Pest Management
– a case study from Babati District, Tanzania

By: Angelica Segerbäck
Handledare: Clas Lindberg
Abstract

The essay covers the subject of pest management in the developing world with focus on Africa. A small study was conducted in the Babati district in Tanzania. The division of labour is usually quite gender specific. Men have the main responsibility for cash crops while women often are responsible for the families food crops as well as household work and taking care of the children. Pest management often also falls on their lot. Yet women get very little information and education as well as gain access to important resources that could lighten their work load. Farmers generally use chemical pesticides as their main method. In the larger cash crops fields especially, farmers feel that it is too difficult to use other methods with exception for crop rotation and in some cases intercropping. In the smaller plots for family use it was however more common that other methods were used. However chemical pesticides were still used if they could be afforded. Tasks being so gender specific women have different needs than men but they are rarely asked what they need and how they perceive things. There seems to be a lot of bias and great misconceptions when it comes to the importance of women in agriculture.

Key Words
IPM – Integrated pest management
Cash crops
Food crops
Pesticides
Gender issues
Indigenous knowledge
Extension
# Table of Contents

Abstract.........................................................................................................................2
1. Introduction..................................................................................................................4
   1.1. Purpose and outline of the study.............................................................................4
2. Method and concepts.....................................................................................................5
   Small scale farmers.......................................................................................................5
   Large scale farmers......................................................................................................5
   Extension service..........................................................................................................6
   Farmers training center...............................................................................................6
3. Pests and pest management.........................................................................................6
   3.1. The most common pests.......................................................................................7
       Grain eating birds......................................................................................................7
       Rodents.....................................................................................................................7
       Insects.......................................................................................................................8
   3.2 Methods against pests...........................................................................................8
       Chemical pesticides..................................................................................................8
       Traditional methods.................................................................................................9
       Crop rotation and modification of cropping periods................................................9
       Intercropping and altering of planting dates............................................................9
       Weeding, crop hygiene and cooperation for area wide control.................................10
       Physical methods, trapping and hunting................................................................10
       Ploughing and watering............................................................................................10
       Pest resistant varieties.............................................................................................11
       CBC – Classical biological control.........................................................................11
       IPM – Integrated pest management.........................................................................11
4. Knowledge diffusion, farmers participatory research and the gender dimension.........12
   Knowledge diffusion....................................................................................................12
   Extension services........................................................................................................12
   Farmers participatory research – FPR..........................................................................13
   The gender dimension..................................................................................................14
   Economy........................................................................................................................16
   Education......................................................................................................................16
   Research and extension...............................................................................................17
5. Results.........................................................................................................................20
   Field work summary.....................................................................................................21
6. Concluding discussion................................................................................................21
   Policy implications........................................................................................................23
References.......................................................................................................................25
Appendix.........................................................................................................................27
   Interviews with farmers...............................................................................................27
   Mamire & Mutuka.........................................................................................................27
   Sigino............................................................................................................................31
1. Introduction

Within recent years the awareness of environmental issues has increased dramatically and can especially be seen in the increasing demand for organic products, especially food. Both for health- and environmental reasons many people choose to consume organically grown crops. With the increasing demand more and more farmers take the step over to organic production. Is there a similar trend in development countries? With harsher conditions due to poor soil quality, soil erosion, drought etc. Care for the environment should be on the top of the list to secure food production in the present as well as in the future. Part of that is the choice of methods used to keep pests at bay. The use of pesticides, although initially effective will affect the environment as well as the health of the workers and perhaps also the people consuming the goods. In time the pests may become immune to these pesticides and stronger ones will be needed with increased damage to the environment and the people. Many of the farmers in the developing world are very dependent on getting a good yield. They do not have great margins so if their crops fail they could be ruined and risk starvation.

1.1. Purpose and outline of the study

The essay will attempt to investigate methods used to counteract various pests in development countries and the spreading of knowledge of pest prevention with a gender perspective. The main focus is on Africa, especially East Africa. A field study was conducted in Babati, Tanzania, as an example of how it can be in reality since the majority of the population in Tanzania is dependent on agriculture.

The study will attempt to answer the following questions:

- What kinds of methods are used? Traditional methods, pesticides or new more environmentally friendly methods?

- Is there a noticeable pattern in the choice of methods? For example age, gender, large scale or small scale farming etc.

- Is there a difference between how the extension workers and the farmers perceive the situation?
The limited field study will be combined with a literature based discussion on gender and knowledge diffusion.

2. Method and concepts
In the spring of 2008 a study trip was made to the Babati district in Tanzania. Babati is both the name of the district and of a city in the Manyara region. Babati town as the city is referred to is the administrative capital of the Babati district and the city lies 172 kilometers south from Arusha. In 2002 it was recorded that the Babati district had a population of 303013 people. (http://mwankama.com)

For this study a series of interviews were conducted in the villages Mamire, Mutuka and Sigino with a number of farmers of both genders and both small scale and large scale. Interviews were also made with the agriculture and livestock extension officer in Mamire and with the project manager, Mr. Mao, at the farmers training center in Wang Warai.

Information was gathered through 15 semi-structured interviews on location in the Babati district. That allowed for a more open communication, a discussion rather than a questioning. Although the study is too small to draw any general conclusions from it still shows an example of how local conditions can be.

Small scale farmers
To distinguish between large scale and small scale farmers a limit for how much land they cultivated was established. Farmers who had 10 acres or less are regarded as small scale farmers. The small scale farmers had either just a plot by the house for family use or also another plot elsewhere that was mainly for cash crops. Interviews with small scale farmers were conducted in the village Mamire. The mean area per small scale farmer is approximately 4 acres.

