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# AND
# SOUTHERN NEW HAMPSHIRE UNIVERSITY

MASTER OF SCIENCE IN COMMUNITY ECONOMIC DEVELOPMENT
(2005)

# SOCIAL ECONOMIC BENEFITS OF IPDM TECHNOLOGIES TO BEAN FARMING COMMUNITIES IN HAI DISTRICT, NORTHERN TANZANIA.

**A PROJECT EVALUATION SUBMITTED IN PARTIAL FULFILMENT FOR THE REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE IN COMMUNITY ECONOMIC DEVELOPMENT IN THE SOUTHERN NEW HAMPSHIRE UNIVERSITY AT THE OPEN UNIVERSITY OF TANZANIA**

**(2005)**

**KOMBA, SOPHIA**

## SUPERVISOR CERTIFICATION

I SUSAN KAARIA, certify that I supervised this work and that is not been presented by any one in any University for a similar or any other degree award.

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## DEDICATION

This work is dedicated to my parents M.B Komba and T.L Mwakatobe and my young brothers Castor M. B. Komba and Andrew M.B. Komba.

## Abstract

Hai district farmers have observed a decline in bean crop production in Hai district in recent years and after consultations with researchers and extension personnel, they associated the situation to damage by insect pests and diseases as well as unreliable weather conditions and infertile soils.

The implementation of IPDM project in Hai district was based on farmers' and partners' participatory efforts in reducing bean crop losses caused by pests and diseases in the district. Available sources of information confirmed that the common bean is an important crop produced in different parts of Tanzania where the scale of production varies depending on gender, wealth and location. Consequently, the decline in bean production in Hai district had many negative effects to bean farmers especially the smallholders who are the main producers of the crop. Beans are the main source of family food and household cash income for smallholder farmers in the district.

This study was conducted in Hai District, northern Tanzania in 2004. The purpose of the study wass to assess the social and economic benefits of IPDM technologies to at the household level.

Secondary and primary data were collected to improve our understanding of agriculture technologies and bean production in Tanzania, particularly in Hai district. The study and the information on bean production in Tanzania revealed different production constraints to bean farming including the problem of insect pests and diseases.

In order to gather appropriate information for this study, farmers in Hai communities were first grouped into two (project participating farmers and non participating farmers). Focus group discussions were conducted with IPDM project group members. Survey questionnaires were administered to both participating and non-participating community members to understand farmers' perception on the effectiveness of the IPDM technologies, adoption rate and participation in the dissemination of the technologies. In addition, in-depth interviews were conducted to assess other stakeholders' perception and participation.

The common bean is the second most important crop after maize that is produced in the district both for household consumption and cash income. Although bean crop production is limited by different constraints, insect pests and diseases are among the major production constraints that were mentioned by almost each farmer interviewed in the community. Farmers selected IPDM technologies to address bean pests because they are easy to use, efficient, cost effective and result in increased production. Furthermore, the study revealed the important role played by IPDM project groups and village extension officers (VEOs) in the dissemination of information on the technologies. In this case, 72% and 68% of interviewed farmers received the information on the technologies from VEOs and IPDM group members, respectively.Furthermore, the study found several limitations to increased adoption and dissemination of information. These includes; lack of capital, unpredictable weather conditions, market access, NGOs regulations and land shortage.

Although, the livelihood of the majority of people in Hai district have roots in agriculture farmers also experience problems associated with policies, NGOs participation, shortage of botanicals and dissemination constraints, the study recommended that a stakeholders' workshop be organised to review and discuss about the various problems and draw conclusions for future action.

## ACKNOWLEDGEMENT

It would be very unfair if I pretend to have done this work all by my self. Numerous people and organisations have contributed toward its success. Without their assistance it would have been very difficult for me to compile it fully. I am therefore, gratefully indebted to all who contributed to the success of the work. It is not possible to mention each individual and their contribution in this part. However, some of specific individuals and institutions are worth mentioning.

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## Acronyms

| | |
|---|---|
| VEOs | Village Extension Officers |
| DALDO | District Agriculture and Livestock Development Office |
| VICs | Village Information Centres |
| NGOs | Non Governmental Organisations |
| IPDM | Integrated Pest and Disease Management |
| SAP | Structural Adjustment Program |
| BSM | Bean stem maggots |
| BFB | Bean foliage beetle |
| CBOs | Community based organisations |

**IPDM project in Hai district, northern Tanzania**

In response to requests made by farmers and extension personnel from Hai district, the Bean IPDM project initiated a participatory approach to work with local communities to reduce bean insect pests and diseases in Hai district communities. The project was initiated in the Hai District, northern Tanzania.

During the bean cropping season in 1998, a few farmers from Sanya Juu village in Hai District, requested assistance from the district extension office in the diagnosis and development of solutions to a pest that was constraining bean production in the area. The district forwarded the request to the zonal agriculture research office in Arusha. The Sanya Juu farmers collaborated with the district extension service and research systems led by CIAT and conducted the research with farmers . The insect pest was identified to be the Bean Foliage Beetle (BFB) (*Ootheca* sp.) whose adults feed on bean and cowpea leaves and the larvae feed on plant roots, causing significant reduction in bean production in the area.

An initial project stakeholders' planning meeting proposed and agreed to develop IPDM technologies that focused on cultural practices (timely planting, crop rotation, post-harvest tillage, etc.), botanical pesticides, animal products, amongst others to address the problems of bean insect pests and diseases. In 1998 the first IPDM group, comprised of 12 farmers, was initiated. These farmers established 3 field trial plots to test and evaluate some of the management options for bean insect pests and diseases.

**Mission of the project**

The promotion of strategies to reduce the impact of pests and stabilise yield of crops in Hai district, northern Tanzania.

