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# Part 2

## How to approach academic research

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This part of the book is designed to help you to get started, select your topic and develop and write up your thesis in a way that meets academic requirements. All academic research is primarily directed toward a better understanding of our world. As a graduate student your research is also required to give you practical experience in doing research and to test your ability as a future academician. Graduate research work, particularly in Africa, can make a significant contribution to farmers, service providers, entrepreneurs, communities and/or policy-makers and development agencies.

Your primary objective is to obtain your qualification. We hope that you are also motivated by a desire to serve rural communities. If your research is funded outside the university, then the sponsors will require that your research contributes to their project objectives. If your work is applied, then those with whom you will be researching or working with will expect your research to contribute to their own productivity or development agenda. This can place you, the student, in a difficult situation. The requirements of the project are likely to be made explicit to you. You need to be aware of the requirements for your academic thesis. You can then take steps to balance this with what you are asked to do for your project. The most important thing is to be very clear with the funding agency what you are required to deliver for them. This way they cannot keep changing the goal posts. It also means that you can be sure to adapt your research from the start so that it is able both to achieve the required funding objectives and your personal objective of obtaining a higher degree.

**Kay Muir-Leresche**



# 2.1

## Research for whom?

Bharati K. Patel

- Two-thirds of the African population reside in the rural areas and are involved in agriculture
- Farmers voices must be heard and their participation is essential to bring about change
- Africans can and must solve African problems
- You can make a difference
- Universities must work closely with research and extension services
- Learn by doing – get your hands dirty
- Be aware of the limitations of your research methods
- You should honestly assess the value of your research
- There is great satisfaction in being of service to others

*‘Whenever in doubt apply the following test: Recall the face of the poorest and the weakest man whom you may have seen and ask yourself if the step you contemplate is going to be of any use to him. Will he gain anything by it? Will it restore him to a control over his own life and destiny? In other words, will it lead to self-reliance for the hungry?’*

**Mahatma Gandhi**

Advice to policy-makers

### Research for whom?

Research for the millions of small-scale, resource-poor farmers who have to eke out their livelihoods from agriculture. Nearly two-thirds of the population on our African continent is dependant on, or involved in agriculture. If we want to reduce poverty, feed all our people and develop then agricultural productivity must increase. We cannot ignore or bypass this large sector of our population.

There are many problems to solve in agriculture. Much research has been done and many technologies have been developed, but why are so many of them still on ‘the shelf’? There are a number of reasons why this has happened but for the most part it is because the technologies are not relevant to farmer’s circumstances. To be effective new technologies must fulfil an identified need.

**Farmers’ voices must be heard through their active participation in helping to set research priorities. Only then will research and progress be in step.**

Agriculture and rural development have progressed significantly in Asia and Latin America, why not in Africa? The development journey began at about the same time for all three regions, but Africa has remained stagnant at one tonne per hectare. Cereal output is now at 2.5 tonnes per hectare in South Asia and 4 tonnes in East Asia. We need to change the situation in Africa. Lessons learnt from the Green Revolution in Asia can be applied to raise productivity in Africa but for this to happen agriculture needs to be given centre stage. We can only change this situation if each one of us makes a

commitment to serve and better the lot of the majority of Africans. We need to invest in research and we need to invest in training our agricultural and environmental scientists and leaders of the future.

Some of our governments have slowly come to realise that the small-scale farming sector really needs better support because agriculture is the engine for growth and development, and because poverty-reduction goals cannot be achieved without such support. The Asian governments supported agriculture and benefited from the Green Revolution in feeding their large populace, but African governments wanted to bypass agriculture and leapfrog into industrialisation. Even in those African countries where there was investment in agriculture, it was only in the large-scale sector. Kwame Nkrumah did not heed the report of the economist W Arthur Lewis who advised that Ghana should give priority to food production before embarking on the road to industrialisation. Nkrumah even abolished the national extension system! Korea and Ghana in 1957 had the same per capita income and Ghana's gross domestic product (GDP) was higher than Korea's. Now Korea is a developed country and Ghana is at long last heeding Lewis's advice, having learnt a bitter lesson. Nigeria's experiment with industrialisation is another glaring failure, yet even today many African countries do not give

### **Box 1. My personal research journey – Bharati Patel**

I joined the research service in Zambia in 1971 immediately after getting an MSc degree in plant pathology that required a dissertation and a research study. I did my MSc when chemical control was the in thing and you could always find a chemical control measure to get rid of a disease or pest problem.

My dissertation was on brown spot and blue mould (Wild Fire) of tobacco, and my practical research was on potato dry rot (*Rhizoctonia solani*). During this practical research I learned a lot about varietal reaction to the same pathogen, how size and time of infection affects the quality of potatoes, how long the disease survives in the soil, and how farmers were dealing with the problem.

My first sole assignment when I started work was to solve a disease problem on the greens of the largest golf club in town! I knew nothing about fairy rings, but did manage to identify the cause and provided a chemical solution to the problem.

In those days pathologists and entomologists had to do research and provide a diagnostic service by identifying pests and diseases on samples sent in by farmers – mainly commercial large-scale growers because very few small-scale farmers took advantage of this service. This taught all the staff a great deal about holistic diagnostics and stood them in good stead when they went to the field.

One redeeming feature of the job was an annual tour of one whole province of Zambia and that included visiting farmers of all types – in some areas there were only small-scale farmers. These tours allowed me to observe and learn much about development and problems in the rural areas. We travelled by landrovers over every bump and got stuck many times because the tours were made during the rainy season. It was a wonderful way to see, and learn while building relationships and networking with colleagues from other agricultural divisions – extension, veterinary services, land use planners and those working in the University and the National Council of Scientific Research. In those days I remember we used to have unspent budgets! so adequate funds were available for our research, for travel within the country, to buy books, and to print advisory booklets or pamphlets. Farmer training institutes in the rural districts were well funded. Research centres based in the provinces did do research for the smallholders. They bred beans for local conditions that were based on taste preferences and would fit into local intercropping patterns, and developed sunflower varieties for smallholder production.

agriculture the priority it deserves. Small-scale agriculture can be productive; it helps retain earnings in the rural areas and can have a significant impact on unemployment, as experience in Asia has proved.

The Millennium Goals gave very little emphasis to agriculture but this is changing and agriculture and capacity building for agriculture are now receiving a higher priority. The environment, infrastructure and population density make things different in Africa. The situation calls out for research into what is limiting progress. The contribution you, as a postgraduate, can make is significant.

**We need young Africans to take up the challenge and invest their time and brain-power in agriculture. You must lead the way.**

### **Farming systems came to the forefront in the early 1980s**

The shift in focus in research came in the early 1980s. The emphasis moved to smallholders. Integrated research teams were formed involving economists, agronomists, and sociologists. Adequate funding was provided by donors for these teams, and even though they were looked upon as the 'prima donnas' of the research systems, they did do research in the rural areas on smallholder farms. Funds from government coffers were stable but started to shrink in the mid-1980s and fell to critical levels in 1990s. Major staff training efforts were launched in the national agricultural research systems (NARS), extension and other divisions of the ministries of agriculture with support from donors at this time. An expansion in capacity development that was much needed. Interaction with the international agricultural research centres (IARCs) became stronger in the 1980s and in the 1990s non-governmental organisations (NGOs) entered the agricultural scene with a bang! Today there are many players/actors in the agricultural research and extension arena and agriculture involves many more institutions and organisations than the traditional NARS, IARCs and universities.

### **The two decades after independence can be identified as the period of growth for agricultural research in Africa**

Unfortunately small-scale farmers were not clearly identified nor targeted by research services during the period following independence – they just loomed in the background – forming a backdrop – hence, the road to enlightenment, awareness and duty to identify and assist those who most require our assistance was a long one. The smallholders slowly came into the picture and focus and now hold the centre stage for agricultural developmental activities. There was a transition and a slow change from a classical model of conducting research on-station to advocating and supporting on-farm research by all scientists in the research service.

What stood out was that **good science** – the currency of researchers, whether in the laboratory or field or participatory-based is a **must**. And that you need well-trained scientists to do the research. You reflect on your life and achievements from time to time – and you ask yourself the following questions 'What have I achieved/whom have I helped?'; 'Have I made the best of my opportunities?' Honest reflection often gives you the impetus to go the extra mile. You have to be curious, open-minded and keen to learn to take advantage of all the opportunities that come your way.

### **Your research journey**

**Researchers of today have a clear-cut focus/goal because smallholders are now specifically identified as the target and beneficiaries of research.**

You must be aware that even if your research does not benefit the farmer immediately, ultimately it should. You must also to be aware that you cannot solve all their problems – you

have to empower them to be able to carry out some research on their own in order to find solutions to suit their reality. It still stands that farmers need to be provided with a basket of options, such that they can choose or select options or components of a technology that suit their particular conditions.

Many advances have been made in conducting research in the field and in ways of involving the smallholders – their knowledge and participation is now fully recognised as being of core importance. Different ways of engaging stakeholders and integrating their participation are being tried out in many developing countries of the world. Farmer field schools were first tried out in Indonesia in the rice-based systems and have now spread to our continent. **The cost of on-farm research is high.** This high cost of field research makes it imperative that the farmers become part and parcel of the research and development process. The pros and cons of each approach or methodology should be well scrutinised, revised and refined before being used under African conditions. The costs of field research need to come down through the development of new approaches so that we can reach many more farmers. This is a challenge for all of you.

**Africa has all the natural and human resources to produce adequate food for its people.** Good supportive proactive policies for smallholders, that hold steady over a period of time, would allow the farmers to adapt and grow. **There is much to be done and it can be done.** We need more innovative indigenous approaches that are based on good science if we are to reach enough farmers.

### **Mapping the landscape/situation analysis**

Mapping the landscape and analysing the situation are essential to any research. You need to collect all the available information or data on your topic/pest/disease/soil/system area so that you can sense where your research fits into the agricultural research agenda. This will help you understand what type of research you are doing and where it fits in the research continuum. It took over 20 years of research and interaction with NARS by an IARC for one chickpea variety to be released to farmers. Not much work had been done with chickpeas when the research project started. It began with germplasm collection, evaluation, and selection, and progressed through the initiation of a breeding programme, to field trials, seed multiplication and the eventual release of the new variety. Remember basic or strategic research will take longer to reach the main beneficiary (the small-scale farmer) than applied or adaptive research. The information that you collect while preparing for your research proposal will give you an indication of the importance and relevance of your research. Research results from NARS are usually found in their annual reports. Scientists of the NARS systems do not often publish their results in peer-reviewed journals as do the academics and scientists from IARCs. Most of our National Research and Extension Services (NARES) have a backlog of annual reports. Hence you will need to make personal contact with the staff of these vital services to get the information you need.

### **The role of universities**

**The main function of the university is to create and disseminate knowledge. The primary function is to provide degree training. But, since universities have highly trained staff, their research capacity and involvement in carrying out relevant problem-solving research for the country is vital.**

In his lecture on ‘The Institutions and the African Farmer’, Eicher (1999) makes a logical case for the university to be part of the triangle which includes the national research institutes and extension services. The university/faculty needs to be part of this triangle if it is to provide you with the best possible training in agriculture. It is the university that produces the future staff

of the national institutions. The three institutions should be closely linked. The need for them to work together collectively is obvious but not so easy to put into practice. In some countries integration has been attempted at some level as in Kenya where universities can apply for grants from the Kenya Agricultural Research Institute (KARI) to carry out specific pieces of research. Uganda has also gone some way along the road to integration. The World Bank's Agricultural Knowledge and Information System (AKIS) also supports closer integration of the three main national agricultural institutions: research, extension and the universities.

At the individual level interaction is possible but institutionalising integration requires much more effort and appreciation of each other's strengths and weaknesses. But working at the field level demands not only the input of research scientists based in provincial research stations but also the extension staff based at district/county or sub-county level.

### **Graduate research: learning by doing**

You may have done a small research study as part of your Bachelor's degree. This might have involved some simple tests or measurements such as monitoring the spread of a disease in a plot or field or examining the effect of some chemical on disease or pest control. This will have given you an insight as to what goes into a research study and how to measure the effect of something on a plant, or soil. Such experience helps you to become proficient in spotting a trend or an effect and in turn allows you to make a judgement or perhaps reach a conclusion.

**The best way to learn is by getting your hands dirty. Share with the farmers, live with them, and learn their problems first-hand.**

#### **Box 2. Journeys away from your comfort zone – Rose Njeru**

Rwanda has unique terrain: consists of steep slopes and valleys and is often referred to as a country of a thousand hills. This is in contrast to my previous research sites, the relatively flat coastal zone of Kenya. Therefore, on-farm research sites in Rwanda are quite different and the need for physical fitness so as to climb the slopes whose gradient can be up to 80% cannot be underestimated.

Although I am fluent in English and Kiswahili, I have no working knowledge of either French or Kinyarwanda, which are commonly used in Rwanda. Documentation of current research findings is in English but previous information is mainly in French, thus, having a grasp of the context has been a challenge. These conditions have made me appreciate and become a better team player. I need to rely on those around me with better history and knowledge of local conditions.

After working in an institution with relatively good laboratory facilities for over 15 years, working with fewer facilities and trying to assist in improvements has not been easy. Also, transport facilities for scientists at ISAR is extremely limited and use of public transport is common and time consuming.

At ISAR, most of the staff are below 40 years of age, a dynamic team with limited research experience. I have embraced this as a brilliant opportunity to mentor young scientists to gain that essential experience. In addition, things move relatively slowly in Central Africa. Thus, the need for patience as one adapts to the system is crucial. Compared to the easy connections to various travel destinations from Nairobi, options are much fewer from Central Africa.

In general the challenges of working in a new environment with unfamiliar norms and language is balanced by the rewards of getting to know new cultures and learning how similar we all are. The rewards of being able to make a difference and the personal enrichment far outweigh the difficulties faced.

You learn from practical experience what effort farmers expend on agriculture; the time, energy, opportunity costs and risks they take to eke out a living. The understanding gained will be most useful to you for the rest of your life, and your post-graduate years are the best opportunity many of you will have to gain that first-hand experience.

At the MSc level the research period is usually about 2 years. At the field level this time would allow you to gather data over one or two rainy seasons depending on the crop you are studying and where you are situated in the unimodal or bimodal regions of Africa. At the PhD level your work will cover a period of 3-4 years. In this time you may or may not get a conclusive result but will gain an understanding of the problem or situation and realise that research can be a long process.

### **More ways than one**

You should be aware that there are many ways to get an answer and that your chosen approach may or may not have added advantage over other approaches. You must be realistic in selecting an approach and be objective when drawing conclusions. You need to be aware of the pros and cons of each methodology. Discuss this with the biometricians in your faculty before embarking on your fieldwork. You should also be aware that in a biological living system everything is affected by everything else. The system is complex and the effect can be compounded. We tend to study effects of major variables – the variety being used, the status of the soil, rainfall pattern and management. You can look at the effect of one insect or pathogen or you may choose to look at the effect of a combination of factors such as the effect of diseases or pests on growth, or to study the interactions between the factors on the crop. Your research could fill a gap in the knowledge, or it might be of an exploratory nature, that focuses on listing of all problems and issues linked to a certain crop and then prioritising the problems from the farmers' perspective and experience. Your research might just validate a result already obtained elsewhere in the country or region, or it could adapt technologies from elsewhere to local conditions.

### **You should assess the value of your research**

Where does it fit in the farmers' priorities list? It may also be useful to see how it fits into district, provincial or national level priorities. What type of research? Is it basic or strategic, applied, or adaptive? Discuss all these aspects with your supervisor, NARS scientists, extensionists and others working in the field. If possible you must try to work on a relevant and real problem that farmers face. Seek out academics who prefer to work in the field as your supervisors. 'Outreach' is now accepted as function of the universities and hence it is possible to do research in farmers' fields. 'Service orientation' (service to others, to your nation and to the farmers) should be part of the curriculum. Whatever type of research you undertake from laboratory-based molecular biology to economic/policy research – what you have to keep in mind is that the ultimate beneficiary is the small-scale farmer. We must all acquire a developmental mind set. As my boss used to say frequently 'Africans must solve Africa's problems' – outsiders can assist or facilitate but Africans must take the lead in charting their destiny. **Your role is to take up that challenge and serve your country and the rural poor by applying your talents positively.** At the MSc and PhD level you are just beginning the journey – which path you take will depend on your ambition and/or the jobs or opportunities available. Your first research project is a learning exercise – your first hands-on experience.