Large scale farmers
Those farmers who had 11 acres or more are regarded as large scale farmers. The interviews with large scale farmers were conducted in both Mamire and Sigino. Since there are fewer farmers that can manage to be large scale only 3 interviews were conducted with large scale farmers of which none were women.
Extension service
The agriculture and livestock extension officer in Mamire and Mutuka usually works with groups of farmers. He goes out to contact them or they can come to him for help, advice and to buy pesticides and fertilizers. He also works with researchers from Arusha and with the farmers training center to prevent pests. Farmers are participating in the research of more pest and disease resistant varieties of sunflowers and pigeon peas. One sunflower variety for example has its flowers bent down which makes it harder for birds to eat the seeds. The farmers get paid for the use of their land for the project and the plots are then used as demo sites for other farmers.

Farmers training center
The farmers training center in Wang Varaj close to Babati was started 11 years ago and the project manager Mr. Mao has been working with the center since it started. The center helps train farmers and they also do a lot of agricultural research and develop new techniques and can supply farmers with seeds. When the center was started the land was in bad shape and there was soil erosion and not a lot of trees. They have completely transformed the area and it has become luscious and green with a lot of trees. At the training center they also teach farmers how to spray their crops. They mainly use chemical pesticides but there are also a few biological techniques like spraying with cow urine that has been fermented for 25 days and that kills some insects. It is more common to use alternative methods for stored crops but when the crops are in the fields chemical pesticides are the main solution. The ashes of burned cow dung can also be used for stored crops and protects against certain worms. Silos are however seen as the best way to protect stored crops. Small scale farmers can use 200 liter drums to store their crops. Mr. Mao estimates that most farmers, about 90 percent, use traditional methods when storing their crops. In the future he thinks that no artificial methods will be used. When it comes to protecting crops in the field however, most farmers use chemical pesticides. There is also a lot of pressure from the chemical industry that their products should be used.

3. Pests and pest management
“The term “pest” is often used for animals causing damage or annoyance to man, his animals, crops or possessions, such as insects, mites, nematodes, rodents, birds. In phrases such as “integrated pest management” and “pest control”, the term pest is used in a broader sense to mean all harmful organisms including fungi, bacteria, viruses and virus-like organisms, and weeds.” (http://thailand.ipm-info.org) Every year insects, other
pests, weeds and diseases cause around 5-40 percent loss of crops. (Malena, 1994) In this essay the main focus is on grain eating birds, rodents and insects.

3.1. The most common pests

Grain eating birds
Birds can be a big problem for farmers as they eat grains such as millets, sorghum and wheat as well as sunflower seeds. In years when bird populations are large, farmers can lose as much as fifty percent of their crops. (Bruggers, 1980)

Rodents
Rodents create many difficulties as they attack most crops in the field as well as in storage. Damage by rodents can occur from seeding to the maturing stage rodents can also damage the crops when they are stored by consuming it, contaminating it or spilling it. Rodents can be a big problem when they damage the crops or transmit diseases. There are about 77 rodent species in Africa that harm various kind of crops. In East Africa there are at least 35 species of rodents considered as pests. The crops that are most effected are crops such as wheat, barley, sorghum and maize, but rodents can also damage root crops, plantation crops, forestry plantations and they can also damage stored crops. Besides crop damage rodents can also damage storage structures and if rodent numbers are large grazing areas can be damaged. Some rodents only damage crops when the seeds are newly planted and therefore counter measures against them need only be taken certain seasons.(Fiedler, 1994)

Rodents populations increase and sometimes erupt when the conditions have been favorable. The most favourable conditions seem to be connected to rain. Drought followed by normal or excessive rainfall seem to be the most favourable conditions. The rain means that plants can grow and thrive which in turn gives the rodents more than enough shelter and food and thereby increasing reproduction. One of the problems is that controlling measures are not taken before a breakout has occurred. Only when the problem has become evident and damage has already occurred to the crops action is taken, and then it is usually too late. Measures must be affordable because most farmers can not afford to take preventative measures and they are also very vulnerable if their crops are destroyed. The solutions must also be practical and not add more labour. (Fiedler, 1994)
Insects

In southern and eastern Africa cereal crops are mainly attacked by stemborers and striga. There are great regional differences but as much as 80% loss of crops can be attributed to stemborers in some areas while the average lies around 15-40% in other areas. When insect pest occur simultaneously with weeds, such as striga weeds, the entire crop can be lost. Striga weeds alone can cause crop losses around 30-100%. Stemborers especially are difficult to get rid of through chemical pesticides because their larvae live deep inside the stems. If these losses of crop could be avoided there would be enough food for 27 million people. Every year crops at a value of 7 billion dollars are destroyed due to stem borers and striga. (Malena, 1994)

3.2 Methods against pests

Chemical pesticides

During the late 1800’s synthetic pesticides came into use and it had a massive impact on agriculture. Now pest problems could more easily and effectively be dealt with to a greater extent. However, the problem with pests did not disappear when synthetic pesticides arrived, although decreased in number. More and more we begin to see the negative effects of synthetic pesticides. The extensive use of chemical pesticides has also increased pests resistance to the pesticide as well as increasing resurgence when the natural enemies of a pest are killed by the pesticide and thus the pest can then come back in greater numbers when their natural enemies are weakened in number (http://thailand.ipm-info.org/).