**Specific objectives**

1. To reduce losses caused by bean pest through effective targeting, dissemination and adoption of IPDM strategies that are acceptable to smallholder farmers in the area.
2. To enhance farmers' capacity to understand factors that lead to pest problem development and provide them with available options for pest management.
3. To increase community awareness of the pest constrains and increase the uptake of IPDM technologies through the promotion of sustainable control methods for bean pests in smallholder production systems.
4. To increase IPDM awareness at community level and among policy makers to support IPDM as a sustainable pest control strategy.
5. To promote sustainable systems and natural resource management
6. To catalyse the formation of community based organizations (CBOs) in order to address different problems in the community.

**Key Activities**

1. use participatory methods to generate and evaluate different IPDM technologies.
2. Enhance the formation of IPDM groups for problem diagnosis, monitoring, evaluation and dissemination of IPDM technologies.

3. Conduct training for extension agents (including participating NGOs), participating rural schoolteachers and students in order to disseminate bean IPDM technologies appropriately.
4. Facilitate cross village and across site visits to enhance information exchange among farmers and encourage farmer to farmer dissemination of technologies
5. Catalyse the setting up of village information centers (VICs) in order to provide IPDM and other relevant information materials to the communities.
6. Sensitise policy makers through the mass media, invite farmers' to technical meetings, field days, training seminars and stakeholder workshops.
7. Facilitate farmer field days to reinforce the dissemination of the IPDM information and technologies within and outside the target community.

# CHAPTER ONE

## 1.1 Background

Beans (*Phaseolus vulgaris*) are a common and important crop in Sub Saharan Africa. Smallholder farmers consider it as a food and cash crop that generates competitive income to family members. In Sub Saharan Africa, rural women farmers are the primary bean producers and the crop is used for family food and household cash income (Wortmann *et al.* 1999).. Wortmann *et al.* (1999) further state that about 40% of the total beans produced in Africa is marketed at an average of USD 452 million annually. Since the main producers are rural women farmers, the income received from crop sales is used to purchase household needs and pay for children education.

In Tanzania, common beans account for about 80% of the total amount of pulses produced (Mashamba, 1998). The crop is mostly produced for home consumption and as a cash crop by smallholder farmers who mainly intercrop beans with other crops, particularly maize. However, in northern Tanzania (Arusha, Kilimanjaro,Manyara and Tanga regions), some farmers grow beans as pure stand and in large scale farms. Intercropping is partly practiced to mitigate risk against unfavourable weather conditions and to optimise use of land and labour. This is because households do not have sufficient labour to prepare a separate field for beans because the family is the main source of labour. The wealthier farmers also hire Labour from the poorer families. The land allocated to smallholder bean production in most regions ranges from one to five (1 to 5) acres (0.25-2.0 hectares).

Common beans are highly valued by the poor because all parts of the plant are consumed, the leaves are used as spinach, grains are eaten fresh or dried and the haulm (stems and pod shells) is fed to livestock. Most farmers in Hai district – northern Tanzania depend on beans as a cash crop because of the low coffee prices and high input costs. Increased bean production has however, been constrained in recent years by high incidences of insect pests and diseases, unreliable weather conditions, low soil fertility, limited access to improved quality seed and unreliable markets. The bean foliage beetle- BFB (*Ootheca* spp.), bean stem maggots- BSM (*Ophiomyia* spp.), storage weevils (bruchids) and aphids (*Aphis* spp.) are among the major insect pests that cause damage to beans (Abate *et al.* 2000). Farmers in parts of northern Tanzania have stopped growing beans because of bean foliage beetle attack (Ulicky, 2004, personal communication). BSM have been reported to cause production losses in the range of 30-100% in several countries in eastern, central and southern Africa (Ampofo and Massomo, 1998). Effective management of these pests requires community collective action.

## 1.2 Justification for the study

Since independence in 1961, Tanzania has been struggling to find ways that can suit agriculture development. Approximately 85% of Tanzania's population live in rural areas where they are principally engaged in agricultural activities (Christopher, 1989). Most farmers in Tanzania are poor and they face different problems including the lack of appropriate and improved technical knowledge, rural credit for small scale farmers, inadequate marketing systems, unreliable weather conditions, diseases, insect pests and infertile soils.

In Hai district communities have formed groups / community based organisations (CBO's) as a strategy for addressing their problems through collective action. Groups help to increase community participation and improve governance in solving agriculture, social and economic problems. As a result of these efforts in farmer group formation, different research projects have been implemented by different non governmental organisations (NGO's) and institutions with the aim of reducing bean crop losses caused by diseases and insect pests, and provide agricultural knowledge, farm inputs, market information, etc.

The International Centre for Tropical Agriculture (CIAT) in collaboration with the national agriculture research and extension systems (NARES) and locally active NGOs (e.g. World Vision International- Sanya Area Development Program) have been working with bean farmer groups in the district to develop, test and evaluate integrated insect pest and disease management (IPDM) technologies to reduce the effects of pests and other farm production constraints. Farmers have further united their small groups to form a larger community based organisation (CBO) in the district named MUVIMAHA (Muungano wa Vikundi vya Maendeleo Wilaya ya Hai - Union of Development Groups in Hai District). Farmers in these groups have adopted some of the bean IPDM technologies and also embarked on disseminating them to other farmers within and outside the district. This process has enabled the farmers to reduce the losses caused by bean pests and diseases and helped to improve bean and other farm production activities.

In this regard, Bean farming communities in Hai district in collaboration with CIAT, through the Bean IPDM project, have identified, developed, tested and adopted a number of strategies using different dissemination channels to address crop production losses caused by insect pests, diseases, low soil fertility, inadequate market information and poor quality seed. This study aims to evaluate the social-economic benefits of bean IPDM project activities that were executed by farmers in the district.

## 1.3 Goal

To evaluate the social-economic effects of integrated pest and disease management (IPDM) technologies on rural livelihoods of the bean growing communities in Hai district, northern Tanzania

## 1.4 Objectives

- To document the perception of stakeholders on the effectiveness of IPDM technologies and assess the extent of adoption or rejection of the technologies.
- To identify the effectiveness of farmer groups in promoting IPDM technologies.
- To assess the benefits of IPDM technologies on livelihoods.

