Data preparation

Data are prepared in an appropriate format, style and structure using different tools of data presentation methods.

1.1.1. Presenting production data

Presentation of data- in graphs and diagrams may also used to give the data a vivid meaning and make the presentation attractive. Data are presented in the tabular or graphical or diagrams form of presentation. Large data will be presented in tables in a very summarized and condensed manner.

Discussion helps to interpret the results of the study in proper perspectives and to relate them with other relevant studies, including the hypothesis rejected and accepted.

A .Tabular method of data presentation

The row data which have been collected and edited will not usually give you sufficient information unless they are put in to a form that will make them eases to understand and interpret.

Consider the following raw data collected from the scores of 40 samples students in a Horticultural crop production examination (in table 3 .1).

Table 1.1. Score of 40 students of exam results

56	78	62	37	54	39	62	60
30	67	72	39	56	78	64	56
42	55	39	54	78	56	62	78
56	55	37	56	47	42	30	37
47	54	42	55	46	46	55	80

We can say about the performance of the 40 sample students unless the above raw data are put into an ordered array in ascending or descending order so that they can be looked at more objectively.

The above data may be set up and tallied like this Ungrouped frequency distribution (see table 1.2 ungrouped frequency distribution.

Table 1.2. Score of 40 students of exam results

Score	(X)tally	Students no (f)
30	II	2
37	III	3
39	III	3
42	III	3
46	II	2
47	II	2
54	III	3
55	#	4
56	#II	6
60	I	1
62	III	3
64	I	1
67	I	1
72	#	4
80	I	1

N=40

X=row scores

F= frequency

N= total number of students

Raw data are better understood if they are summarized in same defines order or sequence.

After having summarized the scores of 40 students you can say more about the performance of the student, the score of the students range from 30 – 80 they rather dispersed the most frequently occurring score is 56.

Definition,

- A table which shows the list of all values obtained in the data and the frequency with which these values occur in the data is called a frequency distributions table.
- A table that grouped data that can be easily visualized is called frequency distributions.

If you had a large number of scores say thousands or more, the bode method of summarizing data would be very lengthy and quality in efficient in cases where we have a very large data, it is necessary to condense them in to as suitable number of groups or classes and then assigning the combined frequencies of these values to their respective classes. For example, the data about the marks of the 40 students can be condensed into five classes as shown bellow.

Table 1.3 Grouped frequency distribution or grouped data

Range of scores	Frequency
30-40	8
41-50	7
51-60	14
61-70	5
71-80	6

N= 40 (Total)

The table used for the arrangement of data into groups of classes, together with the respective class frequencies is called a grouped frequency distribution table (see the above table 3.3)

The grouping of data in a grouped frequency distribution destroys mach of the original detail of the data. For instance, in ungrouped frequency distribution table we know that there is only one student who scored 64. But in grouped frequency distribution table tells us that there is only one student who has scored in the rang 61 – 70 we do not know from grouped frequency distribution whether that single student has scored 61,62,63,64,65,66,67,68,69, or 70 .

Some basic terminologies

- **Class interval (k):-** It used to categories (classify) data into similar characteristics. Stages rules used to determine the class interval(k)

  $K=1+3.322(\log_{10}n)$, where n is the total no of observation. In the above table n=40 then $k=1+3.322(\log10^{40})$

  K=6

  Example: - in table 3.3, the symbol 30 – 40 used to denote the first class is a class interval of 30 – 40.

- **Range:** is the difference between maximum value of data and minimum value collect data.

  In the above table 3.3 **range=maximum value-minimum value**

  <div align="center">

  R=80-30=50

  </div>

- **Width(w),** **w**=range/k =maximum value -minimum value/class interval=50/6=~8

- **Class limits: -** the first and last elements of a given class interval are called class limits. Or by taking the last value of an observation as the lower boundary of the first class and obtain the other by adding the class width.

  Example: - in the interval of 30 – 40, the value 30 and 40 are class limits. 30 is the lower class limit and 40 is the upper class limit of the interval 30 – 40.