The chemical pesticides can be problematic since water and soil are polluted and the chemicals may affect other organisms than the ones targeted such as insects, plants, birds and other animals, even human health has been effected. (Malena, 1994). When highly toxic pesticides are used other organisms are usually killed quite quickly and the connection is easier to discern. But in the case of less toxic compounds that are more persistent the effects can be very slow and it is harder to see a connection to the source. The effects may be both direct to the exposed organism and indirect on the structure of the population. These more persistent compounds can also be spread from the source through the air or in water. Traces of pesticides also occur in places where they have not been used. Although concentration of the compound may be low it can accumulate over time in the organism as well as in those that feed on them and travel up through the food chain. Residue from pesticides can also appear in the crops that were treated. (Study group on unintended occurrence of pesticides, 1971)
The usual chemical control method is mixing zinc phosphide with grains that are available. Sometimes other pesticides are used if they are available. Coumatetralyl, warfarin, coumachlor (anticoagulants) are also used. But the poisonous bait is not used until the crops have been badly damaged. (Fiedler, 1994)

**Traditional methods**

There are several traditional techniques that risk being forgotten if they are abandoned for the sake of chemical pesticides. Techniques that have often been taught from parents to children and so on. Such techniques can include crop rotation, inter-cropping, use of pest resistant crop varieties, altering of planting dates, strategic flooding, the setting of traps, and selection of pest-resistant varieties. (Malena, 1994)

**Crop rotation and modification of cropping periods**

By not always planting the same crop in the same place but instead rotating where crops are sown the risk of pest outbreaks is minimized. By modifying the planting dates of the crops the most vulnerable stages of the crops can be timed with the seasons that have the lowest number of pests. If harvest is delayed this can result in more crop damage since the crops are exposed to the risk of attack longer. (Fiedler, 1994)

**Intercropping and altering of planting dates**

Today the biological diversity has drastically declined. Especially within agriculture where monocropping, large fields of just one crop, is common. Very few crop varieties are used and although it is easier to tend to when it is planted and harvested it makes the crops more vulnerable to pests, diseases and changes in the climate conditions. In order for monocropping to work a lot of chemical pesticides need to be applied, not to mention chemical fertilizers and artificial irrigation systems. This cost a lot of money which most farmers in the developing world do not have. By intercropping, the planting several different crops and using different crop varieties in the same plot the risks are spread out more. If one crop is damaged farmers can still have other crops left. It is also harder for pests to thrive when the fields are mixed. Some crops can also complement each other and repel certain pests and thereby protect other crops.
Weeding, crop hygiene and cooperation for area wide control

Rodent pests usually stay where they have cover from vegetation. That way they are more protected from predators. If the fields and the area around the fields are weeded more often this can reduce the crop damage that rodents are responsible for. A lot of weeds can give rodents ample opportunity to go further into the plots rather than just stay along the edges. (Fiedler, 1994)

By clearing away infected plants, debris and old dead plants that can be used as shelter by some pests, the risk of attack declines. Infected plants and their roots should be burned so that they do not infect other plants. (Schmutterer, 1969)

Physical methods, trapping and hunting

When it comes to rodents they can be kept from damaging stored crops by making it more difficult to get into storage facilities and containers. Cilos can be used to store grains or it could be stored under ground if the ground is not too moist. Food can be stored rather successfully in pots of clay or baskets made from mud and sticks with lids on.

Some rodents, both pest an non pest, are eaten and some are even thought to be a delicacy. Cane rat, porcupine and ground squirrels, to name a few, are hunted for food. They are hunted with dogs, spears, nets, fall-traps, burning vegetation in dry seasons, smoking burrows or captured by trapping, digging or flooding of burrows, burning their habitats etc. Rodents as a food source need to be taken into consideration before trying to control the rodent populations with pesticides. Trapping and hunting reduces numbers directly while weeding reduces populations indirectly.

Ploughing and watering

Infected fields can be ploughed during seasons when certain pests are in a stage of rest in the ground and thereby they are exposed to the sun while in a vulnerable state. Plowing also allows birds to feed on pests that are brought up to the surface by the plow. (Schmutterer, 1969)
Watering clay soil can also kill some pests that are in the ground because the water can remain in the soil for a few days and the pests then run out of oxygen if they are in the pupae stage. (Schmutterer, 1969)

When a pest population declines in an area it can create like a vacuum where pests from nearby areas come in and the pest problem continues regardless of measures that have been taken by one farmer. But if the farmers in an area work together it is easier to keep down pest populations. (Schmutterer, 1969)

**Pest resistant varieties**

By choosing other varieties of a crop the pest damages can improve. Some varieties might be more resistant to pests and therefore can bring a greater yield because less of the crops are ruined by pests attacks. They can be more resistant to crop diseases or they might have a slightly different form which in some way makes it harder for pests.

**CBC – Classical biological control**

In Africa CBC (Classical Biological Control) has had a good turnout. By bringing in natural predators one has managed to control more than fifteen of the main insects that have been causing problems, and without adding labour or costs to the farmers. (Malena, 1994)

**IPM – Integrated pest management**

Integrated pest management emphasizes a holistic view where it is important to recognize the connection between the ecosystem and the agricultural system. Therefore alternative methods are preferred to chemical pesticides. (Malena, 1994) The methods used should pose as little threat as possible to the environment, people and property and it is rather important that these methods should be as economical as possible since most farmers have a rather small economy. (http://www.epa.gov)
4. Knowledge diffusion, farmers participatory research and the gender dimension

Knowledge diffusion

According to Per Hillbur's Study (the knowledge arena) farmers tend to go to the closet source for information. The neighborhood, parents and relatives are the main source of knowledge for 38 percent of the farmers in the study. Many also went after their own judgment because they did not think that there was anyone in the village that knew. Although there are village extension officers (VEO) in most villages several of the people in the survey did not know the VEO. For many, however, the VEO is the most reliable source of agricultural information. Farmers generally have a good knowledge about the local conditions. They usually also have a lot of experience. Coffee farmers, for example, have a lot of knowledge about spraying with pesticides, that is, when to spray, how much and what chemical to use. The knowledge of the local environment is often better among farmers than among VEOs that do not come from the area where they work. When it comes to the supply of pesticides it is in some areas available through the VEO. But in most cases it has to be acquired outside the village. (Hillbur 1998)