**The journey is long but the satisfaction of being of service – bettering the lives of others, creating knowledge, training and seeing your name in print – makes it all worthwhile.**

### Important things for a Change Agent to remember

- 1 Respect for all – everyone is important and everyone can contribute their own knowledge – the farmers, the extension worker, everyone involved in rural transformation.
- 2 Learning together – make this your motto – observe, question and keep on learning – you never stop learning because you do not know everything!
- 3 Be transparent in all your dealings – when you do not know something, say so – you can always find out!
- 4 Empower others – give them space to learn and lead.
- 5 Build solid relationships with the farmers – make their reality matter.
- 6 Development does not occur overnight – it takes time; be patient.
- 7 You will have to play many roles, researcher, advisor, listener, convenor, negotiator, facilitator, social worker and more.....Be prepared.....
- 8 Be a good team player.
- 9 Make room for reflection and enhance your analytical abilities.
- 10 Have a vision...an individual can make a difference .....one little mosquito can and does!

### Resource material and references

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# 2.2

## The first steps – literature reviews and references

Kay Muir-Leresche

- What research would fascinate you and what are you good at?
- Consider the problems that need to be solved – use your everyday experience to help you
- Look for projects working in this area which you could join
- Carry out a preliminary literature scan and Internet search
- Narrow down the broad topic to the specific area you would like to research
- Avoid reinventing the wheel
- Use literature to show the contribution your research will make
- Synthesise, summarise and be critical. Do not just paraphrase literature.

*‘Every man is a borrower and a mimic ... and literature a quotation.’*

**Ralph Waldo Emerson (1860)**

*Society and Solitude*

### The first steps

#### Assess your ability

Carefully assess your strengths and weaknesses. Consider first in which subjects you are strongest and which most fascinate you. Remember that you will have to maintain your interest and enthusiasm for the topic for a long time – often many years. Enjoying and having a good grasp of the subject area you work in is important. Then consider whether you would be better working with abstract concepts emphasising theory and mathematical models (basic research), or if you would be better working more closely with people in a practical and development, or policy-oriented way (applied research). You do not need to decide anything at this stage. You just need to have a realistic view of what you can do and where your interests lie. You will be most effective if you are able to be passionate about your research so it is very important to choose interesting topics and an approach which suits your personality and abilities.

#### What issues need research

When you have thought of your strengths and interests, you need to think about the world in which you live. In your own opinion, and based on your experiences, what do you think needs to be researched? Ask yourself such questions as:

- Is there a particular soil type that appears to be unproductive for a particular crop or in a certain area?
- Are farmers’ decisions relating to resource use leading to soil erosion?
- When you were studying biochemistry, the only examples used were analyses of tests from another continent – would it be interesting to run similar tests on local soil?
- Does goat manure appear to be more economic than cow manure in improving the productivity of soils for growing maize?

- Are the currently used physical measurements of soil structure relevant in a particular situation?

These sample questions are from different disciplines but are all directed at considering the productivity of soil in one particular area. It is you who decides what the most interesting research needs might be in the particular topic and area you are considering. A few students will focus on basic research, but most African graduate students will be primarily focused on addressing their research to real-world problems. Your own life experience can be an important contributor to your understanding of issues and problems:

- What problems do your parents face on the farm?
- What products or services are not meeting your needs as a consumer?
- Which government policies are making it difficult for your uncle to establish a business or for your cousin to market the commodities she grows?

These and other questions could all be inspiration for the starting point of your research. Your observations of the world – even simply that some farmers get better results than others – can all lead you to problems to research as you consider why. You will then use theory as a central component to solve the problems, even in applied research.

Your starting point could even come from a news report or from a crisis the country is going through, or from a change in government policy. Reading literature, journals, Internet articles, books and even your studies will provide most of you with ideas for applied research. A literature search and your own laboratory experience are often the main source of inspiration if you are more interested in basic or theoretical research.

### **Find out about existing projects**

When you have some idea of your field or fields of interest, approach your university lecturers and find out if there is an on-going project in this area which you may be able to join when you carry out your research. It is useful to indicate your interest early.

**Do not make an approach to them, even informally until you have briefly looked at some literature so that you are able to talk with some confidence on the topic when they question your interest in the research.**

Look outside the university as well. Research goes on in many different organisations – national, regional, international and even some commercial. Many have schemes for attaching students from universities, and often have better-funded projects that can help support students.

If you are prepared to finance your own research then you will have more control over what you research and the approach you use and you can go directly to a more-detailed literature search. If you have already been recruited to a project, then your choice of field and approach to be used may be prescribed for you, but the emphasis you place on different aspects will still be up to you.

### **Do a preliminary literature search**

Once you have some idea of the topics you will investigate, carry out a preliminary search of the literature. If you have access to the Internet that is a good place to start. If your university does not provide good Internet access then you might have to invest a bit of your own money in using a public Internet access point ('cyber café'). If you do not have Internet access, then go to your libraries and search by subject matter. There are some journals which provide abstracts of recent publications in particular fields. Also go to relevant journals and glance through the article titles, occasionally stopping to look at abstracts. Many African agriculture faculties and libraries have access to CD-ROM literature databases, like the Essential Electronic Agriculture

Library (TEEAL) which is a full text collection of core journals in agriculture and related fields. TEEAL is compiled by Cornell University. It is most useful, particularly as you can scan and print the abstracts, and only print a few of the most relevant articles. Given the high cost of printing, it is not advisable to print much when you carry out your initial exploration of the literature.

### Narrow down your research topic

After you have looked at some of the literature relating to the topic of your interest, you should be in a position to begin considering exactly on which area you are going to focus and to start to narrow this area to a researchable problem. Now go and visit lecturers, research funders, stakeholders and other persons involved in the work you are interested in pursuing. Discuss with them your ideas and what you hope to achieve. You can then begin to put together your research proposal. This will require you to consult the literature in more depth and to start looking at the theoretical literature and the data collection and analytical methods that may be appropriate for what you want to achieve.

Research is an on-going process and your thesis will represent one cycle. It will not be the end of research into the topic. One of the purposes of academic enquiry is to develop further questions for research. (Figure 1).

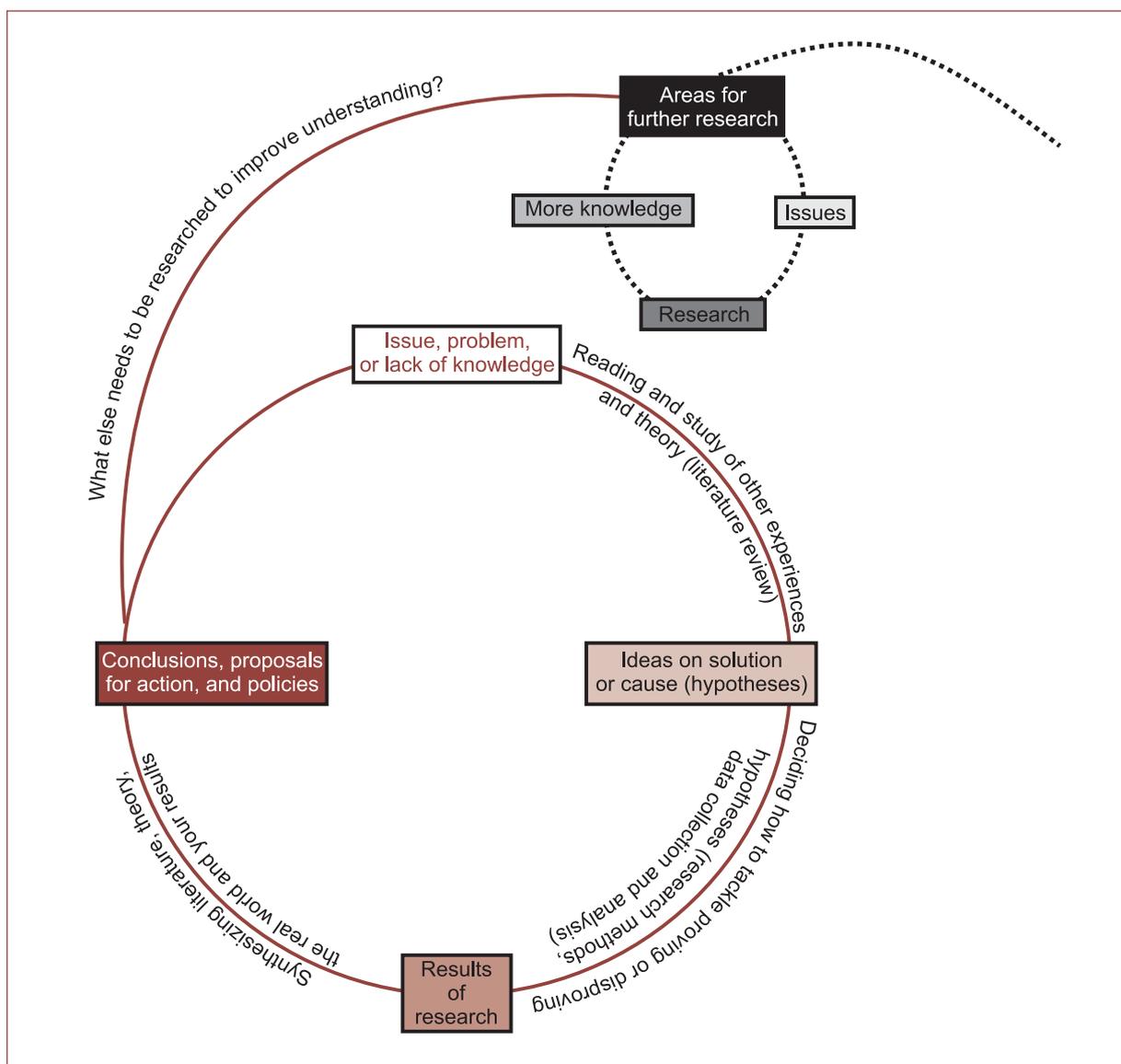


Figure 1. The cycle of research

The purpose of research is to increase knowledge. The scientific process starts with a problem that needs to be addressed. After reading and consultations, you should be able to come up with some ideas of cause and effect and to present the issues to be researched as one, or a series of hypotheses. You will collect data in a variety of ways: in the form of experiments, or surveys, and/or literature and secondary data sources. This data will then be analysed and interpreted and, where appropriate, presented as recommendations and areas for further research. Your conclusions will be based both on analysis of the data on theoretical principles and the literature review. With the new questions posed by your research, the cycle will begin again.

## Literature review

### Your literature review

- Identify earlier work in your field – avoid reinventing the wheel
- Use the literature to show how your research will contribute to greater understanding of the subject
- Synthesise and summarise the earlier studies in a way that links together and highlights and resolves conflicts between different approaches
- Be sure that your review is critical and keeps showing the reader its relevance to your study.

### Purpose

It is a tragic waste of our precious human resources to continually re-invent the wheel.

Reviewing literature takes up considerable time for all academics – even those involved in the most theoretical, mathematical or practical research projects. It is particularly important to those addressing descriptive or policy issues. One of the main reasons that reviewing literature is so important is to avoid your spending long hours investigating something that has already been investigated! Re-investigation is only appropriate if you consider the previous research process inadequate, or if a different research method or new technology could produce different results.

For both masters and doctoral theses you will need to demonstrate your understanding of and competence in the research process, research techniques, interpretation and presentation. Your work must contribute to the body of knowledge but only doctoral theses have to demonstrate that the research constitutes an original investigation or testing of ideas or, if it is predominantly descriptive research, that it is in an unexplored area.

In order to demonstrate this you will need to provide a review of the literature to show you are not re-inventing the wheel. You will also require the literature to describe the problem you are researching and to explain why you consider it worthy of research. You will need a review of the theoretical literature in order to provide for the logic behind your hypotheses and for the interpretation of your results. You will need to use literature as evidence to support many of your statements, both theoretical and empirical, during the course of writing your entire thesis.

**A thorough understanding of the literature is an essential component of graduate studies.**

All dissertations, including honours theses, must demonstrate your ability to make critical use of literature and to provide a clear link between the literature reviewed and the research being undertaken. You must not review conflicting texts without highlighting the conflicts and interpreting them in relation to your own thesis.

## **Your literature review must avoid simply summarising available texts.**

All graduate students need to ground their research in an explicit theoretical or conceptual framework, even when it is based on problem-solving or policy-oriented applied research. You will need to include a specific section related to those theoretical principles which underlie your assumptions and which inform your analysis and conclusions.

**For your review of theoretical literature, it will be useful to scan old notes from relevant courses and then do the additional readings you may have skipped at the time.**

### **Doing the review**

In the first place you will need to make a preliminary review of the literature to provide you with the inspiration you need when developing your research topic and your research proposal. Then you will need a thorough review of the literature on the problem you are addressing. This will normally, but not always, be presented in a literature review chapter of your thesis. The literature review chapter presents the views of other authors on the problem and issues your research addresses. Your opinions should be kept out of this chapter except where you critique what a particular author is saying. You are also required to show the reader how the literature you are reviewing relates to your research. This must be a well thought-out review of the literature. You use it like building blocks to show what other research has been carried out in the field and to review the theoretical principles which form the basis for the hypotheses you are postulating and/or any principles you may actually be testing in your research. You need to show:

- What other studies have been done, what their findings are and how they relate to what you propose to research. You need to report the results of others' findings and provide a critical review of these and of the methods which were used
- What theory has to say about the relationships you are investigating in the problem you are researching
- That you are familiar with the literature (not that you have seen it all!) and that you are able to understand and interpret the work you are reviewing. You need to make a particular effort to access current literature.

**Links between each reviewed author and the research problem, and those between the reviewed authors must be made explicit.**

**It may be appropriate to include an analytical model which summarises the theoretical framework.**

Many students are afraid of models. Don't be! A model is just an abstraction of reality. We build models to make it easier for us to deal with a very complicated world. A model can be descriptive – when you describe the real world, but do not include everything; schematic – when you produce an illustration which simplifies the relationships; or you can develop mathematical models. Mathematical models are the most useful when you need to make predictions, whereas descriptive and schematic models are useful when trying to understand the world better. Mathematical models are also very useful in establishing which variables are important in a system and how they are linked. See **Chapter 4.4** for a detailed discussion of models.

The literature review provides the validation of your research. It also provides legitimacy to your approach to data collection, analytical techniques and to your interpretation. It should be an interesting synthesis of available literature which will make it clear to your examiners why you are undertaking this research and why you have chosen a particular approach. It will also lead them towards an understanding of your interpretation of the results and of your

recommendations to producers, or policy-makers. The literature review will also inform them about areas for further research which are such an important component in graduate research. Most importantly it shows readers that you are not repeating earlier work.

### **Two common problems to avoid**

- 1 Taking a literature review from another paper and giving the impression that you have yourself looked at the articles referenced
- 2 Plagiarism through copying large sections from other unpublished or unpublished sources without acknowledging your source.

### **What is literature?**

Literature is really just information that has been presented by other individuals or institutions. It includes text books, journal articles, graduate theses, working papers, occasional papers and briefings, Internet articles and data sets. It also includes unpublished reports, documents in files, pamphlets, draft research and notes. Published literature is that which it is possible for other readers to access. 'Grey' literature is that which is only available directly from the author or institution who produced it and is not available for public orders. Text books from reputable publishing houses and journal articles will normally have more credibility than unpublished reports, or pamphlets. This is because the published work will have been reviewed by peers and the data collection and analytical techniques will have been open to scrutiny. Unpublished work may be based on poor data or analysis or may even be deliberately biased to a particular outcome. When you are using literature to provide evidence for some of your assertions you need to keep this in mind.

**Don't be fooled – not all published journal articles are based on sound data or evidence. If the results or conclusions are not logical, carefully question the author's assumptions, data and/or analytical methods.**

#### **Be warned!**

In my own experience, I published data from very dubious records by District Administrators on estimated crop areas and yields in communal farming areas. I placed caveats everywhere warning people not to use the data which was only included as a matter of historical record since there was no other data available between 1890 and 1960. The supply response studies I did using the data were not included in my thesis because of the unreliability of the data. Some 10 years later I saw an article in the American Journal of Agricultural Economics, estimating supply response using my data with no acknowledgement of the problems that existed with that data!