## 1.5 Hypotheses

1. Stakeholders perceive IPDM technologies as cost effective

2. The rate of IPDM technology adoption by group members is higher than non-group members
3. More women and poor farmers participate in IPDM research groups than men and wealthier farmers.
4. Farmer groups are an efficient mechanism for IPDM technology dissemination
5. IPDM research groups enhance and contribute to women empowerment in the community
6. The adoption of IPDM and other technologies contribute to improved livelihoods of farmers in Hai district, northern Tanzania.

# CHAPTER TWO

## Literature Review

### Introduction

This study focused on the assessment of the impacts of the integrated pest management/Integrated insect pests and diseases management (IPM/IPDM[1]) technologies on beans in Hai district communities, northern Tanzania. The farmers' perceptions of the effectiveness of the technologies and adoption rate of the technologies were explored to assess the social economic benefits of the technologies at household level.

### 2.1 Theoretical review

Integrated Pest Management (IPM) has become one of the most widely used catchwords in agricultural development and environmental conservation programs (Robin and Gunby, 2002). An IPM program might incorporate biological control agents such as predators or sterile insects and pheromone traps, and integrate these with cultural methods such as crop rotation and judicious application of chemical pesticides, when necessary.

The history of insect pest and disease control can be traced back prior to the Second World War where pest control included the application of chemical, cultural and

[1] In the course of these studies, the word IPM and IPDM were used interchangeably because farmers were integrating management strategies that address insect pests and diseases e.g. improved bean varieties and cultural practices.

biological techniques. Immediately after the war, synthetic organic insecticides such as DDT were introduced. The effectiveness and the low cost of the new compounds meant that they were embraced by the farming community, and quickly became the most preferred means of reducing insect pest damage. This almost completely replaced other control measures and made significant contributions to yield increases between 1945 and 1960. At the same time, research scientists quickly adopted the new chemical controls and the chemical industry realized large profits in the development of new pesticides, and they invested accordingly (Robin and Gunby, 2002).

In recent years however, it has been shown in various areas and in some crops that there have been severe decreasing returns from investment in pesticides use, largely in the form of pesticide resistance As a result, there has been a shift away from synthetic chemical control reliance toward IPM practices.

### 2.3 Definition of the terms

**Integrated pest management (IPM) and integrated pest and disease Management (IPDM):**

IPM can therefore be referred to as all approaches that are applied by farmers to manage pests by combining biological, cultural, host plant resistance and chemical options in away that minimizes economic, health, and environmental risks and provides the wide range of choices among farmers to manage pests. Although many farmers claim to practice IPM and researchers, NGOs, etc. emphasize the use of IPM this word is still controversial to many people. Sindel, (2000) defines IPM and analyses each word that forms Integrated Pest Management.

**Integrated:** The Australian Oxford dictionary refers this to 'the compilation of several parts into a whole'. 'Integrated' is probably the key word in the IPM term; it implies the construction of a system made up of several parts, in this case pest management options. They are not just added together in an ad-hoc fashion, they are linked so that each component is reliant on and supports the other. Interdependence is both the strength and weakness of the system and the removal of some of those integrated parts could lead to inefficiency and unfavorable functioning of the pest management system.

**Pest:** Within scientific circles the term "pest" has meant different things to different scientists over the years. In entomology, 'pest' would probably have referred to insects causing damage. In more recent times, pests have generally been understood to include plant diseases. Surprisingly an obvious 'pest', such as weeds, has often been left out of the pest definition. Weed scientists still refer to weed management separately as IWM or Integrated Weed Management. However, most current definitions now recognize 'pest' to include crop-damaging insects, plant diseases, weeds, etc.

**Management:** When dealing with pest problems in an integrated manner, our approaches usually extend beyond simply controlling or killing the pest. We generally need to manage the system within which the pest occurs. It may be possible to achieve our objective to reduce or remove the damage caused by the pest by simply reducing the population of the pest to a level known as the "threshold level". This is the level at which the existing pest population does not represent an economic threat. Pest management systems incorporating biological control may rely on beneficial biological control agents to lower the population of the targeted pest to insignificant levels below the threshold.

**Types of IPDM Practices**

Hoyt et.al (2003) document a number of IPM approaches practiced by farmers to manage insect pests and diseases in different communities:

**Biological control** - Using living organisms against other living organisms. It helps to save money and safeguard the environment.

**Calibration**: Calibrating the application equipment will not only save money, but it also lessens environmental impact by helping to ensure that the proper amount of material is being applied evenly in target areas.

**Herbicide choice** - Herbicide choice is an important factor when deciding how best to control unwanted vegetation. Efficient proper use of chemicals saves money and time. It's important to choose a herbicide which is designed to specifically target the plant(s) that are not required (i.e. the target weeds).

**Pest identification** - Pest identification consists of identifying and monitoring what insects and/or diseases are in the field. These two steps can aid you in deciding what, when, and if you need to spray. Another important aspect is to know what type of damage (if any) insects/diseases cause on the target crops. Some insects may actually be beneficial by controlling other insects. Some diseases may have minimum impact on crops or infect and kill some insect pests.

**Pesticide choice** - Pesticide choice goes hand in hand with pest identification. Proper pesticide choice means choosing the right chemical, for the right insect, applied at the appropriate dose and right time, so as not to waste chemicals, money, and time.

**Physical/mechanical control**- Physical control may not be necessary, but it can offer an environmentally friendly manner of controlling vegetation, animals and insects. Some physical control measures consist of plowing between rows of crops, picking out infected crops to prevent diseases from spreading, manually collecting and killing insect pests, etc..

**Rules and regulation of pesticide uses** – It is critical to be aware of the rules and regulations pertaining to pesticide application. (i.e. herbicides, insecticides, fungicides, etc.). Serious consequences may arise if and when rules/laws are not followed, including fines as well as personal injury/death from potentially dangerous chemicals

**Choice of appropriate crop growing site** – Appropriate crop growing site selection is important because a farmer would not want to waste money or time on a crop that is not going to grow properly and yield well.

