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Agricultural Research Proposal Writing

Addresing Familiar Questions

Abebe Kirub አበበ ቅሩብ

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Ethiopian Institute of Agricultural Research

Agricultural Research Proposal Writing

Addresing Familiar Questions

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Introduction

Agricultural research proposal refers to preparing a substantial and assessed written document and presenting it at review meetings of different levels.

Developing a agricultural research proposal takes time. The process starts by identifying a general area or research and then developing a focused research question to be addressed. Followed by a research procedure is created. The procedure needs to be appropriate to the research question, also feasible in terms of time, resources and other considerations such as relevance and ethics. Research proposal is the proper narrative of this process.

The first part of the proposal will include examining provierbial research questions to be addressed along with statements such as why the area of research is important and what is known already. The second part of the proposal is the methodology section, where the strategy for answering the research question is given. Depending

on why the research proposal is being written, other sections may need to be included in the proposal.

When a researcher is ready to start writing the research proposal, the first step is to carefully read over the guidelines of the institute he/she is affiliated with and whatever instit4ute the proposal is to be submitted. Oftentimes the guidelines give the deadlines for 41 ?:>,jq+-*ubmission and instructions for the length, structure and format of the proposal. Proposals that are late or do not meet the institute's guidelines will usually be subject to rejection. Therefore, it is well worth the effort to obtain and carefully read the guidelines prior to writing your research proposal.

The purpose of this book is not to teach agricultural researchers how to design a research project. Rather it is to help researchers translate research plans into an effective research proposal. A well-written proposal will ease the process of obtaining institutional approval and will increase the chances of obtaining funding/ budget.

Agricultural research requires good ideas, a favourable institutional context and resources

It is true that researchers are trained at universities, and they may have outstanding scientific qualification, but

they usually lack the experience for developing acquiring and conducting agricultural research projects.

This guidebook aims at helping to close that gap by assisting in the development of skills for writing and managing agricultural research proposals. The publication also presents the logic, structure and elements of a successful proposal as well as institutional requirements are discussed.

The steps and elements involved in preparing agricultural research proposal are captured in this guidebook. It is known that any project starts out with the original idea. This is followed by various-collective or individual - planning activities that involve different communication strategies and their structuring and visualization, a feasibility assessment, and a action or structural plan. Only then starts the process of writing and further planning,

In writing agricultural research proposal, the required tools and knowledge involve writing, communication, and technical skills. Associated with preparing and implementing agricultural research project are considerations of institutional demands, research ethics and networking activities.

The book is designed for agricultural researchers; however, the general concepts are applicable to most disciplines.

The Research Method

Agricultural research is a very general term for an activity that involves finding out solutions for the value chains in productivity, production, processing, marketing, and consumption patterns in a more or less systematic way, aspects that a researcher did not know. Specifically, research involves finding out about things that no one else knew either; therefore, it is about advancing the frontiers of knowledge in agricultural science and technology.

Agricultural research methods are the tools and techniques a researcher uses to do research. They represent the tools of the profession, and provide the researcher with ways to collect, sort and analyse data so that the researcher can come to some conclusions. If a researcher uses the right sort of methods for a particular type of research, then he/she should be able to convince other people that the conclusions have some rationality, and that the new knowledge created is sound foundation.

Some of the ways it can be used one to:

Categorize

This involves forming a list of objects, events or concepts, i.e. a set of names into which they can be sorted. This can be useful in explaining which 'things' belong together and how.

Describe

Descriptive research relies on observation as a means of collecting data. It attempts to examine situations in order to establish what is the norm, i.e. what can be predicted to happen again under the same circumstances.

Explain

This is a descriptive type of research specifically designed to deal with complex issues. It aims to move beyond the attainment the facts in order to make sense of the numerous other elements involved, such as human, political, social, cultural and contextual.

Evaluate

This involves making judgements about the quality of objects or events. Quality can be measured either in an absolute sense or on a comparative basis. To be useful, the methods of evaluation must be relevant to the context and intentions of the research.

Compare

Two or more contrasting cases can be examined to highlight differences and similarities between them, leading to a better understanding of occurrences.

Correlate

The relationships between two phenomena are investigated to see whether and how they influence each other relationship might be just a loose link at one extreme or a direct link when one phenomenon causes another. These are measured as levels of association.

Predict

This can be done where correlations are already known. Predictions of possible future behaviour or events are made on the basis that if there has been a strong relationship between two or more characteristics or events in the past, then these should exist in similar circumstances in the future, leading to predictable outcomes.

Control

Once a researcher understands an event or situation, he/she may be able to find ways to control it. For this, the researcher needs to know what the cause and effect

relationships are and that the researcher is capable of exerting control over the vital ingredients.

The Research Process

It is necessary to first define research problem in order to provide a reason for doing the research. The problem will generate the subject of the research, its aims and objectives, and will indicate what kind of data need to be collected in order to investigate the issues raised and what kind of analysis is suitable to enable you to come to conclusions that provide answers to the questions raised in the problem. This process is common to virtually all research projects, whatever their size and complexity. In addition, they can be very different. These differences are due to their subject matters; for example compare an investigation into sub-nuclear particles with a study of different teaching methods, differences in scales of time and resources, and extent of pioneering qualities and rigour. Some projects are aimed at testing and refining existing knowledge, others at creating new knowledge. The answers to four important questions underpin the framework of any research project:

- What are you going to do? The subject of your research.
- Why are you going to do it? The reason for this research being necessary or interesting.
- How are you going to do it? The research methods that you will use to carry out the project.
- When are you going to do it? The programme of the work.

The answers to these questions will provide a framework for the actual doing of the research. The answers to these questions are not simple. This book has been written to give you an indication of what is involved in answering these questions.

As knowledge and understanding increases during the course of the research project, it is subject to constant reiteration. However, a diagram is useful in order to explain the main order of the different stages in the research, and can be used in order to plan a program of work in the form of a timetable. The progress of the project can then be gauged by comparing the current stage of research with the steps in the process.

Research problem

It is clear that there is no shortage of problems throughout the agricultural sector, but for a problem to be researchable, it needs to have several crucial features. It must be:

- stated clearly and concisely;
- significant i.e. not trivial or a repeat of previous work;
- delineated, in order to limit its scope to practical investigation;
- possible to obtain the information required to explore the problem;
- possible to draw conclusions related to the problem, as the point of research is to find some answers.

Reasons for a Research

In this section, a researcher should argue why the study should be done. The research institute as granting body may have specific high priority areas to be considered as research agenda. Be sure to explain how you study fits into those areas.

Therefore, a researcher should ask him/herself

- Will this study generate new knowledge?
- Will the study benefit farmers, agro-pastoralists and pastoralists, advance understanding or influence policy?
- Will the study fill gaps in existing knowledge or resolve current controversies?

Generally, a research should do more than just generate new knowledge. The knowledge should in some way be useful, either by leading to a tangible benefit such as improved yield and productivity of crops and livestock,

and natural resources management or a less tangible one such as addressing an area of controversy.

Like any other discipline, agricultural research tends to be a cyclical process – research findings lead to concept development, concept leads to further research. As a researcher, one can jump into this process at many places. In the literature review, a researcher should show that he/she is jumping in at the appropriate place. If little is known in an area, then very basic descriptive studies designed to give a preliminary understanding about a phenomenon are appropriate. However, if the area is well advanced, that type of study will be inappropriate. When reading the literature review section, a reviewer will be looking to see whether the researcher is sufficiently knowledgeable about the area and whether the proposed work is appropriate for the level of knowledge currently existing in that area.

In handling reviews as knowledge resources, a researchers should be looking to see whether he/she is sufficiently knowledgeable about the area and whether the proposed area of study is appropriate for the level of knowledge currently existing in that area. The key for successful literature review could be linked to the following key issues:

- Thorough, complete and up to date, but not a reading of every study ever conducted ;
- Logical;
- Original research;
- Primary sources;
- Focus on original research and systematic reviews;
- Well organized/synthesized;
- Critical appraisal;
- Build a case for a new study;
- Describe any controversial areas objectively;
- Include evidence for and against your position; and
- Identify any gaps in existing knowledge

The Use of Argument

As stated in the previous section, the whole point of doing a research project is to identify a particular question or problem, to collect information and to present some answers or solutions. In order to convince the reader that the researcher have collected information relevant to the question or problem and that you have based your answers and conclusions on the correct analysis of this information you will need to use some logical argument. The researcher might want to defend or challenge a particular point of view or propose a new or improved one.

The researcher will have to play the part of a detective making a case in court. The detective will set out to solve the problem (who committed the crime and how?) by analysing the situation (the scene and events of the crime, the possible suspects), collecting and reviewing the evidence, then making a case for his/ her conclusions about 'who-done-it' and how.