- **Class marks (M):-** the middle value of any particular class is referenced to as the class mark or class midpoint. It is the average (mean) of the upper and lower class limits.

  Class mark (M) =   lower class limit + upper class limit

  2

E.g. M (30 – 40) **=** 30 + 40 =35

2

B. Graphical methods of data presentation

Obviously constructing a frequency distribution table is not the end of our work. Rather, it is the beginning. Commonly, the next step is to present the grouped data in charts and graphs so that the reader may easily determine the essential features of a frequency distribution and compare one with another it desired.

Data presentation in charts and graphs

As mentioned above, presenting data in charts and graphs is important it have great memorizing value in that you:

- Has a clear idea about the nature of the data
- Easily understand patterns & trends of grouped data
- Facilitate comparisons between two or more sets of data

The most commonly used charts are: Bar charts and Pie charts. Similarly graphs that are most commonly used are: Histogram, Frequency polygon and Cumulative Frequency Curve. We usually use charts (diagrams) to illustrate data which are discrete while we use graphs to represent data which are of continuous nature. Graphs are simply visual aids for thinking about and discussing statistical problems.

Charts (Diagrams)

I. Bar Charts

It is applicable for discrete variable, i.e. the data given according to time, places, etc.The period of time and place are putting in X-axis and the corresponding frequencies at the Y- axis.

Bars are vertical lines, where the lengths of the bars are proportional to their corresponding frequencies or numerical values. Bar charts are called one-dimensional. This means only the length of the bar (rectangle) is important not the width.

There are three types of bar charts

1. Simple (deviation) bar chart
2. Component bar chart
3. Multiple bar charts

1. Simple(deviation) Bar Chart

When data contained both positive and negative numbers such data like profit, net revenue, present change in deviation, then deviation bar chart is appropriate. Simple bar chart is usually used to illustrate the nature of a single item without considering the components in the item.

Example. Suppose a merchant has the record of net profit (loss) of three commodities in the given period of time below, and then construct deviation bar chart for these records?
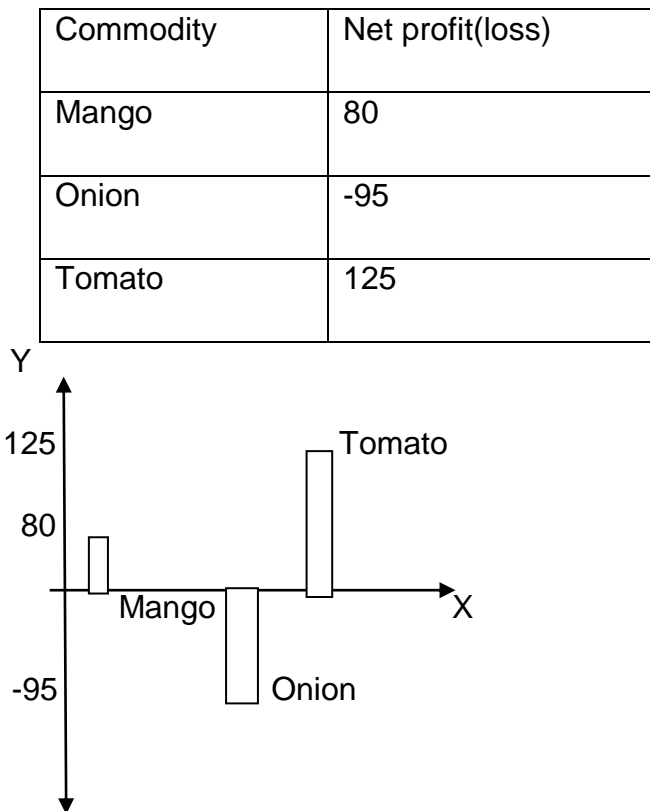
Commodity	Net profit(loss)
Mango	80
Onion	-95
Tomato	125

Figure 1.1 .Deviation bar chart

2. Component bar chart

This is a bar chart which illustrates the component parts of the whole. The rectangles (bars) are subdivided into components depending up on the type of information to be shown in the chart.