You need to be aware that even the most respected publishers and journals may publish material that is false – the review process is not infallible. You must always look at what is presented critically and assess the source of secondary data and the method of primary data collection carefully. For the most part you can assume that information from published sources is reliable – but keep a look out for errors. You need to be critical.

You need to be particularly critical of information coming from vested interests – farmers associations, government departments, or private companies. It is often very good information but you need to assess it for bias. For the social sciences grey literature is widely used, but you have to be constantly aware of the need to assess its validity.

**Literature is central to providing evidence for your choice of topic, your hypotheses, and the interpretation of your results. It also informs the methods you use to collect and analyse**

**data. An effective review of literature provides your examiners with evidence that you understand your topic. Do not overlook its importance.**

## **How to go about a literature search**

### **Where to look**

- 1 Look at the materials that have been recommended to you in reading lists for your courses. These are usually the easiest to obtain. These articles and books will in turn include references to which you can go for more depth. If your library does not have the text you need to access, you can ask your librarian to access it from a larger library. This was common practice until the 1980s when, in most of Africa, paper and postage became too expensive and so for several decades the inter-library loan facilities were not used very much. However, now with Internet and scanning facilities it has become easier for your librarian to arrange for you to access the material you need by using electronic transfers.
- 2 If you have Internet access this is probably the most useful way to get access to literature and some suggestions on how to access the information you need is included at the end of this chapter.
- 3 Use the subject index in your library to go to the shelves and see what is easily available in your area. Increasingly our university libraries have very little modern information, but quite often the old information they do have can be most informative. Many of the studies that were carried out in Europe, Japan, India and North America in the 1950s–1970s can be very relevant to what you want to do. The experiments and analyses reported were relevant to their particular natural and social conditions, but there are others which can usefully provide guidelines for undertaking similar investigations in Africa.
- 4 Go to the journal section in your library and scan the article titles to see which ones may be relevant to your work.
- 5 Use some of the journals and CD systems available which provide abstracts (and sometimes the entire article) of recent research. A list of some of these sources is provided at the end of this chapter.
- 6 Go to government offices, farmers' organisations, NGOs, research organisations and the information libraries of various international agencies and embassy services. Some government departments have a surprisingly good collection of material that is not available elsewhere. Note that in some African countries national and international agricultural research organizations have been in existence for a very long time [the Kenya Agricultural Research Institute (KARI) are celebrating their centenary]. Of course some information they hold becomes out-of-date but much is still relevant.

### **How to look**

- 1 You should learn how to scan (using your eyes not a scanner!) very quickly through books, articles and papers in such a way that you are able to see if they are likely to be useful. You need to look at the abstract first and if it does not appear to be relevant put it aside. This should take you no more than a few minutes for each book or article. If you are looking through a publication of abstracts then use the Table of Contents to find the relevant sections and then glance down the page and only stop to read the abstract if the title seems relevant. You may miss some relevant material in this way but you have to learn to make a trade-off between time available and the depth of your hunt for literature.
- 2 If it appears that the publication may be useful then turn to the Table of Contents and if that also looks useful then make a note of the author and title.
- 3 Next, glance through the conclusion quickly. If it still seems relevant make a few very brief notes from the abstract and conclusion and be sure to fully complete the reference note with publisher and date and place of publication. Then put it aside to check out (if it is in a library)

so that you can read and make notes at leisure. If it cannot be taken home, then make a quick review of the rest of the document, paying particular attention to the results and make a note of the data collection method and the analytical techniques. If there are any really interesting assumptions or conclusions, make a note of these and perhaps even copy out a quote. This should not take you more than 15 minutes per book or article. If it seems that the publication is essential to your research then see if you can persuade the holder to let you borrow it, or at least to photocopy some pages or arrange to come back when you have more time.

**Get a hardback notebook and when you go somewhere head the page with the name of library/office and the date. Use the book for your references and your notes. One of the most difficult things is retracing where you found the information you are using. Be sure to enter these regularly in your computer in case you lose your book! Then back up the computer as well.**

### **Constructing your review chapter**

The type of research you are undertaking, and your discipline, will affect how your literature review is constructed. In most theses the literature review forms one chapter on its own. In other cases the literature review may form an introductory section to several chapters and not stand alone. In others you may actually have two full literature review chapters, one related to description and history and another related to theory and research methods. Whatever the form your literature review takes it must at some point include the following aspects:

- An overview of the subject, issue or theory under consideration, along with the objectives of the literature review
- A categorisation of the literature into those items that are in support of a particular position, those against, and those offering alternative theses entirely
- Explanation of how each reference is similar to and/or how it varies from the others
- Conclusions as to which pieces are best considered in their argument, are most convincing of their opinions, and make the greatest contribution to the understanding and development of their area of research.

In assessing each piece, consideration should be given to:

- Provenance – What are the author’s credentials? Are the author’s arguments supported by evidence (primary historical material, case studies, narratives, statistics, recent scientific findings)?
- Objectivity – Is the author’s perspective even-handed or prejudicial? Is contrary data considered or is certain pertinent information ignored to prove the author’s point?
- Persuasiveness – Which of the author’s theses are most/least convincing?
- Value – Are the author’s arguments and conclusions convincing? Does the work ultimately contribute in any significant way to an understanding of the subject? (For more details see Lyons, 2003.)

**The most important factor in a literature review is that you continually link what you are reviewing to your research. You must show your reader why you are including this work and how it helps to develop your thesis. You need to make these links as explicit as possible.**

### **Helpful hints in writing a review**

You need to ensure that your literature review is not just a jumble of different summaries – you need it to tell a story. The best approach in most cases is to separate the literature into different themes:

- Historical and descriptive – or what research has already been done on this topic
- Methodological – how other studies collected data and analysed it. Here is where you look at various data collection and analytical methods including those you are not going to use and

say why they are not right for your research. In some theses this section can also go before the chapter you write on data collection and/or in some cases before the analysis chapter

- Results, interpretations and controversy – here you discuss the major points these writers were making and how your research fits in. You can assess weaknesses of the earlier research and contribute to the discourse.

### **Remember**

- Use literature as evidence to back up what you are saying
- Be selective
- Summarise the key points made in your own words – don't use too many quotations
- Be careful when paraphrasing – you must represent the opinions and information accurately.

## **Referencing, citations and bibliographies**

It is essential that you always acknowledge the source of what you are saying. Plagiarism and falsifying research data are totally unacceptable in academic circles. Either of these crimes will result in your losing employment, funding, and credibility, and lead to expulsion from your degree course or to failure. Plagiarism is defined as stealing the writings or ideas of another. It occurs when you are using work that you do not acknowledge, even if you have put those ideas into your own words. You are expected to use other people's ideas and even on occasion their words, but you must always acknowledge that you are using them. There are many different styles of providing the sources of your information, but all systems involve citing the author in the text where you use their ideas (either in brackets or in a footnote). In addition you must provide the full reference to the citation – usually in a reference list at the end but sometimes by providing the information in footnotes throughout the text. The detailed references must provide all the information needed for your reader to access the original source.

### **Evidence and acknowledgement are the heart of academic research**

All written work must include the sources of information you have used. These should be the main sources you have consulted in writing your report or dissertation, i.e., those that you cited in the body of your thesis. Your reference list does not include everything you might have looked at. In some academic writing a full bibliography is given at the end of the publication that includes most of the documents consulted, even if they are not cited in the text. More commonly a reference list is used and this includes only cited work.

### **Why do you need to provide citations and references?**

- To provide evidence – the most important part of contributing to humanity's store of knowledge is to be sure that the contribution is valid (within the limits of what is known at the time). As an academic you should never make unsupported assertions. Evidence and support come from:
  - empirical facts which you obtain by carrying out experiments or collecting data which 'prove' that this is a reflection of the real world
  - theoretical principles (and in some cases you may need to show how these were derived or why they are valid)
  - literature – what other people have found out. You need to say where you got this information from – hence citations and references
- To allow your readers to check what was said and to ensure that you have interpreted it correctly
- To allow your readers to discover more information and read more deeply on the topic.

**Providing citations and references is what separates academic research from political rhetoric, or religious dogma, or uninformed opinion. It is one of the most important parts of your research and your literature review and the references you provide may be the most useful contribution of your research to academic enquiry.**

A bibliography or reference list gives all the work you have cited in alphabetical order by author's surname, or institutional (corporate) name, or by title where no name is given and is usually situated at the end of the main body of your work, but before the appendices. There are many different styles of referencing and you can choose to use any system, even a numbers system, provided you are consistent. Check with your university regulations to ensure that the system you use is appropriate. A slightly adapted version of the Harvard system is the one used in this book that follows the style of the African Crop Science Society Journal.

In the text you should include the author or editors surname in brackets after the presentation of her/his ideas or a direct quotation (e.g., Rukuni and Eicher). It is also common to include the date with the surname/s (e.g., Rukuni and Eicher, 1994) but this is only essential when you have more than one publication by the same author/editors. If you have more than one by the same author in the same year, then you also use alphabetical letters (e.g., Rukuni and Eicher, 1994b) to distinguish them.

It is only for quotations (using the other author's words) or where you want to provide your reader with direct access to the source, that you include the page numbers in your citation in the text. When you quote directly from another work you must indicate this with quotation marks and then beneath where it appears in your text, insert the author/editor name and the page number(s) of the original text. This will correspond to the name/s as they appear in the alphabetical sequence of citations in your bibliography or reference list. Generally textual quotations should correspond precisely to the original in wording, spelling, capitalisation and punctuation. With short quotations incorporate passages of not more than four lines directly into your text, identified by quotation marks, e.g., Ojwang (1994) 'The natural cycles of biodiversity are affected where there is habitat destruction,.....monoculture crops or forest plantations.'

With longer quotations (two or more sentences or more than four lines) set the quotation off from your text and indent from the left margin.

'We have three principal means: observation of nature, reflection, and experiment. Observation gathers the facts, reflection combines them, and experiment verifies the results of the combination. It is essential that the observation of nature be assiduous, the reflection be profound, and that experimentation be exact. Rarely does one see these abilities in combination. And so, creative geniuses are not common.'

(Diderot, 1753)

## **The reference list**

You should find out if you are required to follow a particular system of referencing from your university and search for a detailed description of that system. When you are publishing journal articles you will need to check and see what system is used by that journal. The elements are the same in all reference lists but they may use a different order and different punctuation. The Royal Agricultural College Library has compiled a comprehensive description of the Harvard System also known as the Author-Year or Name-Date system. It gives very detailed and useful information on how to reference and the website details are included in the reference list to this chapter. Modified extracts of their website information, using African examples are provided below.

With different publications and university regulations requiring different formats for the references, it can be very tedious checking that you have it correct and converting from one format to another. There are various software tools, known as reference managers, to help with this. An example is EndNote. Bibus is an open source alternative. With the software you build a database of all your reference. They can then be linked to the document you are writing and the reference list is compiled automatically in any chosen format.

### **Main elements of a reference list – how to prepare a citation**

#### **Author**

- Surname first, followed by initial(s)
- Where more than one author, list them with 'and' before the last one. (When citing in the text if there are more than three, put first named followed by... *et al.* (meaning 'and the rest'. But all their names must appear in the Reference List at the end)
- If they are editors, put ed. or eds. in brackets after the name(s)
- Corporate authors: where initials are commonly used, e.g., FAO (Food and Agriculture Organization of the United Nations), make sure that somewhere in your paper, (perhaps as a separate appendix) you have a list of acronyms giving their full expansions.

#### **Title**

- Must be in *italics*
- Capital letter for the first word only, or second word if the first is an article
- Take the wording from the title-page of the book (not the cover as it may differ)
- A colon precedes the sub-title. (Always include sub-titles because they often give extra useful information.)

#### **Books: Personal author**

Surname, initial(s). (Year) *Title: sub-title*. Edition (if more than one). Publisher. Place of Publication  
Venkatesan, V. (1994) *Seed Systems in Sub-Saharan Africa: Issues and Options*. World Bank, Washington DC, USA.

#### **Books: Corporate author**

Name of Organisation. (Year) *Title*. Publisher. (add Series and number if appropriate)  
ISSER (Institute of Statistical, Social and Economic Research). (1994) *The State of the Ghanaian Economy* Legon: University of Ghana, Accra, Ghana.

#### **Chapter in book**

Cite the author(s) of the chapter, use the word In: to indicate where that chapter is, then give the title of the book in *italics* and editor name(s) publishing details and lastly the page numbers in the book.

Ondiege, P. (1996) Land tenure and soil conservation. In: C. Juma and J.B. Ojwang (Eds) *In Land We Trust: Environment, Private Property and Constitutional Change* Initiatives Publishers, Nairobi, Kenya, and Zed Books, London, UK. pp. 117-142.

#### **Conference proceedings**

A paper in a collection of conference proceedings is cited in similar fashion:

Malaa, D and M. Vabi (2006) The role of market women in ensuring food security in the Republic of Cameroon in G. Tusiime and M Mwanjolo (Eds) *Enhancing Women's Role and Participation in Science for Food and Nutritional Security in Africa* Proceedings of the CTA-FARA-RUFORUM Women's Conference 2-7 July Entebbe Uganda

B. Evans (Ed). Cambridge Environmental Initiative: 37-53.

### **Journal articles**

Author(s). (Year) Title of article. *Title of journal*. Volume (part number): page nos

Adebooye, O., S. Ajayi, J. Baidu-Forsen and J. Opabode (2005) Seed constraint to cultivation and productivity of African indigenous leafy vegetables. *African Journal of Biotechnology* 4(13), 1480-1484.

### **Unpublished dissertations or theses**

Olupot, G (2004) Effect of enriching kraal manure on the yield of sorghum in integrated nutrient management in Kumi District. Unpublished M.Sc thesis, Faculty of Agriculture, Makerere University, Kampala, Uganda.

### **Personal communication**

Guveya, E. and Mokitimi N. (2007 May 22) Conversation about the role of secure tenure in sustainable resource use. Roma University, Maseru, Lesotho.

### **Internet**

Author. (Year) Title. [online]. Edition. Publisher. Available from: URL [Date accessed]

Environment Agency. (2002) *Fisheries action plans* [online]. Environment Agency. Available from: <http://www.environment-agency.gov.uk/subjects/fish/> [Date accessed: August 2007]

### **It is worth keeping copies of key Internet pages on your computer as they can disappear.**

The term Publisher is used to cover the organisation responsible for maintaining the site on the Internet (corporate author). If it is not immediately obvious, delete sections of the URL one by one, going higher up the chain of the Internet address to find out who created the website.

### **Electronic journal articles**

Author (Year) Title of article. *Journal title*. [online or CD-ROM] volume (issue), pagination. Available from: URL. [Date accessed]

Horesh, R. (2002 Sept) Better than Kyoto: climate stability bonds. *Economic Affairs*. [online]. 22(3):48-52 Available from: <http://www.iea.org.uk> [Date accessed: August 2007]

### **E-mail communications**

Discussion lists generate e-mail messages which are sent directly to the subscriber. References to these messages should be treated in a similar fashion to journal references. Use the list name in place of the journal title and the subject line of the message in place of the article title. After 'Available from', use the e-mail address of the list administrator or URL of the archive.

Author (Year, month, day). Subject of message. *Discussion list* [online]. Available from: list e-mail address [Date accessed]

Francis, J. and R. Rege (2007 February) Information and Communication Management Strategies email list serve CTA S&T *Knowledge for Development* also available from <http://knowledge.cta.int/> [Date accessed: 15.7.2007]

## **Searching the Internet<sup>1</sup>**

The purpose of this section (compiled by Lilirosa Maveneka and updated by Natasha Mukherjee) is to provide you with a simplified overview on how to use the Internet to obtain information. There is also a brief guide to some of the agriculture-related databases which you can access. Internet technology has made information widely available and it provides a rich source for

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1 This section is based extensively on information contained in <http://www.lib.monash.edu.au/vl/www/wwwprin.htm>.

accessing current research, data, maps, studies statistics, scholarly texts and a wealth of interactive and knowledge broadening information. You need to be careful, as with all literature, to be sure that the source is reliable. Just because you found it on the internet does **not** mean that it is reliable. You have to learn to be discriminating.