The reviewer will have to decide whether the argument is convincing and that the evidence is sufficiently strong. In the case of a research project, the researcher will be setting the problem and laying out the case, and the reader of the proposal, will be the reviewer.

In writing science and even in presentations arguments may be poorly expressed or submerged within the content. In order to recognize when an argument is being made, look for words that indicate a premise such as:

- Since;
- Because;
- If;
- assuming that; and
- given that.

Then look for words that indicate that a conclusion follows, such as:

- therefore;
- this proves that;

- then;
- consequently; and
- thus.

Then look for any logical reasoning and evidence that is given to link the two.

Why a Research Proposal?

Proposal writing is the most important part of the planning phase of the research process. The thing that separates competent scientist from others is nothing, but careful planning. The basic reasons for writing a research proposal are the following:

- Convince others the project you have designed is important, worth the effort;
- Convince others that you have the ability to carry out the research design and report the findings; and
- Generate funds to sustain the research units operation

In as much as possible a good agricultural research proposal should begin with a statement of the problem/background information; a review of the literature; and defining of the research methodology

Getting started

The researcher should be able to realize the following issues before writing or preparing a research proposal

- **Know your subject.** The reviewers will look for an up-to-date knowledge of the research area;

- **Know your funder.** Be aware of the priorities and interests of the funder you approach, and know that funders are unlikely to support the same idea twice; and

- **Consult colleagues.** Do not be afraid to discuss your proposal with colleagues, or even with the grants officer at the funding body. Early discussions can ensure that your proposal is targeted appropriately.

Therefore, a good proposal is expected to demonstrate high scientific quality; and the requested budget must be in proportion to the proposed project (cost-effectiveness).

Research Objectives/ Questions/ Hypotheses

Identifying the research problem and developing a question to be answered are the first steps in the research process. The research question will guide the remainder of the design process.

Research Objectives

A clear statement of the specific purposes of the study, which identifies the key study variables and their possible interrelationships and the nature of the population of interest. The objective of a research proposal is a very important section where everything else in the study is centered around it.

The objective of the proposed study should be stated very clearly; it should be specific, achievable and measurable. Too many objectives may to be avoided. Even just one clearly stated relevant objective for a study would be good enough. If there is more than one objective the objectives can be presented in the appropriate order of importance

Research Problem

Before a researcher prepares a research proposal, let alone conducts a research, the researcher needs to identify a problem to address and then a question or questions to ask regarding the targeted problem. This will lead the researcher to get ideas to investigate, narrow down or focus on a particular problem to address, and writing good research questions.

In agriculture, a research problem is the topic a researcher would like to address, investigate, or study, whether descriptively or experimentally. It is the focus or reason for engaging in research. It is typically a topic, phenomenon, or challenge that a researchers could be interested in somewhat familiar with.

Research Question

The specific purpose stated in the form of a question (descriptive/exploratory research). A **research question** is a way of expressing interest in a problem or phenomenon. Research questions are not necessarily an attempt to answer questions that often arise and they are certainly not intended to be spanning personal interest. A researcher may have more than one research question for a study, depending on the complexity and breadth of the proposed work. Each question should be clear and specific, reflect an intervention in experimental work, and note the target population or participants. Identifying agricultural research question provides greater focus to the research or clarifies the direction of investigation, whether the research is descriptive or experimental. Quite significantly, a well-written research question will also shed light on appropriate research methods; for example, specify the intended actions of the variables and how an experimental intervention might be measured.

The characteristics features of research questions include

- Are specific;
- Are clear;
- Refer to the problem or phenomenon;

- Reflect the intervention in experimental research; and
- Note the target group of participants.

Hypotheses

Hypothesis is a clear statement of what is intended to be investigated. Therefore, it should be specified before research is conducted and openly stated in reporting the results. This allows identifying the research objectives; identifying the key abstract concepts involved in the research and identifying its relationship to both the problem statement and the literature review

Moreover, hypothesis has also the following characteristics

- It can be tested –verifiable or falsifiable;
- Hypotheses are not moral or ethical questions;
- It is neither too specific nor to general;
- It is a prediction of consequences; and
- It is considered valuable even if proven false

Actually, a problem cannot be scientifically solved unless it is reduced to hypothesis form; and it is a powerful tool of advancement of knowledge, consistent with existing knowledge and conducive to further enquiry

In order for a theory to be tested, it must be expressed as a statement called a hypothesis (testable theory). The essential nature of a hypothesis is that it must be falsifiable. This means that it must be logically possible to make true observational statements, which conflict with the hypothesis, and thus can falsify it. However, the process of falsification leads to a devastating result of total rejection of a theory, requiring a completely new start.

A research hypothesis essentially is a declarative statement of how you expect the research to turn out. It is a tentative explanation for an observation that can be tested, i.e. proved or disproved by further investigation

The specific purpose stated in terms of a tentative prediction or explanation of the relationship between two or more variables. A prediction of the answer to the research question (explanatory research).

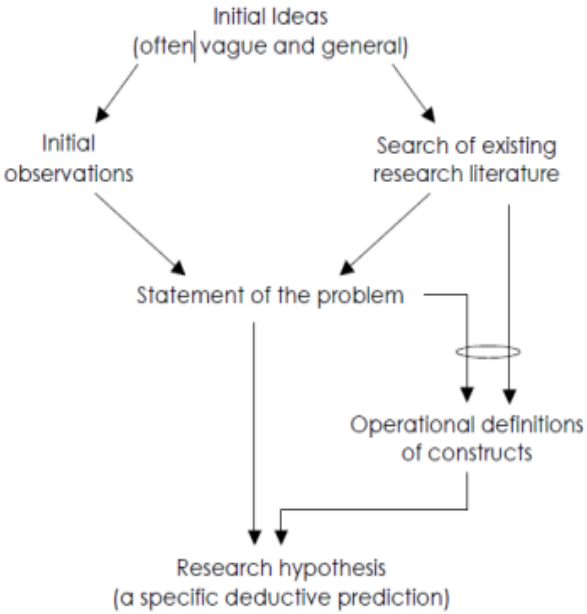
In dealing with hypothesis the key for success include the following:

- Only one or two primary research questions or hypotheses: focus on the important question;
- Clear and consistent;
- Key concepts/constructs identified;
- Includes the independent and dependent variables (if applicable);
- Measurable;
- Hypotheses clearly predict a relationship between variables; and
- Relevant or novel.

The importance of a hypothesis could be explained to figuring out a solution to the problem, i.e. "hypothesizing", before you start will help build a roadmap for approaching the problem

Hypotheses can be expressed as possible root causes of the problem. Therefore, breaking down the problem into key drivers (root causes) can help formulate hypotheses

Steps in generating research hypothesis



Inductive and Deductive Reasoning

Reasoning

The drawing of inferences or conclusions from known or assumed facts.

When solving a problem, one must understand the question, gather all pertinent facts, analyze the problem i.e. compare with previous problems (note similarities and differences), perhaps use pictures or formulas to solve the problem.

Both deductive and inductive arguments occur frequently and naturally. Both forms of reasoning can be equally compelling and persuasive, and neither form is preferred over the other

Inductive reasoning

Inductive **reasoning** starts from specific observations or sensory experiences and then develops a general conclusion from them. This simple example gives and indication of the line of reasoning:

Example; *All the zebras that I have seen (repeated observations) have stripes all over their body. Therefore, I conclude that all (conclusion) zebras have stripes all over their body*

Induction was the earliest and, even now, the commonest popular form of scientific activity. Researchers use it every day as they learn from their surroundings and experiences. Researchers come to conclusions from what they have experienced and then generalize from them, that is, set them up as a rule or belief.

However, there are problems with induction. The first is the question of how many observations must be made before a researcher can reasonably draw a conclusion that is reliable enough to generalize from; and the second is how many situations and under which conditions should the observations be made so that true conclusions can be reached? These problems do not stop us from using inductive reasoning every day quite successfully without even thinking about it. Nevertheless, a researcher should

be aware that what might obvious might not be so reliable with making further investigations. Therefore, in order to be able to rely on the conclusions a researcher comes to by using inductive reasoning, he/ she should ensure that they make a large number of observations, repeat them under a large range of circumstances and conditions and that no observations contradict the generalization made from the repeated observations.

Deductive reasoning

Deductive reasoning begins with general statements (premises) and, through logical argument, comes to a specific conclusion. Again, a simple example will provide a guide to how this works:

> **Example:** *All living things (General statement – first premise) will eventually die. This animal is a living thing. (Inference–second premise).Therefore, this animal (Conclusion) will eventually die.*

This is the simplest form of deductive argument. It consists of a general statement (called the first premise), followed a more specific statement inferred from this (the second premise), and then a conclusion which follows on logically from the two statements

One of the problems with deductive reasoning is that the truth of the conclusions depends very much on the truth of the premise on which it is based. For example, in the past many conclusions about the movement of the planets were incorrect due to the premise that the earth was the centre of the universe.