**Species choice for site and climate** - A species should be chosen that is going to grow best and be most productive in the planned planting area. The factors involved are geographical, climate and precipitation.

**Plant identification** - Plant identification consists of identifying the plants in the field to distinguish between beneficial and unwanted plants (weeds), this will help in the selection of the appropriate chemical to use and the proper timing of application.

Although many farmers may feel that they are not using IPM, the fact is that many growers have been and are using at least some of the IPM options in their fields. They may not be combining or integrating them for maximum effect but they are familiar and practicing the technologies for insect pests and diseases (Sindel, 2000),

The focus of IPM is on economic loss rather than physical damage, and a variety of measures are used to minimize economic losses. Robin and Gunby (2002) describe these two features of IPM: Firstly, in the presence of pest infestation, control measures are applied only if the cost of application is less than the value of the damage that would be caused by the pests. The second feature of IPM, which argues for its technical superiority, is that it attempts to take advantage of natural controls. In developing the strategies, researchers look for and try to use those controls of nature that already prevent population explosions of damage-causing species. IPM strategies generally attempt to enhance natural interactions rather than to overriding them by eliminating some species. There have been many studies of the economics of IPM that tend to find that after a switch from conventional control measures to IPM practices, the results lead to increases in yield , net returns and environmental and economic risks decline.

IPM is described as a "technology which substitutes knowledge and information (labor) for pesticides" (Hall, 1977). Any technology that is knowledge or information intensive operates under high fixed costs and falling average costs, since information, once produced, is cheap to reproduce. However, at the initial stage the information, or R&D costs of IPM are high because the problem that needs to be solved is typically very complex.

An IPM program involves several components: identification of the pests to be controlled; definition of the management unit; development of a pest-management strategy (which can demand extensive knowledge of the interactions of plant and pest life cycles); development of reliable monitoring techniques; establishment of economic thresholds; and the evolution of descriptive and predictive models (because control measures must be applied before economic damage occurs, which involves making predictions about population dynamics). For any crop, or set of crops, IPM is a technology that involves the development of each of these components, the cost of which must be borne before the technology is usable. However, once this knowledge is obtained, any farmer can use it. Since IPM is a knowledge intensive technology, information's gathering and processing are the major and important factors to be considered in the implementation of IPM, therefore sources of inexpensive localized information can be crucial. This source is often the neighboring farmers (Allen et al. 1987). For example, this study found that over half of the farmers surveyed considered their neighbors as "preferred or useful" sources of information regarding pest control.

## 2.2 Empirical Review of the Benefits of Applying IPM technology

IPM is the crop protection system which best meets the requirements of sustainable development and sustainable agriculture. It is a whole-farm strategy that involves managing crops profitably, with respect for the environment, in ways that suit local soil, climatic and economic conditions. It safeguards the farm's natural assets in the long term. It includes practices that avoid waste, enhance energy efficiency and minimize pollution Robin and Gunby (2002).

Integrated Pest Management (IPM) strategies have been evolved for controlling pests in important crops like cotton, rice, beans, coconut, castor and red gram. In cotton, the IPM technology developed is now being widely practiced in large acreage in major cotton growing areas. Similarly, IPM in rice has become a part of the farming practices of the farmers in Europe. **(put the name not the web-page)**

(a) ***Bolivia. Community of Taracollo, Province of Aroma, La Paz (3900 m)***

Social and economic benefits of IPM project have been reported by the potato growers in the high Andean mountains of South America were Andean potato weevils, or potato white grubs, are the most severe pest of potatoes cultivated in the in the area http.

**Reduction of weevil damage:** Prior to the initiation of the Project (1995), weevils infested 48 to 100% of harvested potato. In monitored areas, tuber damage was 48.9%, despite the use of insecticide. After three years of IPM implementation, tuber damage was reduced to 15%.

**Reduction of insecticide use:** Prior to the IPM program, all farmers made broad-based applications of insecticide (parathion and methamidophos), two to four times a season. In three years, the farmers discontinued these applications completely. However, in 1998 some farmers (30%) made localized applications to their field borders when weather conditions caused by El Niño favored the migration of weevils to potato fields.

**Improvement of farmers' knowledge:** At the beginning of the program all farmers recognized the larval form of the pest, but very few—if any—connected the larvae to the adult weevils. None of the farmers knew about the weevil's seasonal history, its behavior, or its over-wintering areas. Three years later, all farmers knew these aspects of the weevil and used them as a basis for adopting better control measures.

**Adoption of IPM components:** The following IPM technologies were adopted: (i) Field border trenches covered with plastic sheets; (ii) destruction of volunteer plants; (iii) destruction of weevil larvae in rustic stores (using Beauveria brongniartii); (iv) weevil hand-picking; (v) use of sheets for piling potatoes at harvest; (vi) use of chickens as predators; and (vii) occasional applications of insecticide along field borders (band spraying) .

(b) ***Peru: Communities of Chuamba and Casabamba, Huancayo***

**Reduction of weevil damage:** At the beginning of the program, 40 to 53% of harvested tubers in the community of Casabamba were infested, and some potato fields had been abandoned because of high weevil damage. After three consecutive cropping seasons, damage was reduced to 8%. In the community of Chuamba, where insecticide was used intensively, average tuber damage was 19% in 1995. In 1998, damage was reduced to 4.1%.

**Reduction of insecticide use:** Prior to the IPM program, all farmers of the Community of Chuamba used broad-based applications of insecticide (aldicarb, carbofuran, methamidophos, parathion, and tefluthrin) 3 to 4 times per cropping season. After three years, many farmers did not use any insecticide. Those who chose to use insecticide limited their application to bands along field borders (band-spraying).