The Worldwide-web, or **the Web** in common parlance, refers to the information resources that can be accessed through the Internet. Broadly, there are three search options available to access information on the Internet. These are: **search engines**, **meta-search engines** and **subject gateways**.

**Search engines** are the primary tools that are used to search for information on the Internet. Search engines enable you to search the Internet using keywords that describe the subject you are researching. Currently, there are many search engines available; the most popular search engines are Google and Yahoo; they accounted for almost 75% of all searches in early 2007.

**Meta-search engines** and **metacrawlers** do not search the Web themselves to build listings. Instead, they allow searches to be sent to several search engines all at one. The results are then blended together. Award-winning meta-search engines that are currently favored are Dogpile, Vivisimo and Kartoo.

**Subject gateways**, also referred to as **directories**, are organized lists of websites that are divided into subject areas. The gateways that are listed below lead – in turn – to agricultural and applied economics databases that are made available by national, regional and international government agencies and academic institutions.

Popular and award-winning search engines, 2007		
Search engines	Meta-search engines	Subject gateways for agricultural and applied economics
<a href="http://www.google.com">http://www.google.com</a> <a href="http://www.yahoo.com">http://www.yahoo.com</a> <a href="http://www.live.com">http://www.live.com</a>	<a href="http://www.dogpile.com">http://www.dogpile.com</a> <a href="http://www.vivisimo.com">http://www.vivisimo.com</a> <a href="http://www.kartoo.com">http://www.kartoo.com</a>	<a href="http://ageconsearch.umn.edu">http://ageconsearch.umn.edu</a> <a href="http://www.intute.ac.uk">http://www.intute.ac.uk</a> <a href="http://www.usda.gov">http://www.usda.gov</a>

### Simple Internet searching techniques

To get started you connect to the internet by double clicking or selecting the Internet application button. When the internet window opens type in the search engine address e.g. <http://www.google.com>. When the dialogue box comes up then put in what you want to search for. Use one or more key words or a phrase. When the resulting websites and links come up you can see if you used the correct phrase. If not go back and try again with a different key word or phrase.

A simple search on the Internet will yield an almost overwhelming amount of information. The trick is to make any given search as efficient as possible – that is to find the most relevant materials in the shortest amount of time.

The following considerations might be helpful in making your Internet search efficient:

- 1 It is crucial to define your search with the most effective key terms
  - First, define the key information you are looking for, and then define the key terms for your search
  - Alternative spellings and phrases might help better define your search
  - You can further refine your search by using Boolean operators – AND, OR, NOT – to specify relations between search terms:

- AND: to indicate certain terms that appear on a page simultaneously
- NOT: to indicate that certain terms should not occur on the page
- OR: to indicate the search to contain either key term
- The Boolean operators can be useful in eliminating irrelevant information – an important task for any Internet search

The Advanced Search in Google this will help you to more clearly specify your requirements. You can easily click on it and it will ‘walk’ you through the steps.

2 It is suggested that you execute the search using a variety of search engines:

- Use a variety of search engines, meta-search engines and subject gateways as possible
- If you are unsuccessful in your search, you might consider asking experts in the field for help in formulating a more effective Internet search
- Another alternative is join a Web-based mailing list or discussion group<sup>2</sup> on the topic. This will help you gain a more nuanced understanding of the subject matter at hand.

### **Is the information any good?**

Since anyone with access to the Web can put up material, it is very important that you learn to become very discerning *vis-à-vis* the information you find. You need to look at certain features to judge whether the source is worth using. For instance, it is important to pay attention to:

- The particulars of the website authors. Do they provide their name and a contact address?
- Is there a *raison d’être* for this site? Does the site endorse a particular political ideology?
- Does the website provide a reference list or a bibliography? What type of research does the website base its information on?
- Is the website regularly updated? Is the information on the website current?

### **Do you know what a domain is?**

Understanding the concept of a domain name can help you discern what type of an organization is hosting the webpage you are looking at, and should help you decide whether you will consider using the information the site contains.

The domain name consists of several parts.

Example: www.IDS.ac.uk

In this example, the first part of the domain is ‘IDS’ – the Institute for Development Studies (IDS); this is the name of the organization that is hosting the website. Part 2 of the domain name is ‘ac’ – an acronym standing for ‘academic’; this denotes that the organization in question is an academic institution. Part 3 of the domain is ‘uk’, and this show that the website is located in the United Kingdom (UK).

Table 2 shows more acronyms denoting other types of organizations and other countries.

Most US-based websites do not include a country code. Some organizations host personal pages (e.g. staff working papers) that may not express the opinions of, or be endorsed by that organization. These personal pages often have a ~ (tilde) in the URL.<sup>3</sup>

### **A note on ‘Wikipedia’**

It is very likely that during the course of your Internet research you will come across information from a website called ‘Wikipedia’.

Wikipedia refers to itself as the ‘free, online encyclopedia’. The articles contained on the Website span a wide range of subject matters. The information in these articles is provided by

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2 Email-based discussion groups are a very useful resource on the Internet. These allow you to communicate with people with similar research concerns. Many discussion groups maintain archives of past discussions which are useful in finding the answers to common questions. To find appropriate lists you can use subject gateways. A useful starting point is: <http://groups.google.com>

3 Every page on the web is referred to by an individual website address, URL (Universal Resource Locator).

Table 2

Organization types	Countries
<b>com</b> or <b>co</b> – commercial	<b>au</b> – Australia
<b>edu</b> or <b>ac</b> – educational, academic	<b>cn</b> – China
<b>org</b> – non-profit organization	<b>de</b> – Germany
<b>net</b> – networking providers	<b>bw</b> – Botswana
<b>mil</b> – military	<b>in</b> – India
<b>gov</b> – government	<b>ke</b> – Kenya
<b>int</b> – international organizations	<b>nl</b> – Netherlands
<b>aero</b> – air transport industry	<b>uk</b> – United Kingdom
<b>biz</b> – business	<b>zw</b> – Zimbabwe
<b>coop</b> – Cooperatives	
<b>info</b> – unrestricted use	
<b>museum</b> – museums	
<b>name</b> – individuals	
<b>pro</b> – accountants, lawyers, and physicians	

the Internet public; the content and accuracy of these articles is subsequently checked and edited by the Internet public. In other words, there is no formal peer review mechanism to check the accuracy of the information.

Some academic institutions have specifically banned Wikipedia citations (most institutions discourage using information from encyclopedia, preferring primary citations). Even Wikipedia acknowledges that it should not be used as a primary source for serious research. However, others have noted that in some areas, such as science, Wikipedia's quality is often excellent. A report by the science journal *Nature* claimed that 'Wikipedia comes close to Britannica in terms of the accuracy of its science entries.' What you have to do, as with all the information you take from internet or any other source, is use your judgement before including it. Provided you clearly identify the source of your data, information or opinions, your reader can also use their own judgement when determining the acceptability of your findings.

## Resource material and references

**Appendix 5.** Stapleton, P., Youdeowei, A., Mukanyange, J. and van Houten, H. 1995. *Scientific Writing for Agricultural Research Scientists*. WARDA/CTA, Ede, The Netherlands.

**Appendix 6.** Publication as an Output of Science. Adipala Ekwamu.

**Appendix 7.** The Art and Ups and Downs of Scientific Publication. Adipala Ekwamu.

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Galvan, J.L. 1999. *Writing Literature Reviews*. Pyczak Publishing, Los Angeles, USA.

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# 2.3

## Your research proposal – hypotheses, objectives and research questions

Kay Muir-Leresche and Richard Coe

- Planning research means reducing and organising information
- What you can achieve is limited by your time, skills, contacts and resources
- Do not overstate what you will research – rather understate and achieve more
- Your thesis will be judged on how rigorously you research the hypothesis and objectives you specify
- A hypothesis is a statement of what you think is true based on what you know. Your research will prove or disprove the hypothesis
- You must provide the rationale for your hypotheses and be sure you will be able to test them
- Continually involve your supervisor in the development of your proposal

*‘Extraneous information and ideas are eliminated as foreign matter might be filtered in a funnel’*

**Andrew and Hildebrand (1982)**

### Getting started

You have decided on the area you want to research, gathered information on the topic and held discussions with prospective supervisors – you have established what you want to do. You have thought about your research in the context of different approaches to research and you have clearly identified your niche if you are doing your research as part of a larger project.<sup>1</sup> Now you need to work on your own research proposal and you need to clearly define your research. In due course this research proposal will form the basis of the introduction to your thesis.

The most important task is to focus on one aspect and to clearly specify what you hope to achieve. You need to outline the problem or issue you are addressing in your research. You need to show why this is an important topic. You can specify the problem in a broad context at first but then you will need to narrow this down to exactly what you will be researching and show how this will contribute to rural development. Planning research requires that you reduce a large volume of information to manageable proportions. Each part of your research proposal should be designed to make what you are researching clearer to your reader (and yourself!).

Think of a funnel model: you start off with the wide section

<sup>1</sup> It is likely that your supervisor or someone else has developed the research proposal for the larger project of which your research is just one component. This means that you will need to adapt your research to fit in with the requirements of that project. Study the project research proposal and project documentation before you begin to refine your research proposal. Do not rely on someone to tell you what is needed. When you have done this, then carry out the steps outlined in **Chapter 2.2** before going on to develop your research proposal. You will need to provide more attention to the logistics of your research and to the budget and timeframe when you are going to do your research through an externally funded project than when you are self-financing.

of the funnel and the general setting, this narrows to problems faced, then specifically to the problem you address and then to the hypotheses you will test, your objectives in testing them and the questions you will pose to gather the information. You need to keep filtering out surplus and less directly relevant information to make the orientation precise. The constraint is the narrow part of the neck of the bottle into which the filter must fit – this bottleneck is the resources available to you – time, skills, contacts, and the physical and financial resources for the research.

If you need to incorporate additional research in order to meet the requirements of other stakeholders (the communities/farmers with whom you are working, the funding agency and others) then provide them with a supplementary proposal. This should detail those aspects that you will include but which are not being included in the academic research proposal.

The aspects covered in your academic proposal will receive a more academic and theoretical approach than those included in the supplementary proposal. The requirements of a research report to stakeholders are different from the requirements of a thesis. The former is more interested in your findings and in ensuring that the research process used is valid and that the findings are legitimate. In addition to these criteria, your thesis needs to show your examiners that you understand the theoretical concepts, are aware of the available research and analytical tools and of the literature. A thesis proposal must indicate to the academic committee how you will address these issues, whereas a research proposal to prospective funders or clients needs to be more explicit about how your project meets their needs. In rural development you also need to show how you will include affected communities in the research process and how they will benefit.

The research proposal for your thesis is a vital component of your research and can take up to a quarter of the time allocated to the thesis. Specifying the problem clearly is essential to avoid gathering the wrong information and/or using the wrong research tools and analytical methods and then having to start again or to base conclusions on inadequate evidence.

If you include the context in which your research will operate you may find that this will help you to limit what you are planning to achieve. If you are explicit about the geographic, social, and economic bounds of the problem and solution you can avoid the trap of producing a grandiose but unachievable proposal.

You need to continually involve your supervisor and other lecturers in your research proposal phase. In many ways this is the most important time of your research. It is also the time when you are likely to interact most closely with your supervisor and is a good time to really get to know her/him.

### **The rush to the field**

Getting out and active is what most people want to do. If you really have to start before the proposal is ready, use your early fieldwork to refine the proposal. Use rapid rural appraisal to gain an overview, informally pilot possible approaches and pre-test your questionnaires. Avoid starting to collect data before you have a research proposal accepted by both your academic committee and, if appropriate, those funding your research.

## **The research proposal**

### **Setting the stage – Introduction**

You need to provide an introduction that gives the background to the topic, explains your rationale for choosing this problem and briefly includes a review of some of the other work carried out on the subject. You should avoid giving a detailed review of agriculture in that region – rather just highlight the elements which are most relevant to your research and provide references. However, you do need to provide the general background for the particular research problem you will address.

### **Example**

Smallholder farmers in Africa have very low yields and low incomes with impacts on poor health and other livelihood indicators (provide references). The poor soil fertility and the impact of pesticide residues negatively affect productivity (provide references) and contribute to unsustainable production systems and a degrading environment (provide references).

This is a key part of your research proposal but you should avoid providing detailed information here. It is more important for you to extract the essential elements and then to provide references indicating where information can be found. The length of this section depends on the type of problem you are addressing and depends on whether you will include a brief literature review after providing the statement of the research problem. You will need to get guidance from your own university on their limits and requirements. Some universities require you to have both a long and a short proposal. The long proposal would include a comprehensive literature review. However most academic committees when deciding on the merits of your research proposal will use a short proposal and will not want the introduction and literature review to be more than one or two pages.

Start off with as much of a background as will help you to set the stage. Then go ahead in specifying the problem and developing hypotheses and research questions. After this is done go back and cut the introduction to the required length, making sure what you leave in is directly relevant to your proposed research.

If you are applying for an independent research grant then you will need to have a long proposal with a detailed literature review to provide background to the short proposal. If you are applying to be part of an existing or proposed project then your own proposal does not need to be so long. It does, however, need to be very clear on how it fits in with the project. What will your research contribute? How will it meet some of the specific objectives of the larger project? Will it address any already established hypotheses? If not, how do your hypotheses add value to the project?

### **The Research Problem**

Your statement of the research problem should be in a section on its own. This is your opportunity to clearly indicate which component you will address from the general issue/problem outlined in your introduction. You need to use it to show how this aspect fits in to the general subject area. You can also use the section to show why addressing this particular aspect is important – to academic enquiry, to your client population, or to society in general.

#### **Example of research problem statement**

Pesticides and chemical fertilizers are expensive and frequently unobtainable. Some smallholders in Western Kenya have been successful in increasing incomes and maintaining soil fertility by using an integrated pest management (IPM) scheme and crop rotation. However other farmers have been less successful. It has been suggested that soil type has a large impact on the viability of these management techniques, and that might explain varying adoption. If we knew which practices were better adapted for which soils, dissemination could be targeted and further research may develop techniques for problem soils.

### **Literature Review**

In short proposals this may be included in the Introduction but in a long proposal it will be in its own section. The literature review is essential as it provides evidence that you understand both the context of your research and what other work has been done on your proposed

research topic. You need to show that you are building on what is already known, not just repeating it. The information provided in **Chapter 2.2** is relevant here, although, the proposal will not provide the detailed analysis that the literature review chapter in your thesis will. In the proposal, the literature review is a brief summary of the most important information, highlighting its relevance to your choice of topic and showing the academic committee that you are cognisant of the work that has gone before. It provides the rationale for your choice of research problem and your approach.

**Conceptual frame**

With your own ideas, through talking to farmers and other researchers, and especially from the literature review, you will realise that there are many approaches to the problem you plan to work on. Taking the example of adoption of IPM and crop rotation and the role of soils, this could be studied from the point of view of farmer resources and decision making, of farm economics, of local ecological knowledge, of pest dynamics and nutrient cycling, of access to information and understanding, of national policies, and so on. Which of these is going to be your focus? Do you need to look at several of them, for they are all related? If you decide that they are all important, and that you will study everything that might possibly have an influence on the problem, you will have far too much to do, and achieve nothing. You need to clearly specify how you see the problem, and the processes and influences that you will include in your work. This is the conceptual frame.