In summary; Deductive resaoning is :

- commonly associated with "*formal logic*";
- involves reasoning from known premises, or premises presumed to be true, to a certain conclusion; and
- the conclusions reached are certain, inevitable, inescapable.
- It is the ***form or structure*** of a deductive argument that determines its validity;
- the fundamental property of a valid, deductive argument is that ***if*** the premises are true, ***then*** the conclusion necessarily follows; and
- The conclusion is said to be "entailed" in, or contained in, the premises.

Example: *use of DNA testing to establish paternity*

While inductive reasoning is

- commonly known as "*informal logic*," or "everyday argument";

- involves drawing uncertain inferences, based on probabalistic reasoning;

- the conclusions reached are probable, reasonable, plausible, believable;

- By contrast, the form or structure of an inductive argument has little to do with its perceived believability or credibility, apart from making the argument seem more clear or more well-organized; and

- The receiver (or a 3rd party) determines the worth of an inductive argument

-

Variables

Variables are properties that take on different values". A variable is also a logical grouping of attributes. Attributes are characteristics or qualities that describe an object. For example if gender is a variable then male and female are the attributes. If crop is the variable then tef, wheat, chickpea, orange become the attributes. So attributes here describe the species of a crop.

Variables are characteristic or quality that takes on different values. In agricultural research, a researcher should be able to Identify the dependent or outcome variables (the presumed effect); and independent or predictor variables (the presumed cause).

It is pertinent for a researcher to know as how certain variables within a study are related to each other. It is thus important to define the variables to facilitate accurate explanation of the relationship between the variables. There is no limit to the number of variables that can be

measured, although the more variables, the more complex the study and the more complex the statistical analysis. Moreover the longer the list of variables, the longer the time required for data collection.

There are different types of variables and having their influence differently in a study. The most common ones in agricultural research are dependent and independent variables

Dependent variables are what a researcher is trying to explain or learn about. Independent variable is the factor that might hypothetically influence or cause the behavior of interest

In should be noted that variables are not inherently independent or dependent. It should also be noted that in descriptive and exploratory studies, this distinction is not made. Confounding variables are extraneous variable that are risk factors for the outcome variable; and associated with the predictor variable.

The key for successful identification of variables include to clearly identify study variables and their role in the study; and select only variables that are measurable

Research Types and Categories

Kinds of research

Considering its broader context "research" is just "finding out stuff." The most common kinds of research are characterized as scientific, technological, commercial, and political.

Strategically, research refers to

- **Qualitative research:** is research on commonalities;
- **Comparative research**: is research on diversity; and
- **Quantitative research**: is research on relationships between variables

Categories of research

The two major categories of research are observational and experimental. Observational research is non-experimental research. The researcher observes and records on-going issues or behaviors but does not try to change it in a research method.

Research may be applied or basic. The purpose of applied research is to solve an immediate, practical problem. Basic Research (Pure) adds to the existing body of knowledge; does not necessarily provide results of immediate, practical use.

Research may be obvious or non-obvious. Obvious research - where the researcher introduces conditions that influence participants; where the researcher manipulates the environment. Non-obvious research; and where researcher avoids influencing subjects in any way and tries to be as inconspicuous as possible.

The main types of research include the following

Historical Research

A systematic process of searching for information and fact to describe analyses or interpret the past. Its value is expressed in providing prospective for decision making about current problems-issues are often better understood if we understand the historical perspective. The sources-must have good backed sources to protect from criticism - most common sources are past records.

Descriptive Research

Describes, interprets, and clarifies what in the present. It is often done with surveys. It may be done by observation or an observational instrument.

Developmental Research

Developmental Research is one common type of descriptive research, which involves the study of changes in behavior over a period.

Correlation Research

This design is used to examine a relationship between two concepts. There are two broad classifications of relational

statements: an association between two concepts – where there is some kind of influence of one on the other; and a causal relationship – where one causes changes to occur in the other. **Causal statements** describe what is sometimes called a 'cause and effect' relationship. The cause is referred to as the '**independent variable**', the variable that is affected is referred to as the '**dependent variable**'. The correlation between two concepts can either be none (no correlation); positive (where an increase in one results in the increase in the other, or decrease results in a decrease); or negative (where the increase in one results in the decrease in the other or vice versa). The degree of association is often measurable. The purpose is to find relationships between two or more variable so to:

- Better understand the conditions and events that we encounter (what goes with what);
- To predict future conditions and events; and
- Correlations do not show cause and effect

Comparative

This design is used to compare past and present or different parallel situations, particularly when the

researcher has no control over events. It can look at situations at different scales, macro international, national) or micro (community, individual). **Analogy** is used to identify similarities in order to predict results – assuming that if two events are similar in certain characteristics, they could well be similar in others too. In this way, comparative design is used to explore and test what conditions were necessary to cause certain events, so that it is possible, for example, to understand the likely effects of making certain decisions.

Experimental research

An experiment is a research situation where at least one independent variable, called the experimental variable, is deliberately manipulated, or varied by the researcher. Experimental research attempts to isolate and control every relevant condition, which determines the events investigated and then observes the effects when the conditions are manipulated. At its simplest, changes are made to an independent variable and the effects are observed on a dependent variable; i.e. cause and effect. Although experiments can be done to explore a particular event, they usually require a hypothesis (prediction) to be formulated first in order to determine what variables are to be tested and how they can be controlled and measured.

There are several classes of experiment such as pre, true, and quasi, which are characterized by the amount of checking and control involved in the methods.

Simulation

Simulation involves devising a representation in a small and simplified form (model) of a system, which can be manipulated to gauge effects. It is similar to experimental design in the respect of this manipulation, but it provides a more artificial environment in that it does work with original materials at the same scale. Models can be mathematical (number crunching in a computer) or physical, working with two- or three-dimensional materials. The performance of the model must be checked and calibrated against the real system to check that the results are reliable. Simulation enables theoretical situations to be tested – what if?

Evaluation

This descriptive type of research is specifically designed to deal with complex social issues. It aims to move beyond 'just getting the facts', by trying to make sense of the myriad human, political, social, cultural and contextual elements involved. There are different approaches of

evaluation models, for example, systems analysis –which is a holistic type of research looking at the complex interplay of many variables; and responsive evaluation – which entails a series of investigative steps to evaluate how responsive a program, is to all those taking part in it. A common purpose of evaluation research is to examine the working of projects from the point of view of levels of awareness, costs and benefits, cost-effectiveness, attainment of objectives and quality assurance. The results are generally used to prescribe changes to improve and develop the situation.

Action

Essentially, this is an 'on the spot' procedure, principally designed to deal with a specific problem found in a particular situation. There is no attempt made to separate the problem from its context in order to study it in isolation. What are thought to be useful changes are made and then constant monitoring and evaluation are carried out to see the effects of the changes. The conclusions from the findings are applied immediately, and further monitored to gauge their effectiveness. Action research depends mainly on observation and behavioural data. Because it is so bound up in a particular situation, it is

difficult to generalize the results, i.e. to be confident that the action will be successful in another context.

Ethnological

Ethnological research focuses on people. In this approach, the researcher is interested in how the subjects of the research interpret their own behaviour rather than imposing a theory from outside. It takes place in the undisturbed natural settings of the subjects' environment. It regards the context to be as equally important as the actions it studies, and attempts to represent the totality of the social, cultural and economic situation. This is not easy as much of culture is hidden and rarely made explicit and the cultural background and assumptions of the researcher may unduly influence the interpretations and descriptions. Moreover, there can be confusions produced by the use of language and the different meanings, which may be given to words by the respondents and researcher.

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Gender-based

This is more of a perspective than a research design that involves theory and analysis that highlight the differences between men's and women's lives. Researchers who ignore these differences can come to incorrect conclusions. However, everyone is male or female, so value neutrality is impossible as no researcher practises research outside his or her system of values. No specific methods are seen to be particularly gender-based, but the methodology used is informed by theories of gender relations. Although feminist research is undertaken with a political commitment to identify and transform gender relations, it is not uniquely political, but exposes all methods of social research as being political.

Cultural

Cultural research provides methodologies that allow a consistent analysis of cultural texts so that they can be compared, replicated, disproved and generalized. Examples of approaches to the interpretation of cultural texts are: content analysis, semiotics and discourse analysis.

Choosing Research Design

It is a research interest that decides the nature of your research problem, and this will indicate the appropriate type of research to follow. Once the objectives of a research project have been established, the issue of how these objectives can be met leads to a consideration of which research design should be chosen. The research design provides a framework for the collection and analysis of data and subsequently indicates which research methods are appropriate. A researcher can combine two or more types of research design, particularly when your subject combines the study of human behaviour with that of, for example, economics, technology, legislation or organizations. The different types of research design may involve the use of their own specific types of research methods, developed specifically to solve the problems inherent in that design. However, some methods are widely used across many research types.