Example. Let us decompose the total of the number of peasant by status to further subdivision

N in year.

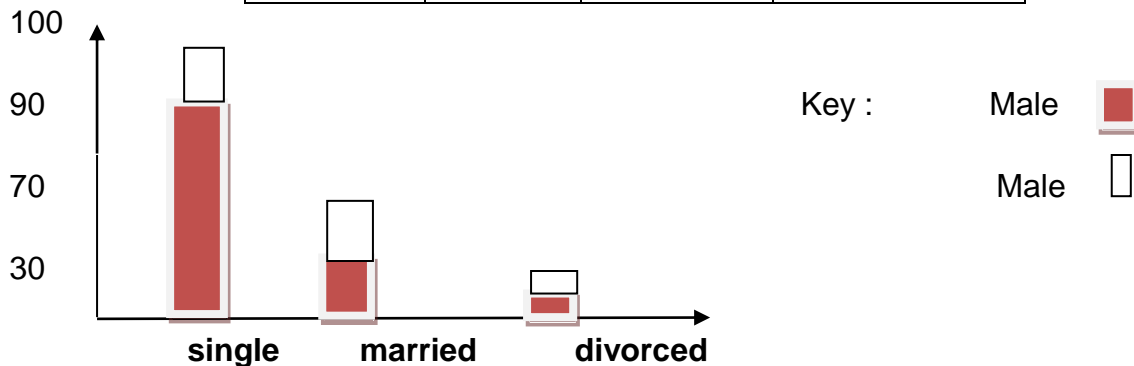| Status	Male	Female	Total
Single	90	10	100
Maried	30	40	70
Divorced	1	29	30

Figure 3.2 Component bar chart

As you may have noted in the component Bar Chart, the two components, shaded red color represents the total numbers of male status and the white un-shaded white is the status of female status subdivision in N year.

3. Multiple Bar Charts

This is a bar chart showing the various components of an item side by side.

Example. The following item of expenditure of two families to different item.

Items of expenditure	Family A	Family B

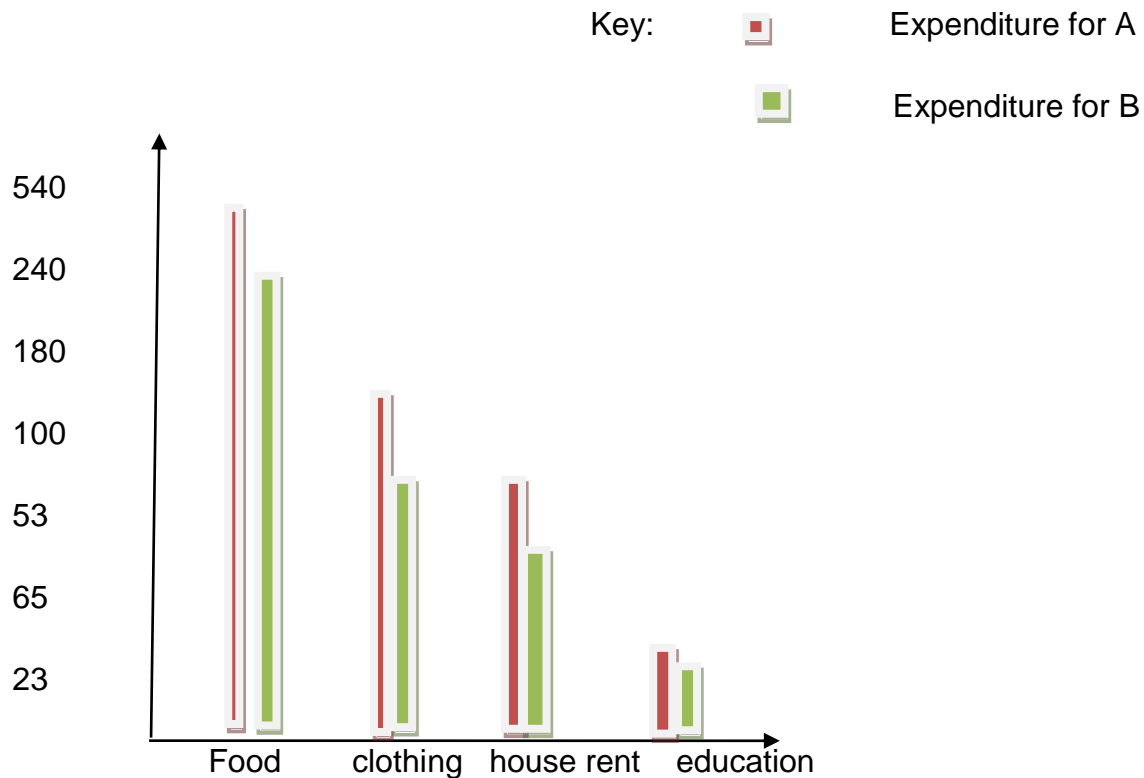|		
Food	540	240
Clothing	180	100
House	100	53
Education	65	23