The term ‘conceptual frame’ is quite explicit. It is a framework for your research, and describes the concepts on which you will base your research. As such it is a necessary part of the proposal. It shows readers what is in your view of the problem and the relationships between those things. It can also summarise the logic of the research, showing the connections and relevance of different components. The conceptual frame is also a frame in the sense that it shows the boundary of your research, what is in and what is not. Limiting the scope of your

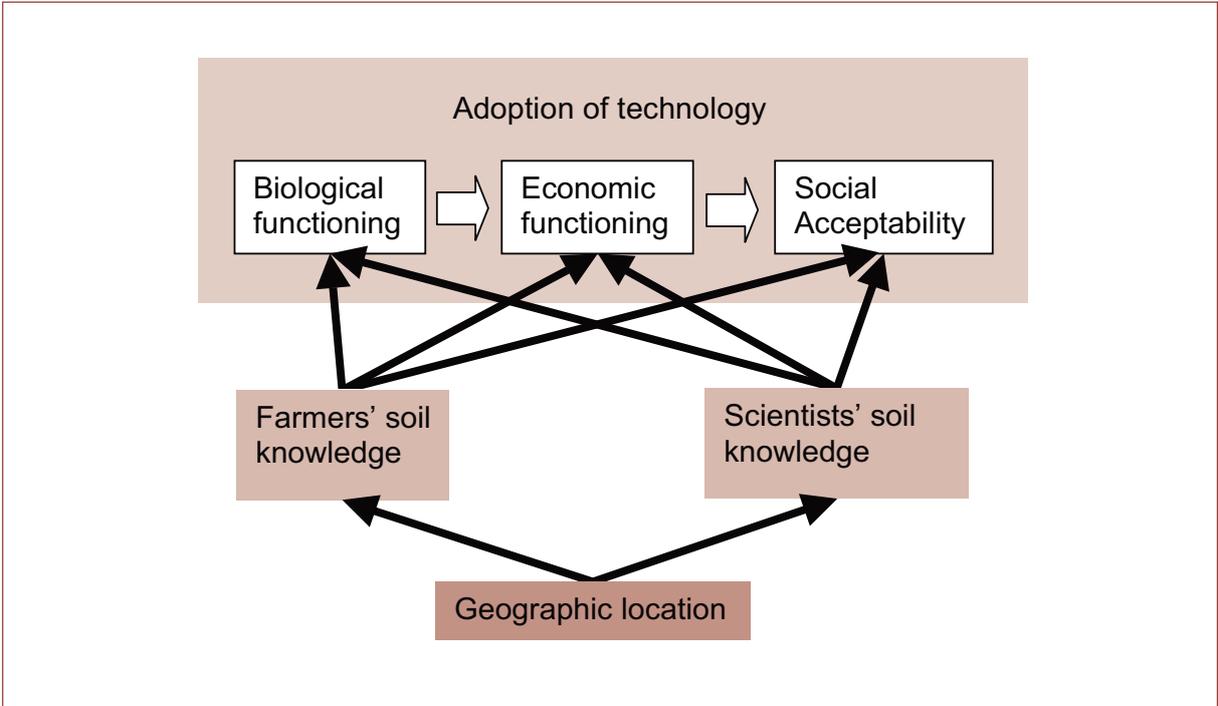


Figure 1. Example conceptual frame for the IPM/Crop Rotation adoption problem. Adoption is modelled as depending on 3 filters, the biological and economic functioning of the technology, and its social acceptability. Black arrows represent hypothesised influences to be investigated

research is important, and you need to do that in a way that ensures that what is ‘in’ makes a coherent and useful contribution.

There is no single way of presenting a conceptual framework. They can often be usefully summarised by a diagram. ‘Box and arrow’ diagrams are typically used. These come in many types, with the boxes and arrows representing different things – for example the arrows may be resource flows or influences. A simple example for the problem of adoption of IPM and crop rotation is shown in Figure 1. In this example we have decided to include elements of farmers’ and scientists’ understanding of soil and its variation in space. We also have a simple model for technology adoption. But we have excluded processes of knowledge acquisition, extension and national policy making, for example, and will not model the detailed dynamics of pests and nutrients.

For any problem we can not say that one conceptual frame is right and another wrong. But if your frame is very different from that used by others and you ignore processes and components known to be important, you will have to justify your approach carefully.

Some students feel they can not specify a conceptual frame as they plan the research, for the aim of the research is to identify processes and components which are important. However, if you make no attempt to think it through beforehand then you will have no idea what to even start looking at and which data to collect. It is very likely that your conceptual framework will be modified as you gather information and ideas, but you need something to guide the work.

## Objectives

What is the purpose of your research? What do you hope to achieve? In answering these questions you will develop objectives for your research. Think of the objectives as those achievements you can point to in order to show that you have succeeded. In a proposal asking for funds, the objectives will describe those endpoints that you will be accountable for. Applied research, which this book is mainly about, is concerned with solving problems. Of course the ultimate objective of your research is to solve the problem. But you can not be held accountable for that – we are doing research because there are unknowns, and we can not be sure the problem will be solved, at least by the route being taken. But if the route to solving the problem involves ‘Finding out why...’, ‘Measuring how much...’, ‘Identifying the key reasons for...’, ‘Establishing the current situation of...’, or similar, these will be your objectives. They are things you can be held accountable for. You should be sure of producing them, whether or not the research and problem solving proceeds as envisaged.

The objectives need to be simply and clearly stated. They need to include both the general objectives, for example related to stakeholder welfare, and the specific objectives of the type of approach you will use and the aspects you will emphasise.

### Example of objectives based on the IPM/Crop Rotation adoption research problem statement:

- 1 To contribute to improved sustainability of the environment and farmer livelihoods by isolating those factors that reduce the adoption/success of using IPM and crop rotations.
- 2 To understand characteristics of the soil which make adoption of IPM and rotations more or less attractive to farmers.
- 3 To document how farmers classify soils and use this information in their decision making on IPM and crop rotation.
- 4 On the basis of soils information, map areas with higher and lower predicted adoption rates.
- 5 To suggest modifications of the IPM/rotation strategies that will overcome identified soil constraints.
- 6 To test the effectiveness of these strategies.

Research is essentially about the new, about innovation, discovery and doing things differently. So your objectives will be different from those of any previous study. However we can identify some characteristics of statements of objectives that will help lead to successful student projects:

- They are clearly stated, making sense to an informed reader, even to someone who has not read all the rest of the proposal
- They are a logical consequence of the background and problem statement. If, for example, the background is about poverty in Kenya and the objectives refer to soil constraints in IPM, then there is a gap in the logic
- They are reasonable given the time and resources available. In the above... example, the last objective probably would not be reasonable within the timeframe of an MSc project
- They are capable of being met by the proposed research activities (such as surveys and experiments)
- They are *research* objectives, not objectives of change ('development'). While the livelihood and environmental change and benefits are the ultimate aim of the work, you are writing a research proposal, so the objectives must be objectives of generating new knowledge and understanding
- They are not a statement of the methods – such as 'To carry out a survey...' or 'To compare treatments...'. The methods are developed to meet the objectives, not the other way around. If you list methods as objectives you have a circular argument in your logic.

All other parts of the research design depend on the objectives, so it is important that they are precisely stated and reflect deep thought.

The objectives are also a way of identifying your clients, defining the limits of the research and describing the expected outputs in a clear and succinct way. It is useful to crystallise your objectives before you finalise your hypotheses, even if the objectives are presented after the hypotheses in the research proposal. There is no standard order in which the objectives, hypotheses and research questions must be presented, and often there is overlap between them. Each school of thought will have its own approach and you must consult with your supervisor to see whether you can choose how you frame your proposal or if you must follow a fixed format.

## Hypotheses

Many descriptions of scientific method describe the role of hypotheses: we make an observation and propose some general rule, process or mechanism to explain it. That rule or process has a hypothesis embedded in it – something which, if true, would explain the observation. The aim of the research then is to try to establish the veracity of the explanation – that is, to test the hypothesis – and update it with a more complete or useful explanation.

### Example hypothesis for the IPM/Crop Rotation adoption problem

Crop rotations with legumes are not an attractive option for farmers with sandy soils because nitrogen rapidly leaches out and does not accumulate.

We test a hypothesis by noting that it allows us to predict how something will behave. If the hypothesis is true it will behave one way, if it is not true it will behave in a different way. We then collect data on the behaviour to see which occurs. In the simple example above, the hypothesis predicts:

- a that fewer farmers will use legume rotations on sandy soil than other soil
- b that when legumes are grown on sandy soil N is leached more than on other soil.

Both these are predictions that can be confirmed by measurement, thus giving evidence to support the hypothesis. The first prediction requires measurement of adoption among farmers who have either sandy or other soil, while otherwise being comparable. The second prediction

requires measuring leaching of N from both sandy and other soils grown with legumes. These two sets of measurements may be on the same farms but do not have to be to test the hypotheses. A critical part of the study design is choosing just how many measurements to take where and when.

If you did collect such data to examine this hypothesis, you may well find evidence to support it. It is also quite likely that the data will not be completely clear cut. You may find that fewer farmers use legumes on sandy soil, but still some do. And some farmers with other soil do not find them useful. This will suggest a new and more nuanced or complex hypothesis – sandy soil is part of the explanation, but not the whole story. On the basis of your data you will propose that further explanation. You may be able to test it with the data you have, or it might require more data, perhaps collected in a more subtle way. That task might be too much for your graduate project, and have to wait for your postdoc work, or perhaps a future student. This is the iterative way accumulation of scientific understanding progresses, and highlights the importance of hypotheses in the process.

If formulating and stating hypotheses seems hard, remember it is something you do every day. At its simplest level:

**A hypothesis is a statement of what you think is true based on available evidence. Your research will then set out to prove or disprove the validity of this belief.**

Think about how you do this in everyday life. On the basis of information available to you; you suppose that something is true and then you check to see if it is. Think of the following example.

#### **Example of every day hypotheses**

In countries with commodity shortages a person might hypothesise that *flour/sugar/fuel is more easily available in the low-density suburbs*. They will then test this hypothesis by going there and trying to find the commodities. Another person may hypothesise that *these commodities are more easily available in the poor suburbs* and go there and find out. One researcher may hypothesise that these commodities are more easily available in the wealthy suburbs because people are able to afford the very high prices. Another researcher may hypothesise that they are more easily available in the poor suburbs because illegal exchanges are more easily facilitated in the open, informal markets.

It does not matter which researcher or individual is correct. That is the task of the research – to gather evidence and then to prove or disprove the hypothesis. What you do need to do when presenting your hypotheses is to make it clear what basis you have for presenting the hypothesis. Thus the two researchers in the examples above give the basis for their hypotheses. They will then test:

- Whether the commodities are more common in one area or another
- Whether the reason for this is the one provided in the hypothesis.

With the diversity of research objectives and approaches there are few simple rules as to what makes a ‘good’ hypothesis. But even with this diversity there are a few guiding principles.

First, hypotheses should be logical or reasonable, based on what we know and is not being questioned. Progress is often made by questioning current assumptions, but you need to have a strong basis for proposing a hypothesis which contradicts understanding which has been found valid. Similarly, a hypothesis which ignores things we already know is unlikely to be useful. For example, if other researchers have found that legumes can fix N on sandy soil, the hypothesis ‘Legumes can not fix N on sandy soil’ would have to be justified by explaining why you think previous results were erroneous.

Second, the hypotheses should be ‘useful’. In this book we are discussing applied research

which is aimed at solving some problems of rural livelihoods and the environment. If your research is to contribute to that problem solving, then establishing the hypotheses should fill significant knowledge gaps, gaps which are preventing further progress. Ideally, it should be possible to say 'Once I have tested these hypotheses I will know what to do next to solve the problem'. And it should be possible to say that *whether or not* your hypothesis turns out to be supported by the data.

Third, the hypothesis should advance knowledge, adding something to what we know already. Student research commonly involves trying something in a new location which has been demonstrated elsewhere. That is fine, but the research should be based on a hypothesis of *why* things might be different in the new environment.

Fourth, aim to have 'why' statements in your hypotheses. The 'why' part of the hypothesis is often the most important yet is often neglected. Too many student research proposals include pointless hypotheses like 'Farmers vary in their willingness to adopt...' This is a tautology. Of course they do! Such studies usually have finding out 'why or how' as the real objectives, but if the reasons are not hypothesised it is impossible to set up relevant methods. In particular, it is impossible to know what to measure.

Fifth, your hypotheses must be testable. To be testable, the hypothesis and its alternative(s) must produce different predictions that can be compared with data. An example of a hypothesis which is probably not testable is 'Suitable N-fixing bacteria for nodulation of a newly introduced legume will populate the soil after sufficient time'. The difficulty here is that if the bacteria are not found, we do not know if the hypothesis is false or we just have not yet waited 'sufficient time'.

You should not be thinking about whether the hypothesis is likely to be true. The most interesting and useful hypotheses are ones which are really completely open. If you (or the scientific world) already have strong evidence for a hypothesis being valid, collecting more data on it may not be a high priority, nor a great start to your scientific career.

It may help to specify a general hypothesis that drives your research. This may be one underlying hypothesis that you are not necessarily planning to test directly, for example, '*Farmers who are risk-averse will have lower gross margins over time*'. In order to test this hypothesis you would need to be able to access time-series data. You would need to take into consideration that the period covered by the series is not exceptional, i.e., that there were not an abnormal number of drought years or greater or fewer policy upheavals etc. This is a testable hypothesis. However if you are not intending to test it, but to use it as an assumption underpinning much of the other research, then you need to discuss it in detail and provide the logic in your use of it in this way. You can then go on and present the specific hypotheses you will be testing, such as: '*Farmers who do not have reliable access to remittances will be more risk-averse*'. You can then go on and give your rationale: 'These farmers cannot afford to risk the failure of basic food crops and are less-able to experiment with production methods and commodities, until these are proven to be as reliable as the traditional systems. Thus even if they have the same soils and inputs they will be less successful than farmers who are more food-secure because they are unable to risk growing unfamiliar commodities or using unproven production technologies.'

A **null hypothesis** presents your supposition as a statement that there is no change, or no influence or effect. If there has been a change then the null hypothesis is rejected which indicates that the alternative hypothesis is accepted. Null hypotheses are important in science and are used in statistical analysis of data. However it is rarely useful to state your research hypotheses as null statements. An example illustrates the problem.

#### **Example of a null hypothesis**

*'The inclusion of legumes in the crop rotation will not affect maize yield'*.

If the analysis shows that inclusion of legumes does affect yield then the null hypothesis is rejected and the alternative hypothesis: 'That the inclusion of legumes does affect yield' is accepted. The problem is that it is always easy to 'fail to reject the null hypothesis' simply by doing a lousy study! If we used a rather small sample size and collect noisy (variable) data, the statistical analysis will conclude that there is no evidence of difference. But this does not mean that there is no difference, only that we have failed to find evidence for one. In ecology this is sometimes explained as 'Hypothesising no pattern and finding none means I have not looked hard enough. Hypothesising a particular pattern and not finding it tells me it is not there.' Thus the statistical concept of a null hypothesis may be useful sometimes, but it does not help design an effective study.

More often in applied research we know the null hypothesis of 'no effect of legume' must be false but are actually interested in things like 'Is it large enough to be of use to farmers?' So it would be better to change the hypothesis to reflect what is needed.

Finding words to express your hypotheses clearly can sometimes be difficult. It may be useful to add diagrams to show what you mean. For example, if your hypothesis refers to the non-linear patterns of adoption over time, you might explain it with sketch graphs of the expected responses.

Many hypotheses state how an independent variable or concept is affected by a dependent variable or concept, indicating that x is related to y, or x causes y. For example, 'Access to supplementary legume feeds during the dry season will improve milk yield'. It can help if you put your hypothesis into a small illustrative model as in Figure 2.

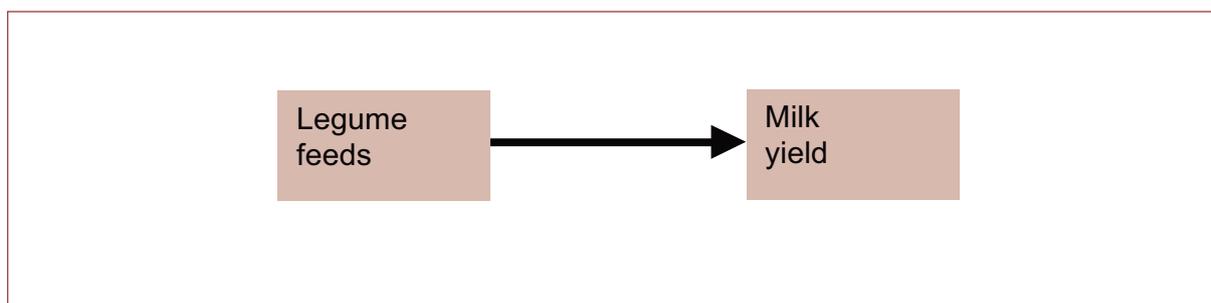


Figure 2. Simple representation of a hypothesis

Such sketches can also help in identifying methods, for example, by avoiding the effects of confounders. If you find three things pointing to 'milk yield', you have to have methods that will separate their effects.