Data or Information Sources

In the first place, why should a researcher care about data/ information sources and types in preparing a research proposal? The answer is obvious. The researcher must understand the data/ information type of each variable in order to record its values in a consistent manner.

There are many different sources of data / information on any specific agricultural research project **and** different types of information/ data vary in their completeness, accuracy, relevance, representativeness, and timeliness

Information/ data sources also vary in the ease with which a base population can be identified, for use in the denominator, for calculating rates.

Primary sources

These sources of data are original or first-hand account of event or experience, persons involved, documents, records or relics

Secondary sources

Primary source is an account that is at least once removed persons not involved directly with an event but has close knowledge (parents, relatives) newspaper

External criticism

It evaluates the validity of the document, i.e., who, when, where it was produced; is the document genuine, authentic; status of author (primary or secondary?)

Internal criticism

It evaluates the meaning, accuracy and trustworthiness of the content (comes after external criticism).

Both external and internal criticism are important to establish validity.

Key issues for assessing appropriateness and usefulness of information/ data and their sources

With respect to technical issues the following are key issues

- Are the definitions clear and appropriate?
- Are the target and study population clear?
- Are the data collection methods clear and sound?
- How complete, accurate, relevant, and timely are the data? and
- How much does this matter?

Issues relating to outcome or decision involved may include the following

- Is the study population sufficiently representative of the target population for the purpose of the decision?
- Do you need absolute or relative estimates, to make the best decision?

- Would existing data source suffice, by using comparative data or by extrapolating with care? and

- Would qualitative information suffice, when habit automatically suggests quantitative data?

Qualitative data/ Information

The researchers should be able to identify the kinds of qualitative data to be recorded in the research activity. There many kinds of qualitative data/ information; the most common ones are:

- Words;
- Feelings;
- Actions;
- Rituals;
- Experiences;
- Perspectives;
- Impressions;
- Events;

- Artefacts; and
- Symbols

The sources of qualitative data/ information include the following:

- Interviews and transcripts;
- Observations and field notes ;
- Documents;
- Pictures and images; and
- Audio and visual recordings

Quantitative data

A researcher might think of a quantitative data as one that can only be recorded using a number. These data describe some quantity about the research subject and are often measured or counted; for example; number of tillers per plant, number of tubers per plant, number of seeds per pod, amount of milk per day per cow, plant height, body weight, fertilizer application in kg, number of bacteria.

Choosing data/ information types

On the practical level, the following issues can affect the choice of sources of data/ information in writing a proposal:

- Credibility of findings;
- Researcher's skill;
- Costs; and
- Time constraints

Doing Literature Review

The researcher should have the ability to review relevant literature as one of the essential skills. A literature review: situates the research to focus research focus within the context of the expectations of stakeholders; reports your critical review of the relevant literature; and identifies gaps within that literature that the research will attempt to address.

After reading literature review, it should be clear to the reviewer of the research proposal that the researcher has up to-date awareness of the relevant work of others, and

that the research question is relevant too. However, the researcher should not promise too much. The researcher should be cautious of saying that the proposed research will solve a problem, or that it will change practice. It would be safer and probably more realistic to say that the research will ‘address a gap’, rather than that it will ‘fill a gap’.

Identifying Researchable Problem

The research problem serves as the starting point for the research and is a unifying thread that runs throughout all the elements of the research endeavor. Without some sort of statement of problem, the researcher can rarely go further and expect the work to be successful. A viable research problem is usually noted at the introduction of the research manuscript to identify why the study is important.

The viability of a problem as a starting point for research cannot be established through a single source. Therefore, the researcher must, develop a research-worthy problem by weaving together the threads derived from a number of sources.

Defining the Problem

The basic questions to ask in defining the problem (regardless of the technique used) are presented as follows:

Who

- Who is causing the problem?
- Who says this is a problem?
- Who are impacted by this problem?
- Etc.

What

- What will happen if this problem is not solved?
- What are the symptoms?
- What are the impacts?
- Etc.

Where

- Where does this problem occur?
- Where does this problem have an impact?
- Etc.

When

- When does this problem occur?
- When did this problem first start occurring?

- Etc.

Why

- Why is this problem occurring?
- Why?
- Why?
- Etc.

How

- How should the process or system work?
- How are people currently handling the problem?
- Etc.

Identifying causes of problems

Identifying causes of a problem is typically used as a reactive method of identifying causes, enlightening problems and solving them.

Although there are a number of techniques to identify the causes of a problem, the "But why?" technique is one method that could be used to identify underlying causes of a agricultural production or productivity issues. These underlying factors are called "root causes."

The "But why?" technique examines a problem by asking questions to find out what caused it. Each time an answer is given, a follow-up "But why?" is asked.

For example, if you say that too many farmers in in the western parts of Ethiopia have problems with acidity of the soils, a researchers should ask him/ herself "but why?" Once the researchers come up with an answer to that question, he/ she should probe the answer with another "but why?" question, until he/ she reach the root of the problem, i.e., the root cause

Identifying genuine solutions to a problem means knowing what the real causes of the problem are. Taking action without identifying what factors contribute to the problem can result in misdirected efforts, and that wastes time and resources. However, by thoroughly studying the cause of the problem, a researcher can build ownership, i.e., by experiencing the problem the researcher will understand it better, and be motivated to deal with it.

Causes of problems in agricultural production and issues related to productivity are the basic reasons behind the problem or issue a researcher is seeing in the farming or pastoral communities—large or small. Trying to figure out why the problem has developed is an essential part of the

"problem solving process" in order to guarantee the right responses and to help farmers, pastoralists and other stakeholders "own" the problems.

Cause and effect diagrams help you to think through causes of a problem thoroughly. Their major benefit is that they push you to consider all possible causes of the problem, rather than just the ones that are most obvious.

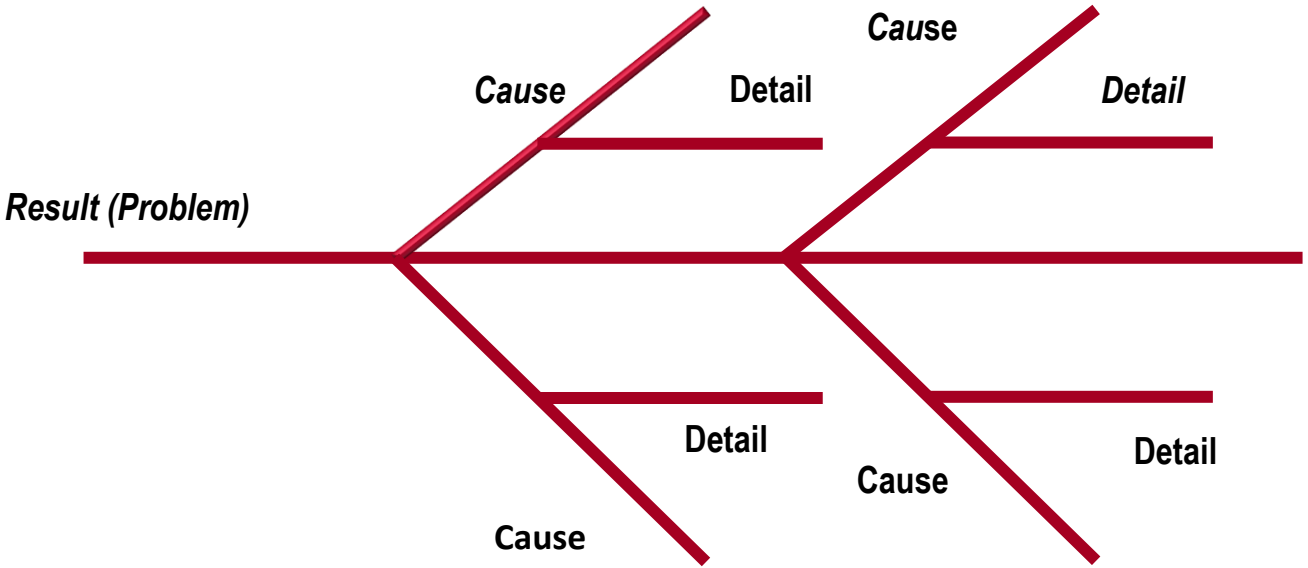
The approach combines brainstorming with use of a type of concept map.

Cause and effect diagrams are also known as **Fishbone Diagrams** because a completed diagram can look like the skeleton of a fish.