For many, however, the VEO is the most reliable source of agricultural information. Farmers generally have a good knowledge about the local conditions. They usually also have a lot of experience. Coffee farmers for example, have a lot of knowledge about spraying with pesticides; that is when to spray, how much and what chemical to use. The knowledge of the local environment is often better among farmers than among VEOs that do not come from the area where they work. (Hilton et al, 2005)

Extension services

Often information and new technologies in developing countries are made available through national ministries of agriculture in cooperation with agricultural research centers. These services are often called agricultural extension. Farmers can get help and advice with agricultural matters and practices, marketing, agricultural credit, subsidy programs and get information about new technologies from their local extension agent. Farmers also have the opportunity to get training and to become involved in research projects, and allow demonstrations on their plots. Extension workers should also provide the research centers with information about what the farmers are in need of and what they prioritize.
Farmers participatory research – FPR

Formal research instead takes laboratory developed knowledge and tries to transfer it to the farmers. Farmer participatory research means that farmers should be part of every part of the research from the beginning to the end. The researchers are open to the farmers knowledge and learn from them and listen to their problems and priorities. The new technologies are developed together with the farmers on site rather than isolated in a laboratory. After all the local conditions are best suited for experimentation with crops that in the end are going to be used there. Also the farmers have good local knowledge of the environment. If the farmers have been part of the whole process they are also more likely to be satisfied with the results. This method goes well together with IPM research. Women especially could benefit much from FPR since they have different requirements then men and they have less resources, smaller landholdings and new technologies would then be more adapted after their needs and their conditions. It would also make it easier for women who are too pressed with time or who can not travel on their own. Then they would not have to travel in order to partake in such activities. Women are also unusual as scientists and therefore this would be way for women to have a scientific agricultural impact. (Malena, 1994)

In Andhra Pradesh, India a FPR project was conducted by The international Crops Research Institute for the Semi-Arid Tropics (ICRISAT) in 1991. The project set out to involve the farmers in developing more pest resistant varieties of pigeon pea. Farmers where involved through out the whole project. Together with the researchers they looked at the fields and showed them the main problems and the main pests. The farmers then got to try four pest resistant varieties on their own farms together with their local varieties and then asses them. Sketching in dust, pebbles, twigs and seeds were used in the ranking of the varieties and the varieties were judged in pairs. This enabled poorly educated women to part take and they managed very well in describing exactly the pest problems and asses the varieties and compare them properly. In the end the assessment showed that the states official variety was not popular because of its taste although it gave a good yield and was efficient against pests. Farmers preferred to grow a mix of more pest resistant varieties together with their usual local variety which was safer because it spread the risk. (Malena, 1994)
The gender dimension

Three ideas why the gender issue is important

1) The equity approach

Because of society being male dominated in many countries women do not have the same opportunities as men when it comes to education, information availability, land, technology and other resources. This results in worse conditions for women such as a higher poverty rate, more malnutrition, premature death and illiteracy. Often women do not get to use the resources that the family has for her crops such as tractors or plows and get limited help from other members of the family because all these resources are only used for the cash crops. Besides agricultural duties, women also have to take care of the children and the elderly in the family, cook, clean, get water and fuel for the household and other domestic tasks. (Malena, 1994)

2 The development approach

Here the focal point isn’t the unequal conditions between women and men. The importance of helping poor people is stressed in this approach. Since women are poor to a larger extent than men and therefore it is important to help women. According to FAO in 1985 more than fifty percent of poor rural households are headed by women. This has been a problem since men have been the main benefactors of most development programs and women are often forgotten. Even if the households gains more money it does not necessarily help the women of the household in as great extent as men. Women also spend most of their money on the crucial household need such as food, clothing and education for their children. Men spend more of their extra income on beer and tobacco for their own use. Therefore helping women benefits the whole household more rather than helping mainly men. (Malena, 1994)

3 The efficiency approach

Since many crops are grown mainly by women many development programs have failed because they have given the information to men who in turn have not passed the information on to their wives. It is inefficient to not give the information to the right recipient. This will heavily slow down agricultural development and modernization. In many cases development is not focused on the task that women are responsible for but rather focus on the cash crops that give a quick income. (Malena, 1994)
In developing countries women constitute 60-80 percent of the agricultural workforce. It is estimated that women in Africa produce more than 80 percent of food crops and 60 percent of all of Africa’s agricultural produce. However, these women are a rather diverse group when it comes to age, culture, religion, class, economy and marital status. There are also differences in how much possibility the women have in making decisions, for example if the women are farmers, married to a farmer, if they are working for pay or if they are unpaid. And a group that is growing and currently estimated to one third of rural households in developing countries is households that are headed by women. These households also constitute about 50 percent of what are considered poor households. These women generally earn less than women in households that have adult males and yet they have to work harder. (Malena, 1994)

The division of work is generally very gender specific. Weeding, pest control, cleaning, sorting and storage are usually part of women’s tasks. Crops also tend to be gender specific. Women are usually responsible for food crops although they also labour with the cash crops but men generally have more responsibility for cash crops as well as harvesting, tree felling, ploughing, planting, and clearing land. Since work is so divided women have very different needs than men. Yet the focus on research and development are usually focused on the men’s tasks. When mechanical possibilities appear for a task it is often taken over by men. Although this gives women fewer task but it also means that their income decreases. (Malena, 1994)