## Research questions

You have established:

- What you are going to research (the research problem)
- Why you are going to undertake the work (objectives)
- What you are going to test (hypotheses).

Now you articulate what you need to find out in order to be able to carry out this research – the research questions. The questions you pose will also affect the research methods you use to obtain the data for your analysis. They are discipline-specific.

If you are an animal scientist then you will be most concerned with comparing milk yield for cows/goats with and without leguminous supplementary feed. If you are a crop scientist you will want to consider the impact on the yields of other crops grown in the rotation, whereas a soil scientist will be particularly concerned with the impact on soil fertility. If you are an economist you will want to assess all the benefits and costs involved for the farmer of including legumes in the crop rotation and you will need the results from all the other disciplines to determine the benefits. A sociologist or anthropologist will want to consider the effect of the changed rotation

on social relationships – does it reduce or increase the income or labour demands of women, or affect the nutritional status of children; etc.

The research questions will help you to determine the required research methods and analytical approach.

### Methodology and analytical framework

Although you may not be in a position to provide the exact research methods you intend to use, your research proposal must provide your approval committee with an indication of what approach you intend to pursue. You need to show them that you understand the requirements of different approaches and that you will be in a position to test the hypotheses specified, or to meet the objectives. You should be able to provide detail on the research methods you intend to use to collect the data even if you are not yet certain of the techniques you will use to analyse the data. Provide a review of your proposed research methods and indicate to the committee that you are aware of the cost and time constraints the selected data collection approach involves.

Experiments and surveys are the two primary methods of collecting new empirical data about a problem, and are explained further in Section 3. If you are using experimental methods, then outline the design – the treatments to be compared, the units they will be compared on, as described in **Chapter 3.6**. If you will use surveys (qualitative or quantitative) then outline the population you will study, the way you will select samples and measurements to be taken, as described in **Chapter 3.7**.

You should include an overview of the analytical techniques which could be used, and where possible indicate which you will probably use. Where you are in a position to give more detail on the analytical methods you will use, it is useful to both you and the Committee to include them in the proposal.

Here are two simple tools to help you think through methods and approaches. We explained earlier that hypotheses are often of the form ‘*x causes y*’ or ‘*changing x leads to a change in y*’. It can be helpful to specify these in a small table as in Table 1. Here *y* is the primary response and *x* is what changes it.

**Table 1. Framework for thinking about methods for testing hypotheses, with an example from the IPM/Crop Rotation adoption problem**

Primary response	What changes it?	What needs to be held constant?	What may be confounding it?	Experiment or survey?
1 Adoption of legumes	Soil type	Wealth status of the farmer	Main crops grown	Survey
2 N leaching	Soil type	N input, rainfall	Soil organic matter	Experiment

The second tool involves imagining the sort of results you expect to get. When you have done the work, the evidence about your hypotheses will usually be presented in the form of tables and graphs. Try to sketch those, with realistic numbers that you might expect to find. Now look carefully at them and try to answer two questions:

- 1 If I got those results, would I really be able to test the hypotheses and meet the objectives?
- 2 If I use the proposed methods, could I really get those results?

### Budget and timeline

In some universities the academic committee is not involved in how you will finance your

studies. They judge the proposal only on its academic feasibility. At other universities they do need to know that your project is sustainable and a budget is required.

If you are applying for a research grant from the university or as part of a project, then the budget is critical. You need to be sure that you provide enough information to justify your requests. You also need to ensure that you cover all the expenses you will face. You are unlikely to be awarded further funds during the process of the research. Take your budget to someone who has carried out a similar project and ask her/him to check that you have everything covered. Also be sure to discuss it with your supervisor.

It is important that you think carefully about the time you expect to take. With a time-limited dissertation and with funded research, you will have to stick closely to this timeline. If you are doing a thesis with a flexible timeframe, it is also important to stick to your timeline. Many theses are abandoned because they have dragged on for too long. If there had been more rigid time requirements, this may not have happened.

### **Iterating to a final proposal**

When you read a book such as this or see a finished research proposal, it may give the impression that it is a simple process of starting at the beginning, with a problem, and finishing with the practical details such as budget. Rarely are good research proposals actually produced like that. As you work on your proposal there will be many times when you have to change important components, revise large sections, even start again. This iteration is inevitable and constructive.

Reasons you will need to review and modify ideas include:

- You realise the problem-objectives-hypotheses statements are not really logical
- You find out more about the problem, related theory or previous work
- As you think about methods, you realise the objectives or hypotheses need modifying
- You realise that the time and budget available will not allow you to do all you intended
- You get ideas from others that suggest improvements.

The last of these is most important. As a student, the work has to be yours, but that does not mean you should not consult and solicit reviews and comments on your work. You should share your draft proposal with anyone who might give constructive feedback. This includes other students, your supervisor, other academic staff, a biometrician, scientists in local research institutes and so on. You can even try contacting authors of key papers that you have not met. Many scientists around the world are willing and able to assist keen young scientists, particularly if you can show you have done your homework and are asking serious questions. Some students (and their supervisors) worry about the possibility of ideas being 'stolen' by others. It does happen, but very rarely. You are far more likely to have your proposal considerably improved by discussing it with other experts.

Well done – you now have a workable research proposal. You are much further down the road towards getting your MSc, MPhil or PhD! Your supervisor is happy with the proposal and the funders have accepted it. Now is the time for you to go into the field. Do not necessarily wait for academic committee approval. One of the biggest problems you might face is the long delays in getting proposals approved and theses examined. In some universities this can be delayed by cancelled meetings, strikes and committee members away on consultancies. If the committee return the proposal with requests for changes you can make them as required. The problem will come if they want you to change the data to be collected after you have already started.

### **Resource material and references**

**Appendix 1.** The Craft of Research. Paul L. Woomer.

**Appendix 5.** Stapleton, P., Youdeowei, A., Mukanyange, J. and van Houten, H. 1995. *Scientific Writing for Agricultural Research Scientists*. WARDA/CTA, Ede, The Netherlands.

**Appendix 6.** Publication as an Output of Science. Adipala Ekwamu.

**Appendix 7.** The Art and Ups and Downs of Scientific Publication. Adipala Ekwamu.

Andrew, C.O. and Hildebrand, P.E. 1982. *Planning and Conducting Applied Agricultural Research*. pp. 14-33. Westview Press Inc., Colorado, USA.

Dixon, J., Bouma, M. and Atkinson, K. 1987. *A Handbook of Social Science Research*. Oxford University Press, Oxford, UK.

Greenfield, T. 2002. Writing the thesis. In: *Research Methods: Guidance for Postgraduates*, Greenfield, T. (Ed.), pp. 307-316. Second edition, Arnold Publishers, London, UK.

Ronald, M. and Bernauer, T. 1998. Empirical research on international environmental policy: Designing qualitative case studies. *Journal of Environment and Development* Vol 7: 4-31.

**There are a number of guides directed at graduate students. Some examples include:**

Greenfield, T. 2002 Writing the thesis. In: *Research Methods: Guidance for Postgraduates*, Greenfield, T. (Ed.), pp 307-316 Second edition, Arnold Publishers, London, UK.

Mouton, J. 2001. *How to Succeed in Your Master's and Doctoral Studies: A South African Guide and Resource Book*. Van Schaik Publishers, Pretoria, South Africa. 119 pp.

Reid, C.P.P. 2000. *Handbook for preparing and writing research proposals*. Vienna, Austria, IUFRO Special Programme for Developing Countries, 2000. 164 pp. Available from <http://www.iufro.org/science/special/spdc/training-resource-centre/proposal-writing/> [accessed June 2009]

There are a very large number of resources on research methods generally, which discuss formulation of research questions, objectives and hypotheses. As usual, Wikipedia is a good place to start online searches. Try: <http://en.wikipedia.org/wiki/Research>

You may also find useful books which go deeper in to the philosophy of scientific methods, for example: Ford, E.D. 2000. *Scientific method for ecology*. Cambridge University Press.

# 2.4

## Being a research student

Kay Muir-Leresche

- Your thesis is totally your responsibility, not that of your supervisor or university. Take Charge.
- Be innovative in overcoming hurdles – make a plan
- When working with a project be clear on what is required of you and what you will get from the project
- You will hone your skills: become more flexible, innovative, tenacious and determined.
- You will learn to manage change; to overcome obstacles and to take responsibility
- Be proactive in developing networks and building social capital

**The Socratic irony is that the only way we are wiser than any other person is because we know that we are ignorant – where they may not. Being a graduate student is a journey into learning that you do not know!**

This chapter deals specifically with the issues confronting post-graduate students carrying out applied research in rural areas. The chapter draws on the real-life experience of current graduate students working with smallholder agriculture, fishing, forestry, wildlife, the environment and rural development.

As post-graduate students you have an advantage over undergraduates since you usually know more clearly what your ambitions are, what you hope to achieve from your studies and how they will affect your career path. But many of you are often also under much more pressure than undergraduates. You may have to keep down a job, be married or even have children, you have more responsibility to the extended family and money pressures may be greater; especially where your studies are being self-financed or financed through loans. Where your studies are financed as part of a project that also brings its own pressures as you are now answerable to a research team and to the funding agents as well as to your own supervisor and academic requirements.

For those involved in research that is closely connected to rural communities, you have special responsibility to those you are working with and for. Some of these issues have already been referred to in earlier chapters. In this chapter we provide a more consistent outline of the main expectations, hurdles and assistance you can expect as you make a path through the maze of getting your graduate degree, becoming a change agent and contributing to sustainable rural development.

### Decisions and commitment

Your first step is the inspiration to undertake a degree that will involve applied research. This requires you to be prepared to take responsibility for your studies and to develop ideas to test. Think about the world around you and identify the gaps and

see if there are any you can help to fill. You need to be interested in finding out 'why' and 'how'; to want to be able to see how things work or to find ways of making them work better in existing situations; or to find ways of changing the current reality. You need to have a commitment to contributing to society and a belief in the importance of science to improving the world. You need the stamina and resolution to ensure that you achieve your best with available resources. Most important of all you need to develop confidence in your ability and the ambition and tenacity to succeed. You need to focus on your goals and steadily work your way towards them.

**As a post-graduate student you are responsible for your own research and studies.** You need to initiate discussions, look for the help and information you need and obtain the skills required to finish your degree or pursue your chosen research topic. The responsibility for your research and for obtaining your degree is yours. Don't expect to be told what to do – it is up to you to find out. You are now in the driving seat. But the university does provide you with guides, supervisors and mentors along the way.

Your journey will be much easier and more effective if you have an environment that is supportive. You will need a university that is able to offer the structures that allow you to undertake applied research as part of your degree programme. Universities that provide their post-graduate students with opportunities to go out and work with rural communities will be best established to deal with applied research. Many potential African research students have trouble finding a structure in which to operate. For those living in countries or regions with some choice in universities, be proactive in finding a university that is able to provide that structure. You can find out from those who have already graduated what experiences they had. You can see from the research output whether a university is active in the fields you are interested in. Use your lecturers, the University, bilateral and multilateral aid agencies, regional bodies and the internet to see what is available. If you do not find what you are interested in close to home then enquire about distance learning opportunities and regional programmes that include provision for the research component to be carried out in rural areas in your home country. If you do find openings in such programmes you will still need to find potential supervisors at home for your field work. Throughout your degree you will need guidance and supervisors who have a strong commitment to science, to rural development and to facilitating student development and learning. Your research and your degree will be more widely accepted if your university has a strong commitment to science and to high academic standards and provides support to its faculty and students.

What can you expect from your University? In addition to the taught programme, a university will provide you with guidance in your research. Depending on the university this guidance will take the form of a team of advisors or one or more supervisors. They will provide assistance in developing your research proposal and, in particular for research degrees, will guide the proposal through application for acceptance by the university academic process. Your supervisor or advisory board will then assist with problems while you undertake the research, but they are not responsible for your thesis. Their role is only advisory. Once you have completed, they will then be responsible for guiding the thesis through the examination process in the university and for working with you on any corrections that may be required.

In the sciences postgraduate students more often have a close relationship with their supervisors because they are often working on the same project, using the same laboratories and equipment. This can lead to less opportunity for independent action and original work. In the social sciences and the arts, most post-graduate students are given more scope for creativity and are often working on their own. The danger here is that they have too little contact with supervisors and may go too far off-track.

Some supervisors micro-manage telling you precisely what to do in each step of your research. This can restrict you and limit your growth and the skills acquired, even though it may help in obtaining your degree. At the other extreme there are supervisors who overwhelm

– throw out a multitude of ideas initially and then leave you to find your own way with periodic visits to throw out more options and ideas. With the former, you need to develop the skill to know when it is essential to go with the supervisor’s guidance and when to put in some of your own ideas. With the latter, you need to just make a note of all the ideas and pick out those that interest you or make sense to you. Don’t be intimidated – rather make use of their creativity. When you have selected what makes sense, produce a draft of what you want and submit it in writing. You will learn to select what is important to you. Both extremes help you in your journey to becoming a good researcher, tapping in to people’s strengths and using them to your own advantage.

Especially helpful to the idiosyncrasies of working with supervisors is the web page ‘Educational Resources for Postgraduate Research’ by Pat Cryer ([http://www.postgrad\\_resources.btinternet.co.uk/index.htm](http://www.postgrad_resources.btinternet.co.uk/index.htm)).

Your supervisor and/or the Department will assist you in how to go about obtaining any permission that may be required for you to work in certain parts of the country. In some local areas you will need special rural permits either from the central government or from the local traditional leaders. You should enquire from your Department and Faculty offices, and even the Dean of Students, about scholarships or potential projects that you may be able to apply to join. Usually, however, the information comes directly from a good relationship with one or more lecturers already involved in research. You should also search on the internet and contact the various government departments and the larger NGOs, multilaterals and multi-national and the larger local companies to enquire about possible support for carrying out specific research that is directly useful to them as part of your graduate studies.

The university is also there to provide you with support in accessing information and with access to computers, laboratories and other resources required for your research. In reality not many universities in Africa are able to provide their students with all the resources they need and this is why so many students prefer to become attached to a project which is able to provide more resources. Even when attached to a project, many graduate students will have to be innovative and adaptive if they are to achieve their goals with the limited resources available. If there is no transport to research sites, local buses can be used. But where the sites are too remote – contact the local service providers; veterinary, health, forestry and agricultural extension in particular. See if you can offer them some services while undertaking your research that would make it worthwhile to assist you with access or other resources. The contacts you make will not only help you with your research but be most useful in the future when you are looking for jobs and when you are working and need contacts in the field.

Some universities make provision for graduate students’ residential and social needs but not all. Before committing yourself to a graduate programme be sure that you have thought through where you will live and how you will support yourself. As more universities and graduate programmes are established there will be more competition among universities to attract graduate students and the living, study and social arrangements for students will improve. In the meantime you need to be sure to find out what provisions are available and ensure that there is sufficient support to enable you to undertake your research and complete your degree.

### **Working with rural communities**

Most of this book is directed at how best to develop your research in a way that is meaningful to communities and that will contribute positively to rural development. We emphasise the importance of working with the communities, recognising the value they bring to your research with their experience of local conditions. One aspect that is not so clear is how empowering it is to you when you are able to work closely with communities and make a difference to their lives. This strengthens you and builds a confidence that will reflect in your work and in your ability to generate ideas and will make you much more employable. More importantly it will

contribute to your personal development and bring you satisfaction that may have more meaning than the material rewards offered by your career.

In order to work successfully in a rural setting you will need to relate effectively with:

- rural households and communities
- bureaucrats, politicians, traditional authorities
- university and project administrators
- faculty and fellow students
- field officers, NGOs and the private sector.

Carefully assess your own attitudes and knowledge of the situation. You need to ensure that you respect the participants in your research: keep time so that your research does not inconvenience them and be aware that the opportunity costs of working with you can be very high to poor households. You must avoid taking advantage of their good manners and social system – be aware that taking their water, their food and especially their time is a burden to them. You must not insult them and of course accept their generosity and participate, but also contribute and arrange your schedule to accommodate their needs.