**Improvement of farmers' knowledge:** At the beginning of the program, farmers did not know about the life cycle, seasonal history, overwintering places of the pest, adult weevil behavior, or the occurrence of Beauveria brongniartii. Farmers learned all these aspects and related them to the management of the pest.

**IPM components adopted:** Most peasants from Casabamba adopted 8 IPM components, while those from Chuamba adopted 10 IPM components. Preferred measures were weevil hand-picking, use of sheets at harvest, improved harvest timing, winter plowing of harvested potato fields, crop rotation, use of chickens as predators, diffuse-light storage for seed tubers, and use of Beauveria brongniartii in rustic stores. When needed, insecticide was applied along field borders (band-spraying).

*Ecuador: Four communities in the province of Chimborazo and three communities in the province of Cotopaxi*

**Reduction of weevil damage:** Weevil damage in communities practicing IPM in Chimborazo was 3.0 to 7.3% in 1998, as compared to 23–32% damage in other communities. In Cotopaxi, the initial average tuber infestation at harvest was 58–80%. Infestation in the participating communities was reduced to 2–15% in a three-year period.

**Reduction of insecticide use:** At the beginning of the program, farmers applied Insecticide (methamidophos, carbofuran, methomyl, dimethoate, and profenofos) 2 to 4 times per season in Chimborazo. Three years later, 92% of farmers applied 1 to 2 times per season, with a trend toward use of less toxic products (acephate).

**Improvement of farmers' knowledge:** At the beginning of the program about 35% of farmers had some idea about the life cycle of the weevil. Three years later, all farmers knew the biology, behavior, and seasonal history of the weevil and related the new knowledge to management of the pest.

**IPM components adopted:** Preferred IPM components were the use of weevil shelter traps, the elimination of volunteer plants, early harvest, and better use of insecticide.

*(d) Colombia: Municipality of Motavita, Department of Boyacá*

**Reduction of weevil damage:** Prior to the IPM program, 60% of the farmers reported 21–60% infested tubers at harvest. After three years of IPM implementation, average infestation was 9.4%.

**Reduction of insecticide use:** At the beginning, all farmers used insecticide (mainly aldicarb and carbofuran) 2 to 4 times per season. At the end of the program 50% of farmers applied insecticide 1 to 2 times; the other 50% applied it 3 times per season.

**Improvement of farmers' knowledge:**

Farmers improved their knowledge of the life cycle, seasonal history, and behavior of the weevil, and 70% of the farmers indicated the new knowledge had improved their understanding of control measures.

**IPM components adopted:** Most farmers adopted the elimination of volunteer plants, the elimination of crop residues, weevil hand-picking, and winter plowing of infested fields. Farmers decreased their use of insecticide.

Moreover, a study conducted in Pennsylvania shows that IPM has been very effective in controlling pests in apple plantations. In this state, apples and other tree fruits are produced on ca. 36,000 acres for fresh market and processing in the area. In a good year, just one well-maintained acre of apple trees can bring in a gross revenue of up to $10,000 and profits which can exceed $1,000.

**Weevil damage:** a large complex of insect, disease, nematode, weed, and mammal pests, however, affects Yield and quality of this crop. One pest, the tufted apple bud moth, causes losses in yield and quality that can cost the industry as much as $2 million each year.

**Improvement of farmers' knowledge:** Since the mid-1970s growers have used an IPM program to manage apple pests. An important part of the IPM program is the black lady beetle, a natural biological control agent. The black lady beetle is critical in controlling another major pest of apples, the European red mite. To conserve this natural biological control agent and control the tufted apple bud moth and other apple pests, growers select pesticides, and time their use to protect black lady beetles in the orchard. This bio-control program has eliminated 1.09 million pounds of pesticide sprays since its implementation, providing a savings of more than $11 million to fruit growers.

**Reduction of insecticide use**: The study observed the following benefits of applying IPM technologies to apple growers; (1) Decreases in insecticide use by as much as 50%, fungicide use by as much as 40%, miticide use by 80%, and overall frequency of chemical application.

**Benefits of using IPM:** Fruit growers argue that IPM increases quality, improves yield, decreases frequency of chemical application, improves pest management effectiveness and increases profitability.

### 2.2.1 Agriculture technologies and bean production in Tanzania.

The common bean (*Phaseolus vulgaris L.)* is a major staple in eastern, central and southern Africa where it is considered as the second most important source of human dietary protein and the third most important source of calories ( Pachico, 1993). In Tanzania, common bean is an important source of vegetable protein and cash for small holder farmers. The crop is normally grown and considered to be an important source of dietary protein to the majority of people who cannot afford the expensive animal protein on daily basis (Kweka and Maingu, 1991). Beans account for about 80%of the total amount of pulses produced in the country, thus making it a strategic crop in ensuring food security and alleviating malnutrition (Mashamba, 1998). There are a large number of varieties of dry beans (both local and improved) grown in Tanzania but the most important cultivars are red, yellow, cream, grey spotted, medium and small seeded types (Limbu, 1999). Beans are primarily a crop of small- scale producers and generally few inputs are used. Consequently, there is a wide variation in bean production systems. The major cropping systems include beans intercropped with maize, sorghum, tubers and root crops, coffee, bananas, vegetables, and with other legumes, such as sunflower or a monocrop.In Tanzania, beans are grown in medium to high elevations throughout the country but the major producing zones include the southern highlands, northern highlands, Lake Victoria zones, Morogoro and Tanga regions (Limbu, 1999). Most of the beans in these locations are normally grown in association with maize, bananas, coffee, root crops, fruit and tree crops in smallholder fields that are predominantly managed by women farmers.