Fishbone Diagram

Fishbone Diagram is an analysis tool that provides a systematic way of looking at effects and the causes that create or contribute to those effects

The value of the Fishbone Diagram is that it provides a method for categorizing the many potential causes of problems or issues in an orderly way and in identifying root causes


Result (Problem)
Cause
Detail
Cause
Detail
Detail
Cause
Cause
Detail

Problem tree analysis

The Problem Tree method is a planning method based on needs; however, it is not a mechanical translation of problems into objectives. While going through the process, taking the different steps, there is continuously room for opportunities, new ideas, and contributions from the involved parties. Problem Tree Analysis should be followed by actual project planning, e.g. with the Logical Framework approach. Alongside, or interwoven with the steps of Problem Analysis (at target group level) and project planning (for the target group), one should analyze the capacity and intentions of stakeholders and the wider institutional context, so that relevant and realistic choices can be made on who does what.

A researcher can use this tool to address the real needs of the beneficiaries. This process will result in an ‘image of reality', enabling the formulation of projects that comprise objectives that have been accepted and supported by all parties concerned. Information collected through these methods can be used as input for project-planning.

Participatory methods

'The better and more participatory the method for identification, the more likely it is that different aspects of poverty and inequality among the poor will appear, such as those of gender, age, class and ethnicity. It also gives particular insight in the distribution of power within the target groups. The challenge is how to manage these differences and address the varying needs, interests, and opportunities with them' (from Building bridges in PME). A successful outcome of using participatory methods depends on the familiarity of the facilitator with the method, the attitude of the facilitator and the implementers and the amount of time that is reserved to do the identification and planning. Particular efforts are made to involve all members of a community into participatory action planning.

How to use it?

Process

A properly planned project addressing the real needs of the beneficiaries is necessarily based upon a correct and complete analysis of the existing situation. The existing situation should be interpreted according to the views, needs, interests, and activities of parties concerned. It is essential that all those involved accept the plans and are

committed to implement them. The Problem Tree Analysis belongs to the family of participatory planning techniques, in which all parties involved identify and analyze the needs together. Participatory methods aim to create ownership and commitment among the involved parties; for example, beneficiaries, implementing organizations, local governments. Three stages in the analysis process in the Problem Analysis method will be discussed:

- the **analysis of problems** related to the subject (the image of reality);

- the **analysis of objectives** (the image of a future, improved situation); and

- the **analysis of strategies** (the comparison of different chains of objective).

There are several complementary methods to analyze a situation:

- expert studies giving answers to questions as experts conceive them;

- interviews with representatives of concerned groups and organizations providing

- perceptions as existing within that particular group or organization; and

- a meeting, in which representatives of all parties concerned, including experts, discuss the same questions in a participatory way, often leading to an analysis, which is shared by all, for example, Participatory Rural Appraisal (PRA). The components of PRA are Components:people, knowledge, participation, planning, and action. Therefore, it is a combination of I different approaches to share, enhance, analyze, plan, and act.

Problem analysis

The problem analysis is of major importance with regard to project planning, since it strongly influences the design of a possible interventions. It is the basis and the justification for the project design. The problem analysis includes:

- verification of the subject of analysis;

- identification of problems related to the subject; make and inventory of all problems perceived by all participants in the workshop;

- establishment of a cause-effect hierarchy between the problems; and

- visualization of the cause-effect relations in a diagram.

It is important that all participants get the chance to express the problems they experience. After discussion and clarification by the 'problem owner', all problems should be respected. It is important to determine whether the different groups of people perceive the problem in the same way; if not the problem should be reformulated or split. For example, if the problem mentioned is 'our family income is not sufficient', for a woman it could mean that she cannot buy vegetables and meat, whereas for the man in the family this could mean that he is not satisfied about the yields.

After a common understanding of all problems is reached, the analysis is presented in the form of a diagram, or a problem tree. A problem is never an isolated negative perceived situation, but relates to other problems. In the problem tree the relations and hierarchy among all identified problems is expressed. Each stated problem is preceded by the problem(s), which cause(s) it, and followed by the problem it causes itself. For example: the rice production in the low lands is decreasing due to the irrigation water not reaching the fields and due to the fact that there is an irregular supply of inputs for rice

production. The problem of a decreasing rice production itself contributes to the problem of food shortages

Objectives analysis

After the problem analysis follows the analysis of objectives. This analysis includes:

- the translation of the negative situations in the problem tree into a realized positive state (the objectives) for example, 'low rice production' is converted into 'improved rice production';

- verification of the hierarchy of objectives; and

- visualization of means-end relationships in a diagram.

Also in this step, it is of importance that all stakeholders are involved. While transforming problems into objectives and verifying the hierarchy, discussion and feedback on the objectives is done. This helps building consensus amongst the stakeholders. It might also be necessary to reformulate some of the problems.

Next, often the objective tree shows many objectives that cannot all be reached at once. Therefore, choices will have to be made. Certain objectives seem unrealistic, too ambitious, or not feasible within the context of a possible

intervention, so that other solutions need to be generated for the problem concerned. However, at this stage of the planning these choices are not yet made. Still all possible ways (objectives) to achieve the desired future situation are considered.

Analysis of strategy

After having formulated the desired future situation, the selection of possible interventions starts. To analyze the strategies for implementation the following steps are taken:

- identification of the different possible groups of objectives contributing to a higher objective (clustering); and

- choice of a strategy for the intervention, choosing the scope of the project (scoping).

In the process of clustering and scoping, it is important to realize that the aim is to contribute the maximum possible to an overall objective, keeping in mind the priorities of the beneficiaries, and the limitations and possibilities of the implementing organization. In the diagram of objectives, the different objectives sharing the same nature can be considered clusters. The clustering should be based on common sense and should be of practical value in the

planning stage. The clusters should not be too broadly nor too narrowly defined. It concerns the identification and selection of potential alternative strategies towards realizing all or some of the objectives. Clusters are made based on similarity of possible future activities, region, or required expertise. In the demonstration case, these clusters are irrigation system, agricultural inputs, soil fertility, and immigration. For each of these clusters a different type of expertise is needed. Out of the clusters, one (and often more) will be chosen and used as the strategy to achieve a future desired situation: the aims of the intervention. This is called scoping, or choosing a strategy. Based on a number of criteria, the most relevant and feasible strategy is selected. Unrealistic objectives should be excluded and objectives that certainly should be included should be prioritized. The criteria have to be chosen and agreed upon by all stakeholders. Examples of possible criteria:

- priorities of beneficiaries;
- expertise and experience of implementing organization;
- fit with mandate of government authorities, sectoral policies;

- duration of implementation;
- contributions of different stakeholders;
- urgency;
- available human resources, institutions;
- contribution to overall objectives;
- available budget;
- inter-linkages between clusters;
- shift in power relations;
- positive/negative side-effects;
- gender and social diversity aspects;
- sustainability;
- likelihood of success; and
- fit with mandate of implementing organization

Preparatory phase

Define the subject

The first thing to do is to define the subject based on which the exercise will be done. The subject is the framework for the discussion; no more and no less. The relevance of the subject is to be discussed with the stakeholders (social actors that have a relation to the subject). As soon as stakeholders are identified and invited to participate, the subject is checked and a consensus on it should be reached. The subject needs to be understood by all parties. Care should be taken that the formulation as such does not unintentionally exclude certain (target) groups

Stakeholder analysis

It is important that all stakeholders get a chance to express their experiences and ideas for the (new) project. Ideas from all different perspectives should be respected and used. Not only individuals can be stakeholders, also organizations that have a social relation the subject need to be involved. The active participation of old and young women and men, married people, single headed households, landless, higher class and lower class, etc. means that a representative group out of the beneficiaries is taking part in the process of project development and implementation. Depending on the setting, the following actors may be involved in the preparatory and analysis phases:

- local communities, the ‘problem owners’;
- implementing organization;
- local government officials; and
- facilitator who will do the moderation of the workshop

Follow up

Planning should continue with:

- Developing the logical framework (in ‘Logical Framework’ tool);
- Assessing and documenting assumptions and risks (in ‘Assumptions’ tool);
- Defining targets, benchmarks and (in ‘Indicators’ tool);
- Operational planning: Budgeting (no tool); and
- Operational planning: Who does what (in ‘Participation matrix’ tool)

Requirements and limitations

All stakeholders should participate in the scoping. This way, their commitment can be obtained and, very important, their understanding for the choices made. Scoping is about assessing with whom you are suited to do what, and what can better be left (to others). This is why you may integrate some institutional and organizational analysis tools at this stage. They give you an overview of current capacities and aspirations, so you consider both your own capacity and those of others in deciding what you will define as within or outside the scope of your project.

In summary, the primary aim of problem and cause analysis is:

- to identify the factors that resulted in the nature, the magnitude, the location, and the timing of the undesired or harmful outcomes (consequences) of one or more past events;

- to determine what behaviors, actions, inactions, or conditions need to be changed;

- to prevent recurrence of similar undesired outcomes; and

- to identify lessons that may promote the achievement of better consequences. ("Success" is defined as the near-certain prevention of recurrence.)