Working in rural areas places a heavier burden on the finances and time of a research student which is why most graduate studies working in the field in applied research are linked to funded projects. You need to be able to access research sites. This can involve obtaining permission from a wide spectrum of authorities. It may involve very costly or time-consuming transport. It poses problems for accommodation, for access to food and basic health facilities. It can cause additional stress on personal relations when being in the field limits the amount of time you can be at home. But it is in these very remote and poor areas that you can make the most impact. It is worth the time and effort required to carry out your research here.

You will need to develop your communication skills. You need to be able to relate to people who may have had little exposure to science and modern technology and who may not even speak your language. You need to communicate in a way that enhances their self-worth but which at the same time is clear. You will also need to be able to communicate with traditional authorities, village elders as well as technical specialists and policy-makers. You may need to be aware of, and respect, customs that are very different from your own. You may need to learn to work through interpreters and to understand the limitations this involves.

### **My Experience as a Graduate Student** **Munyiri S.W. (Egerton University, Kenya)**

#### **Community**

Since Kenya is a large country with about forty two (42) tribes, settling down in a new community with a different cultural background, and whose language you do not understand can be a daunting task. That was the scenario for me when it turned out that due to the nature of the research, (drought tolerance) the trial had to be conducted in the semi-arid zones of Kenya, about 400km away from home and college. This was necessary because the area is a hot spot for drought. In so many ways despite the language barrier, the local community was very welcoming and helpful. Because of the hired labor I needed from the local community during the trial, I learnt basic communication words, how to prepare their local dishes etc. At the end of the sixteen months, I appreciated that we may talk different languages, but we are really the same.

Because I was a stranger doing ‘a strange thing’, I got many visitors who wanted me to share the ‘good hybrid maize seed’ I was working on! It would take an interpreter to explain to an old mama that it was only local maize landraces collected from different niches in Kenya (maybe even from their localities) undergoing some very preliminary tests. In some

instances, I had to part with a few seeds. The abject poverty the majority of them live in due to lack of reliable rains and being so poorly capitalized etc was an eye-opener for me. I have learnt to appreciate what I have and constantly ask myself, 'can today's scientist bring some hope to these forgotten beautiful people?' The area is so dry that for the last seven years or so they have had to survive on government subsidies, but they never give up, they keep planting, and the crops keep dying season after season. I can only hope that what I and many other scientists are doing will eventually bring hope to communities living in the marginal areas of Kenya and Africa as a whole. I was able to respond to the community's expressed needs without many problems because I am an employee of the Ministry of Agriculture and have worked as an agricultural extension agent for some years. My earlier experience in agriculture extension work helped cope and effectively respond to many of the queries that the curious locals had. I took a two year leave of absence without pay to obtain my M.Sc.

### **Faculty and fellow students**

The Dean Faculty of Agriculture (Dr Koskei) paid us a visit once. He may never know (though we told him) how much we appreciated. He was able to identify with our scenario so much that he insisted on visiting what we called our dwelling places to confirm whether we really had decent places to stay! Nobody had done that before. The place is so remote and far from civilization that accessing basic necessities like decent food and even water is a problem (a twenty liter container goes for Ksh 20). To us, he was so real, in touch and down to earth. He encouraged us, reasoned with us and corrected us even though he is an animal scientist! We really appreciated. We were also honoured by visits from the Vice Chancellor and even by the Executive Director of Ruforum.

Life would have been less interesting without the joint venture into this research project with a colleague named Kamau. In college, we hardly related since we were in different classes and had very little to bring us together, this certainly changed once we found ourselves working in a strange land. He was fun to work with and since the environment was far from being conducive for habitation, we encouraged each other a lot. We consulted each other on technical issues, shared jokes, meals and when we got broke (i.e. no money for upkeep) we were able to joyfully share to the last cent in our pockets. It was true comradeship. I am glad to have known and worked with him.

### **Challenges faced**

Life was certainly easier when one had a positive attitude to the project itself, the supervisors and to the community as a whole. Positive thinking reduces the stress levels whatever the source. There were many challenges and hurdles, genuine sources of stress but I was determined to obtain my degree. I tolerated the harsh climatic conditions fairly well (temperatures would go to over 300 C during the day and remain above 200C at night) because a few years earlier, I had had a chance to travel to North Eastern Kenya on local tourism where the weather is more severe. It helps to travel and appreciate others and their ways of life-especially when you are the minority and different in maybe the way you dress, worship, talk etc. Now I look back at the field research experience with joy and pride, I also made valuable friends who have enriched my life in various ways. Thesis writing is proving to be a great challenge but when I look back where I have come from, I am encouraged that I can and will get to the closing line successfully.

The trial site was 400 km from home and because of the 40km stretch of rough road to the site from the main tarmac road, fares were extremely high. I rented a room with shared facilities and had to walk 1.5 km to the trial site every day.

The fact that the offered stipend was supposed to cater for every need i.e. travel,

accommodation, stationery etc proved very hard. Further, the stipend was rarely availed in time and so far I have received stipend for only 11 months. This has made it particularly hard as I was in the field for some 16 months. The area was a malaria hot spot so I took anti malaria drugs and slept under a treated net to stay safe. The mere thought of what would happen if I fell ill was scary. I never felt insecure working or living in the area because there were never incidences of criminal acts/attacks. However because I was a stranger in the area, I knew I had to live wisely and associate with only people of noble character and certainly mind my own business. Such an attitude always helps keep trouble away, whichever part of a community one may be in.

While at the university, I was able to access library materials and journals with limited internet services at a fee. Access to computers was also limited and I used to type my work at a fee in commercial computer places. The faculty has too few computers for all their graduate students. My study leave ended at the height of my research, since then, balancing my duties and studies (thesis writing) has been the greatest challenge so far.

Because CIMMYT-Nairobi and Kenya Agricultural Research Institute (KARI) are involved in maize research, I gained from their wealth of knowledge and received help in sourcing the local landraces genotypes I needed. I also made contacts that will be useful when I am back at work.

My family has been and is still very supportive of my studies. I joined the M.Sc. program when my baby was 2yrs. The whole program was not easy, but it was manageable. It was hard getting separated from my baby girl when she was barely 3yrs so as to conduct the research 400km away, coming home only once /twice a month when time/finances allowed. The financial implications for this venture were great and dug deep into the family finances since every cost had to come from the stipend (traveling, accommodation etc). But the journey has been rewarding and I do not regret the decision.

## **Access to information**

Many students in Africa have struggled with access to information. In the knowledge economy that dominates the world today, this is a severe constraint to African performance. In most cases our libraries have only limited texts and few journals. However the ever increasing access to internet reduces this disadvantage. While many books and journals are still not available on the internet, there are many that are. You need to hone your skills at searching the internet, especially if you have to pay for your connection time. There are a number of international research centres including FAO, the World Bank, the CGIAR centres and many others that make most of their publications available on the internet.

However even if your university library is limited and even if you have little access to internet, there are often international, bilateral or multilateral agencies with offices in your home town. You will find that many of them will provide access to graduate students – especially if your research topic is relevant to their agenda in the region. You also need to explore the various research centres and consultancy companies. In addition to assisting you with access to information, the contacts that you make in these various agencies will be most useful when you are looking for employment and in building up your network for the future. Individual lecturers, researchers and others working in your field may have a small collection of relevant documents and will be prepared to let you borrow. Again making these contacts may seem time consuming but will be useful not only for current access to the information, but to future contacts. This is termed building your social capital, and it is important to invest time in this during your graduate studies.

One of the keys to success in your career path is the networks that you build. It is in fact one of the real advantages of students who study at home rather than abroad. They are in a position

to establish effective links with fellow students who will be part of their working world later in life. They obtain exposure to a broad spectrum of agencies working in their field and to understand what is available. The agencies in turn get to know you, the student, and so when you apply for jobs they are familiar with your work.

Links within the university are also important. This includes informal links through extra mural activities, common rooms, socials as well as the formal contacts through lectures, seminars, workshops and meetings with supervisors, project leaders and university administration.

## **Being a Research Student – Iro Danguimbo, Niger**

### **Introduction**

Progress in development research is always the foremost challenge for a country and its citizens. Governments need to use their universities and invest in training a new generation of researchers. However, in Niger the part played by research is poorly understood by Nigerien society. Some decision-makers and certain citizens are unaware of the fact that many developmental achievements are the fruit of years of technological creation and rural innovation. Does this mean that research has no role to play for society? Absolutely not. These questions arise mainly in a context where there is insufficient financial and technical support, crystallising the will to engage in, and to devote oneself to, research. In Niger, the University and the research institutes were accused of not playing their parts as tools for development. How can we encourage and carry out research if even the most basic requirements cannot be guaranteed? Unfortunately this reality has never kept the political leaders awake at night. Carrying out research in Niger properly is dependent not only on it being financed sustainably, but also on developing suitable nurturing environments and building awareness in target groups to facilitate data collection.

The biggest future threat to research work is the gradual disengagement by the State in its funding, as this sector is considered the most expensive without any guarantees of profitability. Such an assumption will unfortunately bring about the collapse of several research institutes while the students will be the hardest hit, given they are the most vulnerable constituent with their constant appeals for financial and material support.

### **Factors affecting graduate success**

What are the social, economic, cultural, educational and academic factors which damage the willingness of students to undertake and commit to research? My experience acquired in this context helps uncover some of these factors:

### **Access to information**

Carrying out university research requires several information sources including in particular libraries, documentation centres, the Internet, seminars, workshops, symposia, resource personnel, experts and students. Students find certain of these sources of information either often inaccessible or difficult to access. Libraries and access to information do not get the priority they deserve from both university administrators and national funding agencies.

For the most part the existing documentation is made up of general information documents, coursework reports, final year dissertations, some tutor and doctorate theses and reviews and reports available free. In some cases, even access to this documentation is difficult, as a result of actions by the library staff or excessive demand. The unavailability of a complete catalogue of documents the university libraries contain, is proof of the fact the libraries are not as efficient as they could be. Such a catalogue is essential, especially when

the verification of the existence of a document is not computerised. The lack of IT tools delays accessing the information and also in keeping track of documents.

With the development of the Internet, a glimmer of hope has appeared in the university library sector and among the students. Digital collections offer a new opportunity to students to realign themselves to their studies. However, in Niger university libraries are still lacking electronic documents which can be shared easily within the university community. Furthermore, not only is Internet access for students both difficult and expensive, it is also slow and accessible to only a limited number of students.

Conferences, workshops, symposia and seminars where ideas can be aired and debated, are rarely held by the Universities. However, these are occasions where collaborations emerge which give rise to significant benefits. Difficulties are felt when accessing basic data from technical services (annual farming yields or rainfall data over given periods for example). Currently a number of State technical services sell such fundamental data and students do not have the funds to pay for it.

Among the students, information is passed between the students on the source, the existence or the availability of documents. However, sometimes certain students display occasionally egotistical attitudes compromising the dissemination of information.

### **Rural environment research**

Niger's rural environment is going through social, economic and ecological change. In this context where the economic, social and ecological indicators are alarming, it is difficult to carry out data collection in collaboration with rural communities. Such difficulties are many, varied and on occasion seasonal. The availability of people, which is affected by a number of social, economic and environmental factors, is one of the major obstacles to accessing data on village lands. For example:

- The farmer, highly dependent on agriculture within a sector in which agricultural production is under pressure, agricultural deficits are constant, food is in short supply and survival strategies are limited, turns into a beggar when faced with an interviewer. Such a person would not necessarily be prepared to divulge information every time an interviewer asks for it.
- Traditionally, the so-called lean period is marked by an exodus of working people, often consisting of entire families, to the region's major urban centres, sometimes requiring them to cross regional and even national borders. This hinders data collection particularly when the individuals or households sampled suffer from socio-economic instability. On the other hand there are periods which are conducive to tackling rural environments. Following on from a good farming season, data can be collected quite readily as rural communities have less need to travel.
- The gender issue is also prejudicial to the rapid progression of village research. For example, there are major issues surrounding the collection of data on women in rural households. The man dominates the structure in the home in Nigerien villages. Few women are formally recognised as heads of households because the wives of migrants are made the responsibility of the extended family while widows are required to marry the brothers of their husbands. Culturally, in a rural environment, a foreigner is required to address only others of the same sex and can only communicate indirectly with those of the opposite sex. For example, a male researcher can only obtain information from women by speaking directly to their husbands or by speaking to the women in the presence of their husbands, which can compromise the quality or objectivity of the study. The experience acquired during a study to determine the local knowledge of the flora is one typical example. In fact, mixed gender visits to farming or forestry systems have shown

that women refuse to be the first to offer any opinion on species and their use. However, where a female researcher organises a similar field trip then this reveals more clearly what the women know about the flora.

- Sometimes serious confusions arise when researchers are likened to politicians. When the researcher is confused with a politician who never keeps his promises, s/he is confronted with a lack of respect and consideration issues leading to dire consequences.

### **Student-Supervisor Relations**

The university research work done by a student requires the assistance of a tutor or a supervisory committee. There are several reasons why a tutor-student relationship can be either difficult or straight-forward. In fact, when the supervisor is easy-going, a climate of discussion sets in and ideas can be bounced around readily, leading to a consensus of opinion. In this illustration, the supervisor draws up in consultation with the student, the study programme and, in particular, the additional training which the students needs to follow during the research phase. S/he helps the student with difficulties and agrees on a programme of supervision from the fieldwork to the final write-up. Where the supervisor has a severe and authoritarian manner their opinions end up overriding those of the student.

The unavailability of supervisors places the students at a serious disadvantage. One-to-one tutoring by lecturers wanting to supplement their incomes leaves those students who cannot afford such advantages by the wayside.

### **Influence of social life on academic work**

The strong, sustainable dependency of most of the students with respect to their family influences their academic work in a very specific manner. Their ongoing poor financial resources impede their commitment. For example, students entering higher education accept that their fees are paid in full by their parents, because they are young and behind in their studies. This situation is unsettling when the student reaches the age where the financial support from his/her parents is reduced at the point where s/he still does not have any significant level of financial independence. Students are then forced to do fee-paying work even during the academic year. Such fee-paying work competes strongly with their coursework and makes it impossible to do rural research.

### **How to tackle these problems**

Research is an arduous challenge requiring time, peace and quiet. To do their research the students should consider observing a number of guidelines which are worthwhile listing here:

- As the primary person, they should take full responsibility for their research programme and the accomplishment of their thesis;
- They should ensure they give their research their full attention and undertake their work diligently;
- They need to be receptive to the research management and administrative supervision provided by the professors, while at the same time maintaining and developing their autonomy so they can respond, where applicable, to suggestions or decisions that may nevertheless appear irrelevant to them;
- They should not avoid seeking help from tutors and other resource personnel, especially during the development of their research project;
- Finally, they should be impartial in rural environments and respect the villagers to facilitate their access to data.

## Conclusion

It is time to leave behind the hypocrisy and to state the problems and inequalities exactly as they are. The problem faced by university students is not one of the opening hours of the libraries at weekends and during holiday periods, but one of having the documents they need at their disposal, and spending more time with lecturers and supervisors. This requires the creation of posts to put supervisors in front of students while leaving them with sufficient research time for themselves. Some students' income is significantly below the poverty line, meaning that they require huge amounts of resolve and tenacity if they are going to accomplish their academic work successfully.

## Access to guidance

The university's role in your graduate studies includes providing formal guidance for your research and thesis preparation. In reality many lecturers are very heavily committed with a large teaching load and little if any teaching and research assistance, many administrative and outreach activities and, in addition, because of poor salaries many lecturers are involved in outside consultancies. This means that you may not receive the guidance you should. For those students in RUFORUM projects, the project leader receives a stipend to provide this supervision and can be called on to ensure good access to the students. For other students, the best thing you can do is to try to select a supervisor who you know is conscientious and accessible. If you are not able to get the support you feel you need, you should first advise your supervisor that you really need more help and if this is not forthcoming then call on your Department Chair to assist you, or if there is an advisory team for your thesis, then call on some of the other members. They in turn may then put pressure on your supervisor, without your having to make a formal complaint. All universities have a formal complaints procedure and if you feel you have a strong case, then you can follow that after seeking advice from other faculty members.