Key: ▪ Expenditure for A

  ▪ Expenditure for B

Figure 3.3 Multiple bar chart

II. Pie Chart

A pie chart is a circle divided from its center into several component parts to show how the whole is divided up. It is called "pie" because the entire chart looks like a pie and its components resemble slices cut from it. The size of a slice represents the proportion of the component out of the total. A pie chart is a circle divided in components sectors according to the breakup of components given in percentage.

Example of income generated from different sector is given below and then construct a

pie-chart.

Sectors	Income in million(f)	Percentile (%)
Fruit	3200	93.348
Vegetable	28	0.82
Apple seedlings	200	5.84
Total(n)	3428	100%

How to calculate the percentages (**%)** of income generated from each sector

Formula of %=fx100/n   Fruit%= 3200x100/3428=93.48

F=frequency   Vegetable%=28x100/3428=0.82

n=total number   Apple seedling%=200x100/3428=5.834~ 6
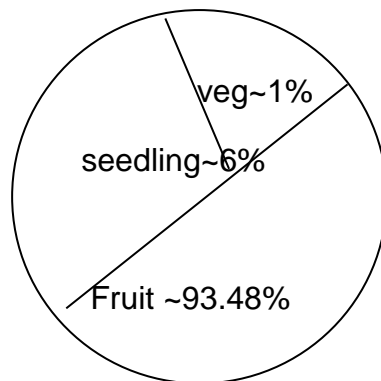
veg~1%

seedling~6%

Fruit ~93.48%

Figure 1.2 Pie Chart

Name……………………………………… ID………………………… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Short answer

2. How data can be prepared?(3 points)

3. List the three types of bar charts?(3 points)

4. Class interval (k)?(2 points)

5. Class marks (M)?(2 points)

Note: Satisfactory rating – 10 points   Unsatisfactory - below 10 points

You can ask you teacher for the copy of the correct answers.

Score = _____

Rating: _____

Answer Sheet

Name: _____   Date: _____
1. _____
2. _____
3. _____
4. _____

2.1. Production Data Structure (PDS)

Definition

A structure generated from a production version or a bill of material in that contains information about the production cycle and the component assignment for the production of a product; the production data structure can be used in as a source of supply for in-house production.

Structure

The production data structure consists of the following list of component with information:

- Consumed total quantity
- Type of consumption
- List of available capacities with reference to resources
- List of activities with data for setup
- List of modes with data for duration and assignment to activities
- Relationships

Use; the production data structure is generated during the transfer of master data from the connected.

Name……………………………………… ID………………………… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

 Short answer

1. List the the component of production data structure?(3)

2. Define production data structure?(3)

 Note: Satisfactory rating – 9 points   Unsatisfactory - below 9 points

You can ask you teacher for the copy of the correct answers.