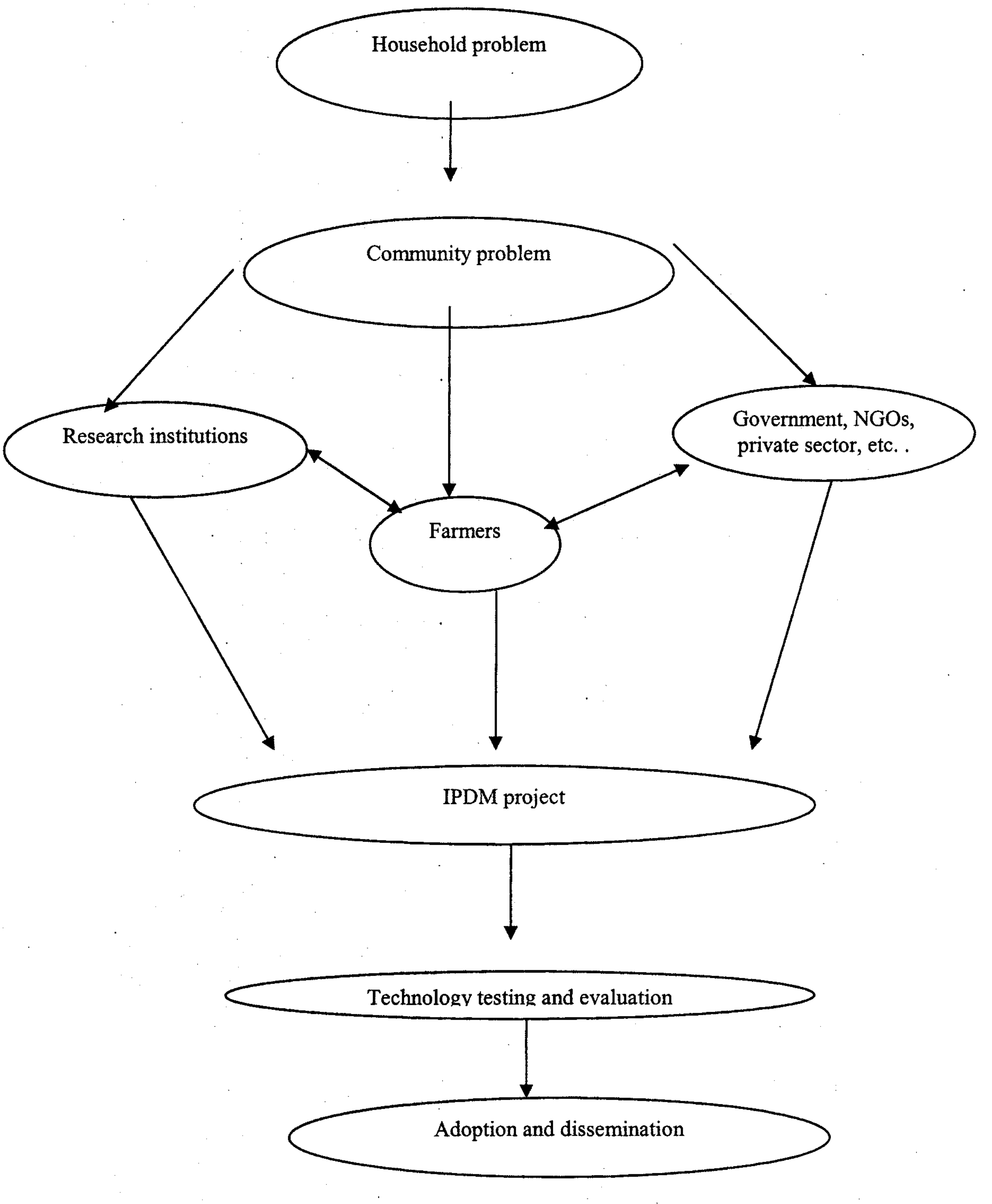
The main production constraints reported in the literature are poor agronomic practices, soil infertility, lack of improved cultivars, moisture stress, weed competition and damage caused by insect pests and diseases (Schwartz and Corrales, 1989). Bean diseases are a major constraint to increased crop production in Tanzania. Grain yield losses of up to 33% have been reported in Morogoro (Misangu, 1986). Different farmers have also reported bean insect pests and diseases as a limiting constraint to increased bean production.

Available information confirms that some farmers in Hai district had been forced to abandon the cultivation of beans because of bean insect pests and diseases. This problem has not been addressed because of a belief that crop losses on smallholder agriculture are due to poor management practices and the assumption that yields could be improved only by the introduction of external inputs (e.g. inorganic fertilizers, conventional pesticides, etc.) (Ampofo *et al.* 2002).

### 2.2.2 Evaluation and structure of IPDM project in Hai district, northern Tanzania

The project entitled ("Promotion of integrated pest management strategies of major insect pests of *Phaseolus* beans in hillsides systems in eastern and southern Africa") was initiated as a first step to integrate and disseminate both local and improved technologies for the management of bean insect pests and diseases in smallholder farming communities. The project was designed to create awareness among farming communities at the target areas and promote acceptable and effective integrated insect pests and disease management (IPDM) strategies for the major bean insect pests and common diseases, particularly bean stem maggots (BSM), bean foliage beetle (BFB), major leaf and root diseases. The project aimed to enhance farmers' capacity to understand factors that lead to pest problem and provide them with available options for pest management (Ampofo, 2002). The figure below describes the evolution of the IPDM project in Hai community.

Figure 2.1. Structure and evolution of the bean IPDM project in Hai district, northern Tanzania



The evolution of the project is depicted by the following sequence of events:

- Household members in Hai district experience the reduction of bean yield.
- Community members experience the rapid decrease in bean production that needs community efforts to address them.
- A small group of farmers from Sanya Juu village request for assistance to diagnose and develop solutions to a bean pest
- Formation of farmer research groups, involvement of R&D institutions.
- Development of IPDM project in the community
- Stakeholders (farmers, policy makers, NARS, IPDM project, donors, NGOs' and other service providers, etc.) participate in identifying the root causes (bean insect pests and diseases).
- Farmers' groups select the plots for learning/demonstration plots with technical support from IPDM project and District Agriculture and Livestock Development Office to test different technologies.
- Farmer group members test, evaluate and adopt different technology options and collaborate with other stakeholder to disseminate the technologies through farmers training, demos/learning plots, field days, cross visits, leaflets, posters, drama, choir, radio, etc.