IPM methods often require a lot of work and time with monitoring of pests, trapping, removal of eggs and so forth. Rural women in developing countries generally already have more than enough work as it is and they are therefore not very likely to adopt these new methods. Methods such as crop rotation, intercropping and altering of planting dates on the other hand do not necessarily bring more work. However, it can be complicated to adapt these methods to the women’s schedules of other daily tasks which have to be done. Choosing other varieties of crops can prevent pest problems since some varieties of crops are more resistant against pests. This option adds no labour and can reduce the use of pesticides and thereby reduce costs for the farmers. (Malena, 1994)

Because official land rights are usually given to male heads of the household, women get smaller plots of various types that are scattered and with less fertility. In 1989 a study was conducted that showed that in households headed by women there was a greater incentive for women to apply proper pest
management if they get income from and control of the crop. Respectively, in households where men have the control and receive the income from the crop while women still do the weeding and pest management the motivation is not as large, which also results in a smaller yield. Integrated pest management has the advantage that it works just as well on varied, small and scattered plots as it does on larger plots. (Malena, 1994)

**Economy**

Because men are in control of the cash crop income, have a greater chance of employment while women have to deal with managing the household without pay, women only get income from selling vegetables that are not needed for household consumption, some casual labor, brewing beer and so on. They have little chance of getting credit because most of them cannot read, they need a man to co-sign and finally they have no collateral. This lack of financial means makes it hard for women to afford such things as pesticides. (Malena, 1994)

**Education**

Women in developing countries are rarely well educated and illiteracy is widely spread. The general literacy rate among women in sub-Saharan Africa is only 40% compared with 62% among men. In some of the countries the rates are even lower for example Sudan has as much as 96% illiteracy among women. (Malena, 1994)

| Illiteracy rates in sub-Saharan Africa 1992 among women |
|-----------------|--------|
| Tanzania        | 85%    |
| Malawi          | 88%    |
| Kenya           | 90%    |
| Nigeria         | 94%    |
| Sudan           | 96%    |

(Source: UNDP, 1992)

Many people live in poor conditions and cannot afford to send their children to school. If they can afford to send only a few of their children boys are given priority over girls who are often required to help out
in the household. Since the girls will be married off and leave their family it is often seen as a waste of money to pay for their education. The boys are also more probable to earn an income to the household. There are also other factors that make it harder for women to get a proper education such as a higher degree of malnutrition and girls getting pregnant at a very young age as well as the educational system favouring boys. This lack of education possibilities creates difficulties for women to adopt new technology. Poorly educated farmers with very limited resources have been shown to be more likely to use pesticide improperly or use pesticides that are no longer allowed or that are old. (Malena, 1994)

Research and extension

In deciding on research areas or development of new technology, what women need is rarely considered. It is not uncommon that new technologies are either not effective enough for women's needs or even have a negative effect. Since women in the developing world are in majority when it comes to agricultural production it is a great problem that their needs are so neglected. According to C. Malena at the Natural resources institute, the problem can be attributed to two factor; there being a great misconception and underestimation of the width and nature of what women do. There are also structural problems in the research concerning agriculture which is a great disadvantage for women farmers. (Malena, 1994)

Often in agricultural surveys women are never asked. Men are always presumed to be the head of the household, even if the only men in the house are children. Therefore the information collected only tells part of the story because the men do not have all the information about women's tasks and often diminish their role because women’s tasks are seen as a natural part of household work and not as 'work' in its proper meaning. Often only the tasks which bring in money are considered as 'work'. Research into women's issues is not very prestigious and since it is more rewarding to research ”large scale, high-tech, export oriented projects”, there is no incentive to do otherwise. The gender bias is both at an individual level as well as the institutional level. (Malena, 1994)

Women get much less contact and help from extension services and only as few as 3 percent of the extension officers are women. Female headed farms were according to a study generally contacted 13 times less than male headed households. One of the reasons for this seems to be that many extension officers do not have enough knowledge about women's importance in agriculture and they also have a prejudiced view of women such as that women don't have time for extension programs because of their
household work, that their agricultural contribution is insignificant, women are shy and difficult to contact as well as organize, women are unprogressive in dealing with innovations, they are only interested in certain 'feminine' activities, women do not respond rationally to economic incentives. The extension services are also focused on large scale cash crop productions and therefore many women don't have enough land to be able to participate. Since women are general less educated that can cause problems for them to understand the advice given and since more women are illiterate they cannot attend because they must be able to read in order to participate in the activities. Since women also have a great and rather constant daily workload it also makes it hard for them to have time for research projects that take a lot of time or to take part in extension sessions. Societal norms often also prevent women from traveling freely because they are not allowed to go alone. These norms may also prevent them from being able to be in contact with male extension workers or from speaking freely and posing questions. (Malena, 1994)

Local knowledge and techniques are an important part of IPM development. Crop-rotation, intercropping and trapping come from traditional methods. Since women in many ways work very separate from men and in different ways, they might have slightly different indigenous knowledge that could be of great use if it was only taken into account. They can have "exclusive knowledge about traditional methods of pest control which could be adapted or incorporated into IPM strategies." (Malena, 1994)