Score = _____
Rating: _____

Answer Sheet

Name: _____   Date: _____

1. _____

   _____

   _____

2. _____

   _____

Information Sheet 3- Reporting and distributing findings

3.1. Ways of reporting data

3.1.1. Posters & oral presentations

Good scientific research involves a sound methodology and a novel idea that can be tested simply and repeatedly to give valid, trustworthy results. However, even the most clinically significant research is useless if it is not communicated successfully. Scientific ideas are novel, sometimes simple in theory, but most always complex in technique. These attributes of research make it necessary to use all available means of presentation. The most common media for scientists to communicate with the general public is primary journal articles. However, posters and oral presentations are also affective because they allow scientists to be in direct contact with their audience. This provides both parties an opportunity to ask pertinent questions to add clarity to the work being presented.

A poster is an exciting way for scientists to present their research. It, just as a primary research article, includes all aspects of the scientific method. A title that is brief, but specific, an abstract, an introduction, material and methods, results, and a conclusion are some headings that can appear on a poster. Also, references and acknowledgments are sometimes are included. A poster is different from a written manuscript or an oral presentation because it is mostly graphical. As such, it is important to design a poster that is visually pleasing by focusing on charts, graphs, and pictures and minimizing lengthy introductions and discussions. Highlighting all significant information with the use of bullets is essential because if further explanation is needed the audience will simply ask for it.

Oral presentations are yet another avenue for scientists to share their findings with the world. Although it can be challenging to present years of works within fifteen minutes, oral presentations can be a rewarding experience because you are the only one front of an audience whose attention you know have. Of course this emphasizes the need to speak clearly and concisely with choice words that engross the audience.

Again, just as with written manuscript and posters the format of oral presentations can also vary, but essentially it must include logical, easy-to-understand events that are presented in a matter with respect to the scientific method.

3.1.2. Recording production data

In the description of the recording techniques contained in the appendices, some of the details given may seem petty and supper fulvous, they are deliberately in clouded, However, because they are often not appreciated, and one of the most important reasons for farmers not keeping records that would be valuable to them is not they do not know precisely what needs to be done. Sometimes recording is started but later abandoned because it proves to be too difficult or not to be giving the information required often these faults can be rectified by a dears appreciation of recording procedures.

Purpose of recording

- To check on performance
- To guide future reference
- To provide planning data

Planning involves both selecting the right technique & obtaining the necessary data. It is usually the later that provides the greater problem for advisers "standard data are available to some extent but are rarely sufficiently detailed to be applied with full confidence to individual. Even if standard data were available in for greater detail than at present, circumstances on the individual farm would frequently fall between different categories, since it would be optimize to expect data to be provided to cover a continuous range of differences.

Method of data recording

Dates are recorded in different methods: - for instance

A. Field data records:- can be kept in on ordinary bound ledger, or on cards. There is no page or cord, per field per year. The virtue of loose leaf files or cords is that successive years for each field can be put together to make continuous record. Also, data for and single horticultural crop can easily be assembled as required. If only a few items are recorded, one sheet or card may be used for more them one year, thus saving on space requirement over a period of years, these records will from a type of diary for each field for subsequent reference. The items to be recorded include

- Horticultural crop grown
- Variety
- Fertilizers and sprays used (organic and inorganic)
- Date sown and
- Date of harvested.

Yield should be recorded as accurately as possible without going to excessive trouble trying to keep lost separate.

Often these can be only roughly estimated, as is usually the case with horticulture, but an approximate figure is undoubtedly better them nothing, Notes should be added, recording observations about the field, E.g. concerning drainage, fertility or soil, many of these items may first be written in note books carried by a member of the form staff the head tractor driver, arable fore man or the farm manager and subsequently transferred to the field records.

I . Rotational data record:-

This should be kept an a single sheet of paper, unless the number of fields is so large as to make it impossible the names and/or numbers of the field (and their areas if required) are listed down the left hand side and the remaining space is divided into other catagories. Say ten columns, representing, successive years, the horticultural crop grow on each field or orchard in each year is entered in the appropriate space.