**Participatory Approach used to involve farmers in IPDM Project**

According to Minja (2003), farmer group involvement in project activities led to the development of novel approaches to disseminate bean IPDM options from community to community through farmer research groups and cross visits. The processes used in this approach involved farmers' participation in planning, implementation, monitoring, evaluation and dissemination of their choices of IPDM options. The result of this was an increased number of farmers that have formed research groups and participated in project activities. Community members were happy with the approach of learning by doing, sharing and exchanging information among groups, non-participating farmers, other stakeholders and visitors.

Different processes including farmer group training, farmer meetings, demonstrations and field days, traditional drama, choir/poems, cross village and across-site visits, leaflets, posters, radio and TV were used to disseminate technologies. Following demands by farmer research groups for information to be availed to them within reach of their communities, pilot village information centres (VICs- small village libraries) were set up by the local community members to stock extension/promotional and other relevant readings materials. Thus, community members easily accessed new information and retained the knowledge they generated at their villages and districts.

### 2.2.3 Tanzania agriculture policy

The economy of Tanzania depends largely on the agriculture sector. The sector faces a number of constraints including lack of capital, lack of appropriate and improved technical knowledge, unreliable weather conditions, diseases, insect pests, improved quality seed, improved livestock breeds, unreliable markets, infertile soils, amongst others.

Following the social, political and economic changes that are taking place in the country, the government recognized the importance of reviewing the policies that were instituted in the 1970s and 1980s. These policies were endorsed at a time when the government controlled all activities in production, trading and other sectors of the economy and farmers were offered few incentives, while the prices for their crops were suppressed and the government monopolized marketing channels.

The goal of the current agriculture policy is to improve the well being of the people whose principal occupation and livelihood are based on agriculture. Among other things, the policy recognizes the importance of different agricultural technologies (traditional and improved) that will contribute to the achievement of the goal.

The present agricultural policy recognizes that pre-harvest field crop losses due to pest infestations are estimated at 30-35% while post harvest crop losses due to different organisms amount to a further 10- 20% ((Tanzania Agriculture and Livestock Policy, 1997). The policy also empowers the responsible ministries to continue to take measures that are aimed at improving and strengthening plant protection services so that crop losses resulting from insect pests and diseases are minimized.

The policy further recognizes the importance of including other stakeholders in the processes of research and development of technologies, although the government will continue to control and regulate migratory pests (e.g. armyworm, locusts, etc.), epidemic diseases and private sector plant protection services. The involvement of other stakeholders such as research institution, private sector and non-governmental organisations in plant protection services will facilitate changes in the sector by building the capacity of farmers to enable them address these problems.

The introduction of free trade and integration of the private sector in agriculture marketing, processing and storage activities serves as an opportunity for farmers to sell their produce at reasonable prices. Although this applies mainly to medium and large-scale farmers who are able to sell their produce at the appropriate time, the smallholder farmers have the alternative of forming groups and associations that will empower them make decisions and build their capacity in the competitive free market arena.

# CHAPTER THREE

## 3.0 The study area and research methodology

### 3.1 Introduction

This chapter describes the general characteristics of the study area, research model and methodology used in collecting, processing and analyzing the field data.

The study was conducted in Hai district in northern Tanzania. This region is the pilot site where the bean IPDM technologies promoted by CIAT, farmers, national program and NGO partners were initiated by innovative farmers. The information generated in Hai has so far been disseminated and adopted in other districts (including Arumeru, Babati, Mbozi, Mbeya, Moshi, Iringa, Njombe, Chunya and Lushoto) and across the borders to Kenya, Malawi, Rwanda and Uganda.