Proposal Planning

Before starting to write agricultural research proposal, there are a number of steps required for ensuring the quality and the relevance of the proposal in view of coming up with relevance to the institute. These involve considerations regarding the research project idea, various discussion strategies leading to the definition of structural elements, quality and plausibility check to fill disciplinary gaps and holes, and understanding of the key elements of the proposal. Only when these steps of planning are completed, start writing.

The idea

Any research proposal starts with an idea. The formulation of a research idea begins with identification of a topic of interest. This can be based on a number of aspects that include inspiration, knowledge and experience (own interest) and it can be the answer to a call made by a

donor. Such calls are often politically motivated and change as paradigms shift.

The main source of idea is resulting from professional socialization in your field of study, on observations based upon your scientific background and on theoretical grounds published in recent scientific literature with high quality and relevance identifies problem areas by government and nongovernment organizations and other sources. . In many cases, the idea is based upon externalized tacit knowledge. Socialization involves transferring tacit knowledge from one person to another. Externalization makes tacit knowledge explicit, thus transferring tacit knowledge to explicit knowledge. Internalization is the transfer of explicit knowledge to tacit knowledge—cooking from a new recipe, gaining latent abilities with a new quality. Irrespective if the topic to be developed is resulting from your own inspiration or is in answer to a call, there is a need to clarify a number of questions before moving into the planning stage:

- what is new and original (literature review)?;
- what is the relevance (in general, for the region for your career)?;
- what is the expected outcome (be realistic)?;

- what are the resource requirements (personnel, equipment, funds)?;
- what is the time frame (p research goal- or donor-driven)?;
- what is the required expertise (team size and composition)?; and
- why are you and your team the best choice to do this research (proof of previous achievements)?

The type of topic you address (broad-based or specific; research or development) determines

- the geographical scope or scale;
- the expertise and disciplines;
- the size of the team;
- the type and number of stakeholders involved;
- the amount of funds;
- the budget horizon;

- the administrative and organizational requirements; and

- the donor to be approached

Communications Strategy

Before writing a research proposal, the problem, aims and hypotheses, checking the feasibility and structuring your proposal, requires discussions with colleagues and potential partners from research, development and administration are very crucial.

Literature review refers to what has already been done in agricultural research. It makes the theoretical background of the agricultural science clear. The discussion should lead to the results of what a research is going to do. *The context* in problem description is not subject to the planned investigation, serves to introduce the general background of the planed study, and helps to come to specific operational questions or hypotheses that can be answered or proved in the process of research.

The researcher should be able to use only the most important and updated literature that is closely related to the idea and the problem. The more the researcher knows about the problem, the more significant are his/ her contributions to specifying the research project and to funnelling its structure.

Feasibility Assessment (SWOT)

Can the research be realized as outlined in the proposal plan derived from the mind-map? What are strengths and weaknesses, what are opportunities and threats? What are additional disciplinary, institutional or organizational requirements to make the project work? This analysis is conducted in the frame of the such-called SWOT approach. SWOT is not a component of the submission documents but rather a planning tool to ensure the feasibility of the planned activities.

After defining the hypothesis, objectives and deliverables, it is important to determine if the researchers can conduct the project or if they need outside help or down size the project to fit the groups' abilities. The underlying question for performing SWOT is always, "How to improve the

proposal/applicant team to make the project work while meeting the needs of the institute?"

The SWOT analysis recognizes that there are both internal and external factors that can affect the success of a project. The internal factors are addressed in the Strengths and Weaknesses, the external factors in the opportunities and threats part of the analysis.

S – Strengths

Any internal asset (know-how, motivation, technology, finance, business links) which will help to exploit opportunities (or to meet demands) and to fight off threats in order to present a successful proposal to a donor and fulfill the research question

W – Weaknesses

Any internal condition that hinders the applicants' team in meeting the demand of the donor or of answering the research question properly.

O – Opportunities

Any external circumstance or trend that favors the demand for the research topic of the proposal or the specific competence that the applicants offer

T – Threats

Any external circumstance or trend, which will unfavorably influence the interests of the donors in the research topic of the proposal, the applicants or the area in which the research might be conducted

The steps to make SWOT a strategic and operational tool involve:

- Preparing the ground (define the planning object and the mission of the planning team);
- Conduct the analysis by visualizing of strengths, weaknesses, opportunities and threats on a flipchart or whiteboard;
- Strategy discussion (relate results to the mission statement and derive strategy elements); and
- Operational planning (results and strategy elements are transformed into planning documents).

Proposal Writing Style and Language

The writing style of agricultural research proposal is the most important factor in conveying the researcher's ideas to the institution. Even experienced researchers must critically evaluate their writing to ensure that the best laid plans are presented in a clear, straightforward manner. The sections that follow represent primary concerns for proposal writers.

Language

The language we use in the commerce of our everyday lives is common language. We acquired our common language vocabulary and grammar by a process that was gradual, unsystematic, and mostly unconscious. Our everyday language serves us well, at least as long as the inevitable differences in word meanings assigned by different people do not produce serious failures of communication.

The language of science, specifically the language of research, is uncommon. The on-going conversation of science, for which a research proposal is a plan of entry, is carried on in system languages in which each word must

mean one thing to both writer and reader. Where small differences may matter a great deal, as in research, there must be a minimum of slippage between the referent object, the word used to stand for the object, and the images called forth by the word in the minds of listeners and readers.

Getting started

To be able to demonstrate high scientific quality; the researcher is advised to consider the following points before writing a research proposal

- Make sure the researcher has an up-to-date knowledge of the research area;

- The researcher should be aware of the priorities and interests of his/ her institution and know that institute is unlikely to support the same idea twice; and

- The researcher should not fail to discuss the proposal with colleagues or even with the planning experts and other relevant experts to share ideas at institutional level. Early discussions can ensure that the proposal is targeted appropriately.

The Care and Nurture of a Proposal

A proposal is a working document. As a primary vehicle for communication with advisors and funding agencies, as a plan for action, and as a contract, the proposal performs functions that are immediate and practical, not symbolic or aesthetic. Precisely because of these important functions, the proposal, in all its public appearances at least, should be free from distracting mechanical errors and the irritating confusion of shoddy format.

Every sentence must be examined and re-examined in terms of its clarity, grammar, and relationship with surrounding sentences. A mark of the beginner writer is the tendency to resist changing a sentence once it is written, and even more so when it has been typed. A sentence may be grammatically correct and still be awkward within its surroundings. The tough test is the best test here. If, in reading any sentence, a colleague or reviewer hesitates, stumbles, or has to reread the sentence

to understand the content, then the sentence must be examined for possible revision—no matter how elegant, obvious, and precise it seems to the author.

In Search of a Title

The title of the proposal is the first contact a reader has with the proposed research. First impressions, be they about crop. Livestock, soils, water, agricultural mechanization, livelihoods, food, or potential research topics, generate powerful anticipations about what is to follow. Shocking the reader by implying one content domain in the title and following with a different one in the body of the proposal is certain to evoke a strong negative response. The first rule in composing a title is to achieve reasonable parity between the images evoked by the title and the opening pages of the proposal.

The title should describe as accurately as possible the exact nature of the main elements in the study. Although such accuracy demands the use of specific language, the title should be free of obscure technical terms or jargon that will be recognized only by small groups of researchers who happen to pursue similar questions within a narrow band of the knowledge domain.

Writing the Proposal

In writing the research proposal, the research should

- Allow plenty of time to prepare the proposal. A good starting point is to write a one-page summary of the whole project. This may take a while to get right, but once completed it will serve as an invaluable tool for writing your full proposal;

- Use the proposal to show the need and then fill the gap;

- Present the proposal in terms of the aims and objectives of the institutions the researchers is affiliated with and not just his/her own – make it clear how the researcher should be able to meet research priorities and pother strategic objectives.;

- Consider the questions the institution will be asking and make sure that the proposal answers them. Be aware that you will have limited to none opportunities to

answer queries arising from a reading of your proposal; and

- Although it is the content that matters, good presentation is often crucial to making the research proposal accessible to reviewers and keeping their interest. Therefore it is advisable to appropriately consider the following aspects

    - Use diagrams and tables to add clarity;
    - Bullet points and sections can break up text;
    - Keep to page, word and font size restrictions; and
    - Activate the spell checker while writing

In structuring the research proposal the researcher should be able to check proposal guideline carefully–failing to meet the institution's format and specifications is one of the most common reasons for applications being returned

Title

This is the first impression readers of research proposal get. It is very significant. It is one of the ways that people other researchers or interested persons will locate the proposal and the findings of the research easily The title should be short and clear, and the reviewer should be able to understand from the title the intentions of the research.

A catchy title posing a question or including an apparent contradiction or acronym may be more easily remembered by a reviewer

In short the title

- may make or break a proposal;
- should be clear, concise, focused, and meaningful;
- should be free of jargon and exaggeration;
- understandable; and
- should be formal

Introduction/ Background

The problem proposed to be studied is introduced in this section It should help the reader to acquaint with the topic. This section of a research proposal should be short about one or two pages The problem should be stated in such a way that it's importance and relevance is realized by anyone who reads it .