Because women have different tasks then men they also have different criteria for choosing different crop verities. Even if a crop is more resistant against pests it might be rejected because because of other reasons. When it comes to food crops women are often part of all the production stages from preparation, planting, weeding, harvesting, processing and storing. So if a crop does not have acceptable taste, if it is harder to peel, more difficult to store or in some other way adds to women's already heavy workload the crop will most likely be rejected. Women are also the ones cooking food, storing it, and processing it, as well as getting fetching water and fuel women can have different criteria when it comes to choosing crop varieties. Even though a new variety is more pest resistant it might still be rejected by women because it takes longer to cook, it is harder to peel, does not store as well, does not taste as good, needs more water or more fuel and thereby means that more work is required. (Malena, 1994)
Since women work so closely with the specific crops in every stage they have much more knowledge about characteristics and problems with pests then men. Even if the women do not have gender specific crops to tend to they have other gender specific tasks such as weeding, food preparation, post harvest
processing and storage which can give them different knowledge than men. Since they are so involved in many of the stages and work very closely with the crops women gain a lot of knowledge about specific plants often exceeding that of men. An experiment in Liberia showed just this. The objective of the experiment was to study the knowledge of rice varieties among men and women. Farmers of both sexes sat back to back and taking turns one gave a description of what they saw and the other had to say what variety of rice it was. While some of the men had as little as two to three correct answers out of 25 women, especially older women, managed to get only 2-3 errors both when it came to answering and describing. There were no men that were as good as the best of the women. (Malena, 1994)

Because women and men are generally responsible for different crops and tasks they also have different perspectives on what pests that are seen as major crop pests. According to a study made in Kenya 1992 women mentioned some pests that were not mentioned by men such as brunchids, army worms, blight, sweet potatoe weevil and monkey. Likewise men mentioned some pests that women did not state as major problems like domestic animals, podporer, beetles, scales, leaf spot and mildew. There is no certain explanation for this but men having identified diseases to a greater extent than women could have to do with men having been more educated and had more availability to extension services and therefore have got information about the diseases. Diseases are not so easy to spot and usually require having previous knowledge about them. The gender division of tasks and crops is most likely also a contributing factor. Weeds and weevils that attack crops in storage as well as sweet potato weevil and maize steak virus are more often mentioned by women while men mention domestic animals and coffee bean virus. Since women and men have different knowledge about pests and different resources they also use different methods against pests. Men tend to use more fertilizers and chemical pesticides. Women have more knowledge about other methods since they have fewer resources and less contact with extension workers and have to rely more on traditional methods like hand weeding, changing the dates for planting, using manure, dung, soil and ash to prevent pests. (Malena, 1994)

Very little attention has been focused on what methods women use to prevent stored crops from being damaged by pests. However one study shows that women in Sudan use quite simple techniques that are quite efficient such as mixing the crops with wood ash and hanging them from the roof. These methods worked well even in large scale grain stores. (Malena, 1994)

Very often a crop can have several different uses especially for poor farmers. The husks from rice can be
used as fuel, live stock can eat get fodder, roofs can be thatched with the straw or it can be made into fans and mats. Beside eating cow peas and some verities of cassava their nutritious leaves can also be eaten the leaves of the cassava are also used to make a low alcohol beverage that is very popular. Although these side resources and incomes are not very great at a wider perspective they can be of great importance for poor farmers. Not taking this into consideration when when new pest resistant varieties are developed can be devastating to those who depend on these side incomes. The new varieties are then at great risk of being rejected. Since women are among the poorest and have more difficulties in finding work they are especially dependent on any side income they can find and are therefore all the more vulnerable if these incomes should disappear. They are also responsible for fuel gathering and nutrition and are therefore very likely to reject crop varieties that do not fill the same needs. (Malena, 1994)

5. Results

Of the eleven small scale farmers that were randomly selected for interviews all but one used chemical pesticides as their main method against pests. The one interviewee who didn’t use pesticides stated that she was a first time farmer and therefore did not possess the adequate knowledge about pests. Of the remaining nine small scale farmers a few used alternative methods, such as ashes, soap and such to some extent but only to a small degree and only in the plots that were for family use. Many said that it worked in smaller plots but not when in the larger plots. Chemicals were also considered the most effective method to defeat pests. However, they all stated that they only used pesticides when their crops had been attacked and not as a preventative measure. Most of the interviewees saw chemical pesticides as the only option. Their general viewpoint was that if they couldn’t afford chemicals their crops would die. Two of the three farmers stated that they used inter cropping and crop rotation as a method to decrease pest attacks. But they all used chemical pesticides to spray against pests. They felt that traditional methods work better in smaller plots but are too difficult and time consuming in larger plots.

According to the extension officer the application of chemical pesticides are the last alternative. Crop rotation and intercropping is a good way to minimize the risks of getting all the crops destroyed by pests. There are also some traditional methods that can be used against pests such as ash from cow dung, medicinal plants and tobacco leaves can be used for the conservation of seeds. Drying farm produce can also kill pests. Farmers however, seem to prefer using crop rotation and chemical pesticides as well as some local medicinal plants.
**Field work summary**

Some farmers made use of traditional methods mainly intercropping, crop rotation and a few other methods. It was more common to use alternative methods in the smaller plots where food was grown for the family while chemical pesticides were used in the larger plots where mainly cash crops were grown. Most of the farmers that were interviewed felt that there were no other options. If they did not have enough money for pesticides their crops were destroyed. There were no large scale farmers in the villages that were women. Since female headed households generally are poorer it is as expected. Since the study was small it is hard to see any clear pattern when it comes to differences between men and women. Both men and women used mainly chemical pesticides, especially on their cash crops. On the plots where household crops were grown it was more common that alternative methods were used and women are usually the ones responsible for the families food crop while men tend to the cash crops.

6. Concluding discussion

In a world where humans have such an enormous effect on the surrounding environment and the climate it becomes more and more important to have a longer perspective rather than just seeing to the short term gains. Therefore it is very important that this is incorporated into every part of human daily life especially when it comes to the production of food since it is a life necessity. The effects of the methods used need to be carefully considered. Many farmers in the developing world are poor and have trouble affording chemical pesticides and irrigation systems. So getting caught in an agricultural system that needs more and more pesticides is not sustainable either for the farmers or for the environment. New methods to handle pest problems need to be developed together with farmer and their knowledge and old traditional methods that work need to be incorporated into the agricultural system and the knowledge needs to be spread to all who need it. If women are to be able to benefit from new agricultural technologies a few things need to be taken into consideration.