**Academic Advisory team:** not all universities have a team of advisors. It is useful where there is because this allows you to consult with more people for guidance. But it can also complicate things if they do not agree amongst themselves. If you find that you are getting conflicting advice, you must alert them as early as possible and take the time to discuss this with your principal supervisor.

**Main supervisor:** it is very important that you select a supervisor with whom you have a good rapport. If supervisors are allocated to you, then you need to see if there is a good connection early in your thesis preparation. If you feel that it will not work well then approach another lecturer about taking on the role. If it is not logistically possible to make the change, then be aware of this and see if you can obtain some assistance from other sources. If your supervisor is away from campus much of the time, then be sure that you keep in close touch by email and that you send in short reports and/or draft chapters, so that you can obtain input throughout your degree. However, you do need to remember that your thesis is your responsibility. If you do not want to follow the advice you are given, then you do not need to. But in that case you will need to be sure that you have strong evidence to support the alternative path you have chosen. At the same time you cannot use lack of supervision as a reason for failure to complete. You are the one affected if you do not graduate. You need to forge ahead and if necessary obtain other input.

**Mentor/guidance counsellor/advisor:** in some instances Universities will allocate you a mentor who is more directed at assisting you with coping with the administrative procedures, the social and personal hurdles you face and help you with logistical arrangements. Where no mentor is assigned, you can usually use the office of the Dean of Student Affairs where you have particular

problems. Otherwise you can often find some of the junior faculty members very helpful when approached informally.

**Principal Investigator or Project Leader:** may not be your supervisor. In this case it provides you with another source of assistance. You should avoid calling on them without good reason. But if you have a particular insight to share or a problem related to the project, you should bring it to their attention.

**Project team:** Here is where you are likely to obtain most of your support during your field work and even in discussing your findings and their implications.

The main purpose of your supervisor/advisory committee is to ensure that your research and work meets academic expectations and to present your work for examination.

Highlights of what is expected of your supervisor/advisory team:

- Give advice and direction on the academic standard of your research
- Help you develop your project proposal
- Direct you to where you can get help with accessing literature
- Facilitate contact with other academics and experts in your field
- Give advice on relevant techniques and methods
- Ensure that you are aware of ethical issues including plagiarism
- Provide you with information on the academic processes for post-graduates
- Review and report on your progress through written work and meetings
- Provide timely and constructive criticism of written work submitted
- Encourage you to disseminate your work widely
- Provide reasonable access for consultation
- Guide your thesis through the examination process.

What is expected of you the Research Student in working with your supervisor

- Agree on the field of research and then develop the proposal
- Take the initiative in arranging meetings and raising problems or difficulties
- Produce work in accordance with deadlines agreed and in time to allow for comment and discussion
- Ensure your supervisor can contact you and knows of fieldwork or other reasons for absence
- Agree deadlines for rough drafts and submission of final thesis.

### **Student related issues arising from project participation**

Students often find that they need to be part of an existing project if they are to be able to finance their studies. The sponsorship obtained may be essential to engaging in applied research and obtaining post-graduate qualifications. However it can have its problems especially where the academic requirements and those of the project differ but it is usually possible to negotiate a compromise. Students frequently face problems where the promises made when joining the project are not kept. This refers most often to delays in, or reduced payment of, stipend and university fees, or the non-delivery of equipment or access to facilities, support and transport. It is very important for you, the student, **to write down what you understand the project will supply and what you are required to deliver**. Be as clear and specific as possible including delivery dates. Show this to the project leader and your supervisor and discuss it with them, then send a copy of the final document to the Chair of the Department. If you have misinterpreted what is being promised it will become clear early in the process. If not, then you will have something in writing to refer to if you have problems later in the project.

Some students resent the limitations imposed by the project on selection of research topic and would like more freedom in designing their research. Often the area of research is determined by the objectives of the project which is externally funded and has probably been pre-determined. In the cowpea project, Uganda and in the soybean project in Zimbabwe, the area of research was defined years prior to selection of students. This means that students had to fit into an on-going project. Students who choose to join an existing project need to find a topic that fits into the project research agenda. Some students find this restrictive and would prefer to pursue their own projects or would like to be part of the project proposal process. Logistically this is not always possible. But within the project objectives the students should be able to find a range of issues which can inspire them and provide the space to develop their own research proposal within specific guidelines from the project. It is more difficult to balance the requirements of your degree and that of the project when working with programmes or projects outside the University. One of the advantages of being part of a University/Faculty/Department managed research project is that students can develop their sub-research projects around a topic according to the requirement for their degree. Some of the other benefits students received from being part of projects include:

- Real problem-solving research experience
- Networking with students, faculty and researchers from other disciplines and agencies sharing experiences and knowledge
- Students have the opportunity to interact with scientists from national regional research stations, the extension department and most importantly with farmers
- Exposure to a broader range of data gathering and analytical tools than would be possible if only involved in their own research project
- Continuity and a greater breadth and depth of knowledge e.g. in the Cowpea project, one batch of students conducted on-station research to understand trends, and the next batch then moved on to farmers' fields and then finally to participate with national agencies and NGOs in dissemination
- The opportunity to participate in a project that looks at the whole chain from production constraints to markets
- Greater opportunities for publishing papers
- Projects offer opportunities for students and their supervisors to attend meetings and present their research data via posters or presentations
- When well managed, a project provides students with the opportunity to arrange and manage meetings.

### **Personal Circumstances**

What you study, how you study and indeed whether you engage in post-graduate studies is often determined by your personal circumstances. Some students are in the fortunate position of having the active support and backing of their families while in others, the family circumstances may make taking time out of a career and reducing family income a real strain on the student. If part of the stipend is used to meet family commitments, this can be a problem and reduce their ability to complete. Success or failure of post-graduate students is often as a result of their personal circumstances as well as their personal attributes. All research is an exercise in tenacity, requiring patience, creativity and determination. Set your goals and meet them. If there are hurdles on the path – find a way over or round them. If there are delays; don't give up. This is all part of the process of developing the skills that come with being a post-graduate student. You will learn to plan, how to allocate resources, think laterally and especially to be flexible and adaptable to change. These are all skills valued by prospective employers. You will need to strengthen your ability to communicate at various levels and to work in a team with farmers, senior academics, fellow students, technical specialists and even policy-makers.

It is also important to relax in between working and to maintain a balance. You will work better if you have a healthy body, mind and spirit. You will also become better educated. Both Socrates and Plato considered that 'gymnastic for the body and music for the soul' should form the basis of all education (Plato, *The Republic II*, 376 in Jowett 1925). This means that you need to be active in social life both on and off campus. Participate in sports teams, expose yourself to music, art and theatre, enjoy social gatherings and be around for some of the down time with fellow students. In addition to providing you with a more balanced life, this is an important part of building social capital for your future, developing the personal skills that will be so important to your success and providing you with the stimulation and inspiration to continue contributing through your research and work.

Take full responsibility for your research. If you find that you are struggling academically and your supervisor is not in a position to assist you; remember it is your thesis and your career at stake. Be active and go out and look for the assistance you need in determining the right method, or interpreting your results or writing the model for analysis. If you approach someone with your problem clearly articulated, you will find most people willing to assist. Avoid letting someone else do it for you unless you can actually give them credit for what they have done. If someone else does the work for you, it will become evident when you are defending your thesis and could even lead to failure (see **Chapter 1.1**).

### **Being a research student** by **Delmira Lorena Mahache Cambaco**

As a research student I, like many other students, face a lot of difficulties but in trying to find solutions, the difficulties actually improve my research qualities. For instance, access to information in Mozambican libraries, in general, and at the University Eduardo Mondlane (UEM), where I am studying, is limited. The available material is either outdated or limited in scope and quantity, the most probable reasons being financial and a lack of a clear library renovation strategy from the University. Therefore, very often I had to use my own resources to acquire textbooks and other research materials. Since it is virtually impossible to acquire all the necessary material due to financial imperatives, I have had to resort to lecture notes handed by the lecturers. To exacerbate this status quo is the working time of the University's libraries which is very limited, in that it coincides with the office working hours. Students do not have access to the libraries after 3.30pm. Some faculties with evening courses, however, have their libraries open up to 8.00pm.

As far as computer material is concerned, the situation is slightly better but still far from ideal. The amounts charged by internet providers are beyond the reach of the majority of students<sup>1</sup>. When I started my post-graduate studies, the Eduardo Mondlane University had a wireless connection and during the short spell we had access to it we were well served. However, the connection became then difficult so I had to rely only on the University PC's with their delays and difficulty of access. Therefore, it is a challenge for a Mozambican student to have access to internet, for a number of reasons. On the one hand, it is the difficulty to access it, but on the other hand, is obtaining up to date information related to Mozambique on the web. Furthermore, often the sites that hold some scientific relevant information require prior registration to access it.

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1 While I was undecided on which provider to approach, some internet companies began advertising broadband and wireless access. Although more readily available on the technical view point, the costs are still very high. All providers charge fees in excess of sixty American dollars per month.

### **Personal circumstances**

My own circumstances may not be considered typical, since for the field work I benefited from family support with regard to various aspects. For example, to go to the research site I used family transport; fuel and living allowance were also borne by my family. I did not benefit from any bursary from any organisation.

Post-graduate fees are not in accordance with the cost of living in Mozambique. The charged amounts are far beyond ordinary family reach. In a family with a member holding a university degree and working in the public service, the monthly income does not surpass USD500. Therefore such a family cannot afford to pay post-graduate studies to any of its members. Myself, I come from a large extended family including mother, brothers and sisters (all of them older than me), nephews and nieces to whom I have to provide health care and basic foodstuff. That is why I have been paying my fees in arrears. All of this would not be possible if I did not have support and encouragement from my spouse.

As far as difficulties encountered in the field are concerned, I can say they are related to limited collaboration from the local communities, who sometimes are unwilling to answer questions because, they are fed up of false promises from the authorities. As easily inferred, the communities take everybody who goes to meet them as part of the government system who promises food and other things but without keeping those promises. Informed sources, nonetheless, indicate that NGO's are to blame because when they want to establish a project, they make promises, but once installed, they do not listen to communities' complaints or cries.

Nevertheless, after a thorough explanation of the object of coming to the community, they ungrudgingly collaborate, warm heartedly providing answers to my many questions. They even provide additional unsolicited information about the community life and needs.

Whilst it is true that those who are clear about my work do collaborate, it is also true that I have had a lot of difficulties in meeting many heads of family. Despite prior arrangements, most of them went away with no explanation. This required some persistence and patience, for I had to go to the same places a couple of times until I could meet them. Other family heads, came drunk to interviews notwithstanding knowing beforehand of the interviews. Under these circumstances, I had to reschedule the interview for another day, obviously with the ensuing up and down costs.

As aforementioned, community perception of research work, or from other visitors, is of someone who brings food aid or other type of aid. In situations where I had to randomly select families, I could note that on the same list of the interviewed persons, one could find husband and wife as belonging to different family households. Going to their homes, it was possible to discover that the same home had already been visited in order to interview one of the spouses.

My own investigation of the phenomenon concluded that this situation occurs when one of the spouses has some family links with the community leader, since the latter, wittingly writes down the members names of the same household in order for them to benefit from any humanitarian aid should it come. The most appalling situation is when the leader lists down children names as heading their own households, but on a different list the same children appear as part of an adult headed family.

With respect to my social life, on and off campus, I can say it is somehow quiet. I have good relationship with my course mates on and off campus. Indeed, from time to time we organise social events in which even some former undergraduate colleagues take part. It is important to recognise though, that in any organisation there are always some elements with outlandish or egotistical behaviour. For instance, it has happened that after agreeing with some colleagues on exchanging study materials such as textbooks or hand outs, they simply do not show up and I have had to start afresh to look for other materials. Other

situations include breach of agreed group study sessions, on the grounds of self-reliance or alleged work commitments since some are employees in either private or public sector.

To sum up, I can say that my life is split between family, academic and work assignments which requires that I properly programme my time. Therefore, I think good time management and the capacity to cope with stress is a key for the success in most case scenarios.

### **What you gain from being a research student**

Becoming a researcher is a role that involves getting advice and developing skills: finding out what to do and then how to make sense of the advice; selecting and rejecting from ideas and theories presented by literature, lecturers and advisors; recognising that research is incremental; that yours will only be a small contribution and most importantly that it is acceptable 'not to know'. As an undergraduate you were confident and felt you knew it all. The postgraduate maze teaches you that there are many paths and that proving something to be wrong is as valuable as proving it right; that there is no shame in not knowing – only in not knowing how to go and find out!

Highlights of some of the benefits of engaging in being a post-graduate student in rural Africa:

- Degree
  - job opportunities (hopefully more interesting and better paid)
  - prestige and social recognition
- Delays the need to find a job – may provide support to family through stipend but this stress can put success in jeopardy
- Personal growth and a sense of self-worth/achievement. It is very empowering both to obtain your degree and to work in rural areas
- Mattering – especially if making a difference to poor households. It is very empowering if what you are doing is contributing to society and improves your self-worth and confidence
- Working with people in rural areas develops a stronger sense of community and service and is important to building social capital for the nation
- Expands opportunities for your social life
- Networking for the future – building personal social capital by making contacts and friendships. It is important to relate well and make an effort as these are the most likely sources for employment, opportunities and assistance in your future working life
- Personal skills – the whole process of establishing a research topic, designing it, budgeting your time and money, working in the field, deepening and widening your knowledge of methods and analytical tools, developing writing and presentation skills and working with teams as well as the tenacity, flexibility and common sense required to succeed, all contribute to the very important personal skills that employers look for.

### **What I Gained From Being a Graduate Student**

**Tavagwisa Muziri: Msc Crop Production, Africa University, Zimbabwe**

Stemming from the background working as a farm manager on a commercial farm, I had never thought that farming could be complete without the prescribed inorganic fertilizers and other purchased inputs. The first year of graduate school miraculously changed my thinking and perception of farming and awakened hope in me for the poor farmers, hope that it is possible to rekindle the flame of sustainable farming without needing to depend entirely on inorganic fertilisers. The previous training and experience I had received made me

see farming as only successful with purchased inputs.

I therefore had never envisaged myself being useful to the resource poor farmer of Chivi (my home area) with their granitic, sandy soils until graduate school broadened my horizon. It gave me the impetus to become an agent of development in my area and beyond. December 2005, I was enjoying Christmas holiday in the rural areas with my village head discussing as we always do, the state of our fields. Realising that I had grown in my understanding of soil fertility issues, the excited *sabhuku* asked me to address villagers on the use of available sources of organic manures in improving their soils. This marked the beginning of my career as an extension agent to my people and later on to various other farmers I was to meet, thanks to graduate studies and the wealth of research knowledge and confidence it imparts on its products.

Back at college a project was waiting for me on the use of municipal organic waste as a source of manure for peri-urban farmers. The project was eventually accepted by everyone I shared the idea with; the city council authorities I discussed with, vegetable vendors at the vegetable market where I collected my samples as well as the smallholder farmers in Nyamazura where I did my project. The people of Nyamazura took pride in the project and made it theirs. They knew my plots and their treatments better than me. They inspected them on their way to the grinding mill and as they came from water points. They even could assess the growth of the crops in my absence making their own interpretation as they did.

I enjoyed working with all these people. I gained skills of interacting with local community, disseminating my knowledge to them at the same time learning from their experiences. I developed affection for the Nyamazura community and felt an invigorated curiosity to contribute to my community back home. I had become more enlightened and empowered. The advice I could now give to them became much closer to their situations and less abstracted from their reality unlike what I could offer in the past. Apart from the enhanced usefulness to the community, being a research student improved my communication and analytical skills. It exposed me to different people and ways of life. The trip to Malawi for the RUFORUM Biennial meeting (May 2007) widened my horizon and understanding of agriculture. It brought opportunities for networking with other scientists and exposure (the desire of every scientist). The stipend received helped me substantially throughout my studies.

On the other hand, the amount of work that the student has to do is sometimes so great that it disengages one from normal social life. I personally lost friends, missed funerals and had little time with my loved one: missing the core values of a functional human being in our society. The ledger is always not balanced between satisfying the requirements of graduate school and those demanded by the social being. Overall though, I gained immensely from being a graduate student, despite the loss on the social front.

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*Sabhuku* – village head

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Most universities have advice for their postgraduate students on line that you can access.