It should elaborate the background (review of literature). This section reflects extensive review of literature done by

the investigator. This is the place where what is already known about the topic is written including the lacunae. Just quoting the literature verbatim will not serve the purpose. It is important to make it coherent, relevant, and easily readable knowledge. This part of the Introduction/ background helps the investigator to gain good knowledge in that field of inquiry. It also helps the investigator to have insight on different methodologies that could be applied

In short, this section should be used to put the work into context:

- what has been done before, and how will the proposed work add to it ?;
- What is the innovative aspect in the research project?; and
- Build the researcher's case by demonstrating his/her/their capability and familiarity in the area.

It should also be considered as

- Scene setting – what is known about the topic?;
- Generate interest;
- Show what has been done;

- Relevant theory and current issues;
- Descriptive and critical;
- Identify gaps / justify your study;
- The researcher should not assume reader knows his/her field; and
- Build on previous work or theory

Objective

The objective should describe what the researcher intend to achieve by doing this piece of work. Objectives are the small steps you need to reach in order to achieve your aim. Objectives should be realistic, consistent, and link them to methods, timetable, and outcomes.

Objectives are essence of the proposal and must state clear statements. They must be specific, measurable, and achievable.

Methodology

This section of a proposal has multiple parts, which include design, sample (sample size, and type) treatments, setting (description of the location), protocol (a step-by-step explanation of procedures) materials required, and data analysis plan.
It is a way to systematically solve the research problem. It may be understood as a science of studying how research is done scientifically. It is necessary for the researcher to know not only the research methods/techniques but also the methodology.

Researchers not only need to know how to develop certain tests and how to calculate the mean, the mode, the median or the standard deviation or chi-square etc., In this part of the proposal It is essential to discuss procedures clearly and completely with considerable amount of details . More careful considerations should be given to study design, study population / Sampling specifications, sample size needed, instrumentation, and Specific procedures .

The proposal should also include the important facilities required / available for the study namely computers, laboratories, special equipment etc.

Characteristically the methodology part of agricultural research proposal is identified as

- Must related to the research objectives;
- Highlight the breadth and depth of research;
- Identify variables;
- Research design – it would be good to put it into a flow chart;
- Data collection plan; and
- Give a detailed sampling plan–the target population characteristics, specific sampling plan, target sample size

The research should elaborate on resources especially, equipment and instruments as follows

- Describe the instruments to be used to gather/ generate data (tests, techniques, surveys, etc);
- Provide reliability and validity information to show techniques are valid for the study;
- Describe how the variables will be measured;

- Provide justification for selection of instruments based on theory, research question, subject characteristics, etc.; and

- Provide published reliability of instrument and plan to establish reliability

Outcomes, Outputs (Deliverables) and Dissemination

From the outset, the researcher is supposed to ensure awareness of the research project across collaborating bodies and stakeholders. It should also be noted that the researcher gives ownership of the research project outcomes to whom it may concern

In this section, the researcher should describe the contribution to knowledge and importance for future research, the benefits to users, and the broader relevance to beneficiaries. Highlight how results will be disseminated (publications, conferences, commercial exploitation, websites, ...).

Dissemination of research findings is pivotal to agricultural research projects. Dissemination may be

conducted in parallel with other research project activities as defined in the original project proposal. A comprehensive communication and dissemination strategy should be put in place including field demonstrations/ field days, website, liaison with professional associations, etc., and collaboration with the extension services

.

Research Design

How is the term `research design' to be used in this publication? An analogy might help. When constructing a dam there is no point ordering materials or setting critical dates for completion of project stages until we know what sort of dam is being constructed. The first decision is whether we need a large-scale irrigation, small-scale irrigation, earth dam, concrete dam, how canals should be constructed, or sprinkler irritation. Until this is done we cannot sketch a plan, obtain permits, work out a work schedule or order materials.

Therefore, research design covers the overall plan for achieving the desired answer to the research question or for testing the research hypothesis. Research design should be **chosen based on r**esearch question/hypothesis; strengths and weaknesses of alternative designs; and feasibility, resources, time frame, and other considerations.

The fundamentals for a successful research design are the followin:

- Clearly identify and label study design using standard terminology;

- Must specify the major elements of the design, i.e., variables, instruments , subjects: sampling frame, sample size, selection procedures, and timing of testing/intervention ;

- Must be consistent with objectives/hypotheses; and

- Must justify choice of design, i.e., appropriate choice to answer question, lack of bias/validity, precision/power, feasible and ethical.

A study design is a specific plan or protocol for conducting the study, which allows the investigator to translate the conceptual hypothesis into an operational one.

The design should be clearly stated. The design should be appropriate for achieving the objective of the study

In social surveys and experiments, too often, researchers design questionnaires or begin interviewing far too early before thinking through what information they require to answer their research questions. Without attending to these research design matters at the beginning, the conclusions drawn will normally be weak and unconvincing and fail to answer the research question.

It has been argued that the central role of research design is to minimize the chance of drawing incorrect causal inferences from data. Design is a logical task undertaken to ensure that the evidence collected enables us to answer questions or to test theories as unambiguously as possible. When designing research it is essential that we identify the type of evidence required to answer the research question in a convincing way. This means that we must not simply collect evidence that is consistent with a particular theory or explanation. Research needs to be structured in such a way that the evidence also bears on alternative rival explanations and enables us to identify which of the competing explanations is most compelling empirically. It also means that we must not simply look for evidence that supports our favourite theory: we should also look for evidence that has the potential to disprove our preferred explanations.

Samples and their specifications

Sampling in agricultural research is generally conducted in order to permit the detailed study of part, rather than the whole, of a population. The information derived from the resulting sample is customarily employed to develop useful generalizations about the population. These generalizations may be in the form of estimates of one or more characteristics associated with the population, or they may be concerned with estimates of the strength of relationships between characteristics within the population.

Provided that scientific sampling procedures are used, the selection of a sample often provides many advantages compared with a complete coverage of the population. For example, reduced costs associated with gathering and analyzing the data, reduced requirements for trained

personnel to conduct the fieldwork, improved speed in most aspects of data summarization and reporting, and greater accuracy due to the possibility of more intense supervision of fieldwork and data preparation operations.
It is important to describe which would be the study population. How proposed study subjects would be selected including randomization process and other details should be given.

It is important to mention in the methodology what would be the minimum sample required and how it is arrived . It is clear that Determination of sample size is a bargain between precision and the price (resources and expenses involved).

In order to prepare a suitable description of a population it is essential to distinguish between the population for which the results are ideally required, the desired target population, and the population which is actually studied, the defined target population. An ideal situation, in which the researcher had complete control over the research environment, would lead to both of these populations containing the same elements. However, in most studies, some differences arise due, for example, to (a) no coverage: the population description may accidently omit some elements because the researcher has no knowledge

of their existence, (b) lack of resources: the researcher may intentionally exclude some elements from the population description because the costs of their inclusion in data gathering operations would be prohibitive, or (c) an ageing population description: the population description may have been prepared at an earlier date and therefore it includes some elements which have ceased to exist.

Describing the process

The research proposal should include the details of all process to be adopted in the study. This includes how exposures, outcome variables and other variables are going to be measured should be described in detail. A brief description of how the data will be processed and use of statistical package if any should be given. What statistical tests of significance would be used?

The steps of the research process and provide an example of each step for a sample research study.

Step 1: Identify the Problem

The first step in the process is to identify a problem or develop a research question

Step 2: Review the Literature

Now that the problem has been identified, the researcher must learn more about the topic under investigation.

Step 3: Clarify the Problem

Many times the initial problem identified in the first step of the process is too large or broad in scope. In step 3 of the process, the researcher clarifies the problem and narrows the scope of the study. This can only be done after the literature has been reviewed.

Step 4: Clearly Define Terms and Concepts

Terms and concepts are words or phrases used in the purpose statement of the study or the description of the study. These items need to be specifically defined as they apply to the study. Terms or concepts often have different definitions depending on who is reading the study.

Step 5: Define the Population

Research projects can focus on a specific group of people, breeds, varieties, strains, species, agricultural inputs, agro-ecologies, , marketing efforts, or the integration of technology into the operations.

Step 6: Develop the Instrumentation Plan

The plan for the study is referred to as the action plan. The action plan serves as the road map for the entire research, specifying who will participate in the study; how, when, and where data will be collected; and the content of the program.

Step 7: Collect Data

Once the action plan is completed, the actual study begins with the collection of data. The collection of data is a critical step in providing the information needed to answer the research question.