- The exact nature and extent of women's tasks
- The rigidity of gender roles and the division of labor there after.
- Women rarely have the means or the power to influence.
- Women might have different needs and possible solutions then men.

For development of IPM technologies it is crucial to have a holistic apprehension of the environment
and a long term view on the effects of exploitation since IPM should negatively affect the environment as little as possible. Women, who are involved in such a broad spectrum of responsibilities and are very dependent of the local environment in so many ways, should therefore be very well suited for participating in the development of new IPM methods. Women are often the ones who suffer most when there are environmental problems. The work required for gather firewood increases when there is deforestation; drought forces women to walk further to get water therefore women often have a more long term perspective while men often are more concerned with short term gain. (Malena, 1994)

Understanding of the causes of pest attacks and crops diseases determine what actions are taken and what methods are used. Because men and women work so separately they have also develop different ways to classify pests and may use different characteristics that are appropriate for their purposes. These classifications are then handed down from mothers to daughters. Extension workers and researchers have noticed that women and men have different names for the same pests. Yet it is the male perspective which is preserved by science. It is important that this difference is taken seriously if indigenous knowledge is to be successfully implemented into IPM. (Malena, 1994)

1) “Women farmers are probably responsible for a majority of pest management activities in African agriculture.”

2) “Due to various gender-related socio-economic factors, the technological needs and priorities of women in IPM differ from those of men.”

3) “In most cases, the specific needs of women farmers are not addressed in the research and development of agricultural technologies.”

4) “Women’s access to new technologies is seriously undermined due to the failure of extension services to establish contact with female farmers.”

5) “Due to gender-specific agricultural roles and distinct communication networks, the indigenous technical knowledge of women differs from that of men and may represent a valuable source of information for the development of new IPM technologies.”

(Malena, 1994)
Policy implications

In order for new technologies to be of use for women and to be accepted women must be enabled to participate in the development process. For this to successfully work the gender bias that exists among researchers and extension workers must be tended to. (Malena, 1994)

When conducting surveys the data needs to be more gender specific, this is easily done by indicating the gender of the interviewees. Then it is easier to see patterns that are gender related. It is also important that enough women participate in the surveys. Perhaps specific quotas are required. Women’s status is often seen as lower and if male colleagues do not regard women extension workers with respect it is hard for them to participate and have a say in important matters. Gender sensitivity training could help both male and female extension workers to work with both men and women more successfully. They would learn better ways to approach and communicate with farmers of the opposite sex. As well as gain a better understanding of their problems, needs and look past gender stereotypical views. It is also important to recruit more women as extension workers as well as involve more women in farmer participatory research projects. If there are more women working with extension services it can inspire other women to participate more and also act as role models. Studies have also shown that women farmers are more easily reached by female extension workers especially in societies with cultural boundaries that do not allow women to be in contact with men outside the family like in some traditional Muslim countries. Then that can be the only chance women have to part take of extension services. Women’s time consuming activities need also be taken into account. Many of their tasks are daily and they cannot be rescheduled. They are also often dependent on a man transporting them if they are to go somewhere because they are not allowed to drive or travel by themselves. In some areas women might best be reached through extension services directed especially to women. Unfortunately such programs often risk being viewed as unimportant and as a result not get the support and funding that they need. (Malena, 1994)

In Cameroon's North West province a project was started in 1986 to try to make extension service more available for women. All extension workers received gender sensitivity training and as much as 20 percent of the recruited extension workers were women. The aim from the beginning had been to get as much as half female extension agents but when this was not managed teams were assembled instead with both men and women. The first contacts were made with groups of farmers and by extension
workers that were of the same gender as the farmers. (Malena, 1994)

Other hindrances for women participating, such as the requirement of literacy, or the focus on larger plots and neglecting smaller and more remote plots need to be looked over. There needs to be stricter guidelines so that enough women are participating in extension services and in surveys. (Malena, 1994)

To help women farmers who are too pressed for time or otherwise unable to travel far to take part of extension activities the extension work should become more field based with mobile training units who can also go out to more remote areas to reach farmers there. If child care is also provided then women have a great chance of having time to participate more. Since women receive much less education, if any, it is more common that they only know their regional dialect and no other language. This makes it hard for them to communicate. This could be managed by recruiting people who are familiar with local dialects and customs. Since women are often involved in or in charge of pest management it is vital that they get the opportunity both to contribute with their knowledge as well as receive information and resources that will improve conditions for them and for the environment.
References


Lindberg, Clas. 1996. Society and environment eroded – A study of household poverty and natural resource use in two Tanzanian villages. Uppsala University, Sweden


Study group on unintended occurrence of pesticides. 1971. The problems of persistent chemicals – Implications of pesticides and other chemicals in the environment. Organisation for economic cooperation and development. Paris, France

Internet:
International Centre of Insect Physiology and Ecology
http://www.push-pull.net/ 2009-05-11

IPM Thailand 2009-05-12
http://thailand.ipm-info.org/components/avoid_resurgence.htm

Mwankama Teachers SACCOS, Ltd 2009-08-20
http://mwankama.com/babati.htm

U.S Environmental Protection Agency 2009-05-12
http://www.epa.gov/opp00001/factsheets/ipm.htm

Interviews:
Mr. Mao Farmers training center 2008

Agriculture & Livestock Extension Officer in Mamire, Elihuruma H Mshana, 2008.03.10

Farmers in Mamire & Mutuka 2008.03.10

Farmers in Sigino 2008.03.12
Appendix

Interviews with farmers

Mamire & Mutuka

Interview 1

Man, small scale farmer
Cultivated land: 3 1/5 acres, mainly for family use.
Crops: Bananas, maize, papaya, passion fruit, sweet peppers. Fruits for the family, vegetables for business and grass for the animals.