II. Labor data recording

On farm with elaborate grapping systems and at peak times (and on many horticultural units labor may be fully deployed on essential productive work for most on even all of the year) the task may be recorded on time sheets, but these are laborious to analysis where

a large staff is employed and are often in accurate, time sheets are more useful as a means of recording ordinary time and ever time worked for calculating wages, and as a means of transferring useful information from the field to the office, them for recording the labor hours spent on different jobs.

On farms with a limited number of major tasks at peak times, the information required about these can be recorded in a way that requires far less subsequent analysis than time sheet, the method involves recording certain details of each task, either in a pocket book kept by the head tractor driver, arable foreman or manager, or specially prepared small cards, one page or cord is needed for each job, unless it covers along period, in which case two or more pages cards, each covering one or weeks, will be required per job, the task such as main crop harvesting is written at the top. Normally there will be one entry per day. Columns are needed for the date, the gang size (i.e. numbers of workers employed, hours worked and hectors completed.

 Preparing appropriate format for data recording

For data recording appropriate format preparation is necessary: - Data are recorded in different waist may be undisruptive way or in way or in table or way or in graphical, chart, figurative.

E.g. Table 3.1. Format of controlling Mango growth

Spacing(m)	Plants/ha	Mango type	Date of plotting	Date of measuring the plant	Height of plant
5x5 6x6	400 360	Dwarf long	10/1/2019 10/3/2004	Monday September Friday October 16/2020	8cm 10cm

Format for recording data is differing according to the user and their necessary, for example format used for recording daily laborers controlling and recording data for horticultural crop management is not the same.

Self-Check – 3	Written test

Name…………………………………………… ID………………………… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Short answer

1. List the items to be recorded include during field data record?(3pts)

2. Describe method of data recording?(3pts)

   Note: Satisfactory rating - 6 points   Unsatisfactory - below 6 points

You can ask you teacher for the copy of the correct answers.

Score = _____
Rating: _____

Answer Sheet

Name: _____   Date: _____

   1. _____
   2. _____

4.1. Feedbacks and comments on findings

Feedback:is the response a receiver gives to the message received. It is the action – reaction interdependence in communication. It is an error correcting mechanism that can overcome noise/barriers of production factors. Is the process in which knowledge of the surroundings or of the consequences of actions of a system lead to adjustments of future actions, seen in the light of achieving a certain goal.

Feedback play an important part because it tells both the source and the receivers, their messages are being interpreted. It provides the source with information concerning his or her success in accomplishing the objective. Feedback describes the situation when output from (or information about the result of) an event or phenomenon in the past will influence an occurrence or occurrences of the same development of the original phenomenon in the present and future. An example feedback, an extension agent who is helping farmers to achieve higher crop yields can improve the farmers' control over their decision making process by teaching them how to measure crop yields. This form of control or feedback should be carried out quickly.

Self-Check – 4	Written test

Name…………………………………………… ID………………………… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Short answer

1. What is feedback(s)? (2pts)

2. Write the role of feedback? (2pts)

Note: Satisfactory rating - 6 points   Unsatisfactory - below 6 points

You can ask you teacher for the copy of the correct answers.

Score = _____

Rating: _____

Answer Sheet

Name: _____   Date: _____

1. _____
2. _____

Reference Materials	

Book:

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WEB ADDRESSES

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No	Name	Qualification	Educational background	Region	Phone Number	E-mail
1	AMENU Olani		Plant Sciences	Oromia	0917845721	amuolan@gmail.com
2	Getenesh Belay	A	Horticulture	Oromia	0911449053	nebzek2@gmail.com
3	Jemal Furo		Plant Sciences	Oromia	0915647611	jemshusni@gmail.com
4	Seboka Adugna		Plant Sciences	Oromia	0910545516	Adugnaseboka@gmail.com