Step 8. Analyze the data

All the time, effort, and resources dedicated to steps 1 through 7 of the research process culminate in this final step. The researcher finally has data to analyze so that the research question can be answered. In the action plan, the researcher specified how the data would be analyzed. The researcher now analyzes the data according to the plan. The results of this analysis are then reviewed and summarized in a manner directly related to the research questions

Person(s) Responsible

Proposal should include who are the primary investigators and co- investigators, their qualifications, research experience etc . The proposal may also include the major roles to be taken up by different investigators.

Proposal should include who are the primary investigators and co-investigators, their qualifications, research experience etc. The proposal may also include the major roles to be taken up by different investigators

The Principal Investigator (PI) bears ultimate responsibility for all activities associated with the conduct of a research project. The PI remains ultimately responsible even when some aspects of the research are delegated to other members of the study team.

Co-Investigators (Co-Is) are a subset of Key Personnel who have special responsibilities on research projects. Co-Is are obligated to ensure that the project is designed and conducted according to the proposal.

PIs must personally perform or delegate to qualified co-investigators or research staff all of the necessary tasks to carry out their studies. Even when specific tasks are delegated, the PI remains ultimately responsible for proper conduct of the study and fulfillment of all associated obligations.

The PI must provide members of the research team with sufficient oversight, training, and information to facilitate appropriate safety procedures and protocol adherence

Budget

The researcher should be able to imagine in the middle of the research—what will he or she need get there? What will the daily routine be? What expenses are necessary for the researcher to complete the research project? What assets does the researcher have to commit to the researcher project? Subtracting assets from expenses, what does a researcher need to support the research project?

The budget translates project activities into monetary terms. It is a statement of how much money will be required to accomplish the various tasks

In developing a research budget, the researcher should

- **Be consistent**—make sure your budget and proposal match;

- **Be conservative**—economize when you can;

- **Be careful**—provide for your basic needs, as well as health and safety; and

- Use common sense and research skills to arrive at specific line items

Action Plans

The proposal should include the sequence of tasks to be performed, the anticipated length of time required for its completion and the personnel required.. It can be presented in tabular or graphic form. Flow charts and other diagrams are often useful for highlighting the sequencing and interrelationship of different activities in the research

For research projects in which several partners are involved sufficient information has to be provided on how the research will be managed. This includes timescales, milestones, communication, and criteria to measure progress, how crisis situations and conflicts will be handled, etc.).

The Elements of a research action plan are **Changes (Interventions)**—to be sought or implemented; and **Action Steps**— who will do what by when to bring them about.

When creating a plan with action steps for each activity sought, minimally describe What specific change or aspect of the intervention will occur, Who will carry it out, and When it will be completed or its duration

To develop a Research Action Plan the following steps should be taken:

Step 1 Identify the aim/purpose of the investigation.

Step 2 Generate a number of focus questions to be addressed by the investigation.

Step 3 Decide which primary and secondary data are needed to answer the focus questions.

Step 4 Identify the techniques that will be used to collect the data.

Step 5 Collect primary and secondary data.

Step 6 Process and analyze the data collected.

Step 7 Select presentation methods to communicate the research findings effectively.

Step 8 Propose individual or group action in response to the research findings and, where appropriate, take such action.

Collecting Facts

In many respects agricultural research refers to a search for knowledge, thus it means a scientific and systematic search for pertinent information on a specific topic. It is also true that research is an art of scientific investigation; hence, its purpose is to discover answers to questions through the application of scientific procedures in agriculture.

A good research proposal is based on scientific facts and on the art of clear communication.

Why should a researcher collect facts/ information about a problem?

The advantages of having this facts/ information readily available are enormous. Having information about a problem is really a worthwhile task, for many reasons. Some of these are:

Knowledge: knowing the facts about a problem is a stark way of determining the size of the gap between the vision of a researcher and the reality in which the researcher live. Gathering information from the time period before your organization got started (also known as baseline data) is an excellent way to show the magnitude of the problem.

Credibility counts: if the researcher is able to talk easily in a casual conversation about the exact numbers of people affected by the issue he/ she is involved in, come across as knowledgeable, serious, and well organized. Writing down those same figures (in detail) as part of a grant application or project summary for potential funders and evaluators may say that the researcher is a well-run person who can get the expected output.

Awareness leads to change: a researcher can use the statistics to raise community awareness of the problems: how serious the problem is, how well (or how poorly) the farmers are doing in relation to other communities or to the nation as a whole, and last but not least: how well the researcher's coalition is attacking the problem at hand.

How do you collect this information?

So, how do researchers go about finding the facts/ information? There are two ways to go about it: a

researcher can use information that is already out there (after all, there is no sense in reinventing the wheel); or, if what researchers are looking for just does not seem to exist, as a researcher you can collect new information yourself. Either way, there are ten steps you will want to go through, to help make your information collecting as efficient and as painless as possible.

Steps in information collection

- Agree on the value and purpose of the information that the researcher will collect;
- Determine when the researcher want to use this data;
- Determine exactly what the researcher want to know;
- Determine who will find the information;
- Identify possible sources of information;
- Set limits as to how much information you want to collect;
- Collect the data;
- Identify gaps in your knowledge;

- Redo the process to try to fill those gaps or collect your own data; and
- If possible, the researcher might want to compare data for your community with that of other communities, or that of the nation as a whole or to trend out your own community's data over time

In collecting new facts / information, the researcher may do the following:

- Identify the method of collecting information that is best suited to your purpose. Different methods that are often used include;

- Decide if you want to inform the public of what you are doing;

- Train the people who will be collecting the information;

- Collect and tabulate your data;

- Report (and use) your findings; and

- Continue to review and collect information on a regular basis.

Expectation of Proposal Reviewers

In the review process which will be undertaken at different levels, several aspects will be thrown to the researchers attention regarding the proposal. The following are the major expectations of reviewers.

- High scientific quality;
- Proposals that fill a knowledge gap;
- Novelty and timeliness;
- Value for money;
- A clear and well thought out approach; and
- An interesting idea – catch their attention

Reasons for Unsuccessful Research Proposal

A number of different reasons could be mentioned that would affect the success of a research proposal. The research should be able to focus on the following so that a the proposal will not be rejected.

- The problem is of insufficient importance;
- Purpose or demonstrated need is vague;
- Problem is more complex than the propose realizes;
- Research is based on hypothesis that is doubtful or unsound;
- Proposed research based on conclusions that may be unwarranted;

- Assumptions are questionable;
- Evidence for procedures is questionable;
- Approach is not rigorous enough, too naïve, too uncritical;
- Approach is not objective enough;
- Validity is questionable, criterion for evaluation are weak or missing;
- Approach is poorly thought out; methods poorly demonstrated;
- Application is poorly prepared or poorly formulated;
- Proposal is not explicit enough, lack of details, too vague or too general;
- Rationale is poorly presented, logical processes not followed;
- Methods or procedures unsuited to stated objectives;
- The design is too ambitious or otherwise inappropriate;

- Some administrative or practical problems are unsolved;
- Unethical or hazardous procedure will be used;
- The procedure is not well enough organized, coordinated or planned;
- Some problems are not realized or dealt with adequately;
- The overall design is unsound or some techniques are unrealistic;
- The results will be confusing, difficult to interpret or meaningless;
- Results from previous research are inadequate; and
- Proposer's knowledge or judgment of the scientific literature is poor

Quality of a Proposal

All agricultural research proposals are different but the following factors are common to all good pieces of research proposals.

- Informative title;
- Clear research questions;
- Pertinent background and rationale;
- Understanding of research issues;
- Understanding of the research area,
- Relevant previous works;
- Appropriate population and sample;

- Appropriate information gathering techniques;
- Appropriate measurement and intervention methods;
- Quality control;
- Adequate sample size;
- Sound analysis plan;
- Ethical issues well addressed;
- Tight budget;
- Realistic timetable; and
- Identify strengths and limitations;

Writing a Good Research Proposal: TIPS

A researcher should emphasize on the following issue to be able to produce a winning proposal

- Allow plenty of time;
- Start by writing a summary of your proposed project;
- Demonstrate an up-to-date knowledge of your field;
- Present your proposal in terms of the aims and objectives of the institute;
- Avoid jargon – say what you mean in clear, simple language;
- Do not be afraid to state the obvious;
- Anticipate questions that may arise, before they arise;

- Ask a colleague to review your proposal; and

- Be enthusiastic about your idea – if you do not sound interested, why should anyone else be ?

Integrity in Research

Once the proposal is accepted and the researcher is undertaking the study, he/she has to follow ethical process by way of achieving integrity in the research. The following are major considerations:

- Intellectual honesty in proposing, performing, and reporting research;
- Accuracy in representing the contributions of individuals to developing and writing research proposals and to subsequent reports and publications;
- Collegiality in scientific interactions, including oral and written communications and use of resources;
- Protection of human subjects, humane care of animals, and responsible treatment of the environment; and

- Respect for the individual and collective responsibilities of investigators and their research groups

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