Pests: Caterpillars eat maize, bananas are attacked by army worms, and the sunflowers get yellowed and get wrinkled leaves.

Methods used: Starts with traditional methods; sweet pepper-liquid + soap on the plants but they mainly use chemical pesticides. Selecron 720EC

Interview 2

Woman, small scale
4 children and 4 adults in the family.
Cultivated land: 1/3 acres for family use, 5 acres for selling.
She plats herself plowing with cows.

Crops: Maize for selling, pumpkin for the family.

Pests: Caterpillars attacking the maize.
Methods used: Professionals who come and spray with chemicals after the crop has been attacked.

Interview 3

Woman, small scale
22 people in the family of which 12 are children.

Cultivated land: 10 acres only for family use
Crops: maize and beans

Pests: beetle, insects that like the sugar in corn.
Methods used: Chemicals that they get from the village extension officer after the crop has been attacked.

**Interview 4**

Man, small scale
6 people in the family of which 4 are children.

Cultivated land: \( \frac{1}{2} \) acres for family use, 5 acres for selling as well as family use. 2 acres maize and pigeon peas, 3 acres of sunflowers.

Crops: Maize, wheat, pumpkin, cassava, bananas, oranges.
Pests: the maize and the oranges get attacked.

Methods used: Chemicals from the village extension officer who sells them. They spray after the attack on the crops has begun. Traditional methods are used for the oranges; soap in liquid form. He learned the method from his parents.

**Interview 5**

Woman, small scale
5 people in the family, 3 of them are children.

Cultivated land: \( \frac{1}{2} \) acre. Small plot for family use only.
Crops: beans, pigeon peas, maize, pumpkin, vegetables.

Pests: Maize attacked by beetles.
Methods: None. It was the first time they cultivated so they did not know what to do.

Interview 6

Woman, small scale
8 people in the family of which 7 were children

Cultivated land: ½ acre for food only and 1 ½ acres for both food and selling.
Crops: sunflower, maize, pigeon peas.

Pests: All crops are affected. Caterpillars attack the leaves and makes the maize become dry. Sunflowers attacked so the seeds become dry.

Methods: Chemicals from the extension officer in the large plot. Traditional methods in the small plot. Ashes of wood sprinkled over the crops is effective.

Interview 7

Man, small scale
4 people in the family 2 of them were children.

Cultivated land: 1/3 acres for family use, 2 acres for cash crops.
Crops: maize, vegetables, pumpkins and beans for family use. Sunflowers for selling.

Pests: sunflowers attacked
Methods: Chemicals from the extension officer or a shop.

Interview 8

Man, small scale
4 people of which 2 are children

Cultivated land: ½ acre for family use.
Crops: maize, cassava (both for the leaves and the root), tomato, potatoes (plus for the leaves), cotton (for shade and cleaning their ears.

Pests: No pests in this season.
Methods: Chemicals from the extension officer. Traditional methods on vegetables, ashes.

**Interview 9**

Man, small scale
6 people in the family of which 4 are children.

Cultivated land: 2 acres
Crops: maize for family use, sunflower and pigeon peas for selling.

Pests: Maize attacked
Methods: chemicals from the extension officer.

**Interview 10**

Man, small scale
5 people in the family of which 3 are children.

Cultivated land: 3 acres
Crops: maize for family use. Pigeon peas and sunflowers for selling.

Pests: Maize attacked
Methods: Chemicals from extension officer. If they don't have money the crops die. They spray after an attack has occurred. No other methods are used.

**Interview 11**

Man, large scale
Cultivated land: 2 plots of 50 acres
Crops: maize, pigeon peas, sunflower, tomato, pumpkin, orange, passion fruit. Both for family and for selling.

Methods: Chemical pesticides. The village extension officer gives advice. It is too difficult to use traditional methods in big plots.

**Sigino**

**Interview 12**

Woman, small scale
3 people in the family of which 1 is a child

Cultivated land: 1 ¼ acre, they cultivate corn and pigeon peas in they remote plot, which is half an hour walk from the house. In their ¼ acre garden plot they cultivate sun flowers, pumpkin and corn.

Methods: Multi-cropping between pigeon peas, beans and sunflowers with corn, which is a result of lack of land, if they have more space they would probably mono-crop. They can not afford chemical pesticides and do not use traditional methods.

**Interview 13**

Man, large scale
10 people in the family

Cultivated land: They own 15 acres but cultivate only 10.
Crops: 160 bags of corn each year of which 15 are for family use. The rest is for selling. Sunflower, pigeon peas, beans, pumpkin, okra.

Pests: Grasshoppers, army worms
Methods: Chemical pesticides are used when army worms have attached the crops. They also use crop rotation and intercropping. They had monocropping before but the yield is better and more resistant to pests when using intercropping.

**Interview 14**

Man, large scale

Cultivated land: 12 acres for family use, 20-30 acres rented where they grow crops for selling.

Crops: maize, pigeon peas, beans, fruits, pumpkins, sunflower.

Pests: grasshoppers attack the pigeon peas and the maize

Methods: If they have enough money they spray with chemicals when they see signs of an attack. They also use intercropping, so if one crop is affected they can still get another crop instead. He learned the method from his parents. Sand mixed with ashes can also work but he prefers chemical pesticides but they are expensive.