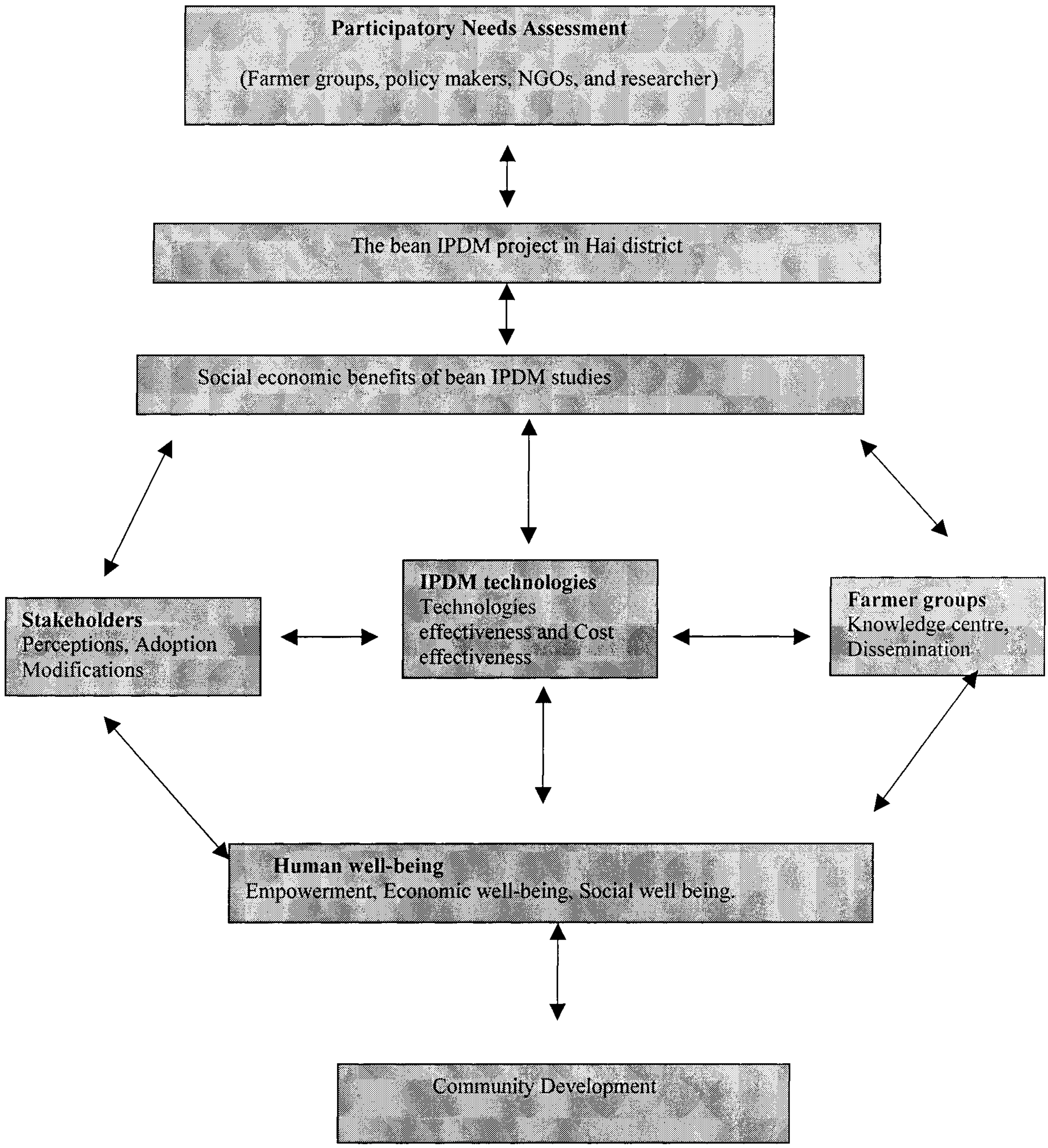
### 3.2 Study area

Hai district is one of the five districts in Kilimanjaro region. . The district lies in the northern part of Tanzania on the western slopes of Mount Kilimanjaro and it covers a land area of 2168.7 square kilometres. The region is dominated by small-scale farmers, with farm size ranging from an average of 2-3 hectares. The common farming system is mixed crop and livestock production. Major crops include maize, beans, coffee, bananas, vegetables, fruits, root crops, other legumes, paddy and sunflower. Hai can be divided into three ecological zone: the lowland zone that lies between 750 and 1,000 meters above sea level (a.s.l.) and characterized by low and unreliable rainfall, the midland zone which lies between 1,000 and 1,500 meters with higher rainfall than the lowland zone, and the high land zone that lies over 1,500 meters a.s.l. and characterized by heavy rainfall, cool temperatures, mountain forests and grasslands. The district has a total of 58,056 households with a total population of 259,958 inhabitants, of which 127,780 are male and 132,178 are female (Tanzania national census 2002).

### 3.3 Conceptual Framework for Study

The Conceptual framework shows the relationship between the primary beneficiaries or end users, i.e. farmers, and the different partners involved in the processes and methods used to address the problem of bean insect pests and diseases in the target community. Livelihood benefits derived from implementing the IPDM technologies are the main focus of the study.. Thus, the framework analyses the roles and links between individual farmers, farmers groups, partners and the ways in which adopting IPDM technologies affected the human well being in the community. The model assumes that improved livelihoods contribute to community development and that community development provides a favorable environment for individual development. The implication here is that individual farmer well-being and community development are interdependent (Figure2.1).

**Figure 2.1: Conceptual Framework for Analysis**



## 3.4 Research Methodology

Primary and secondary sources were both used to obtain data for the study. Different techniques of data collection such as surveys, in-depth interviews, focus group discussions, observations and informal talks were applied to obtain qualitative and quantitative information from different sources that included NGOs, local government personnel, individual farmers, farmer groups, community members, research and extension agents, libraries, etc.

## 3.5 Sampling design

Probability and non-probability methods were used in selecting respondents for the study. Probability sampling was introduced to select groups for focus group discussions and individuals' respondent survey while non-probability was used to select key informants.

## 3.6 Sampling procedures

Different procedures were adopted in selecting respondents for the study. The variation in activities carried out by bean farmers and the intensive nature of IPDM technologies required the use of different procedures for information gathering in the present study. The evolution of the IPDM project activities in the community also influenced the sampling procedures.

### 3.6.1 Selection of groups for focus group discussion

The IPDM project participating farmer groups were categorized into three generations depending on the age of the group. The categories are:

(a) first generation composed of groups formed between 1999 to 2000;

(b) second generation 2001 to 2002, and;

(c) third generation 2003 to 2004.

According to the data from the district agriculture and livestock development office (DALDO), seventy-seven bean IPDM farmer groups were operational in the district by June 2004. Among these, 6 groups are in the first, 26 groups in the second and 45 groups in the third generation. Random sampling was followed in each generation to enable the selection of groups for focus group discussion and quality data collection.

### 3.6.2 Selection of key informants

In each community there are a few local people who can serve as spokespersons or key informants for the rest of the community, who can can provide information about the community. Three key informants were selected for Hai community. They included one person each from the DALDO's office, locally active NGO (World Vision International, Tanzania office) and the union of development community groups in Hai district (MUVIMAHA- Muungano wa vikundi vya maendeleo wilaya ya Hai) that operate under the auspices of the district and the World Vision local office. These informants were interviewed to capture their perception on IPDM project approaches, methods and the adoption of IPDM technologies in general.

### 3.6.3 Selection of farmers for the surveys

Bean farmers in the study area were stratified into two groups (project participating and non-participating farmers) to enable the study to compare and capture information on benefits from the large diversity of bean farmers in the community.

Control group (Non participating farmers): A total of 100 non-participating farmers comprised of 53 women and 47 men were surveyed for the studies. Random sampling method was used to select non-participating farmers from village lists in the district. In some villages the lists were not available and in such conditions a random sampling method of counting houses was introduced and used by the study team. In this method, a central or starting location was agreed on by the study team as appropriate in capturing the diversity of information within the village.

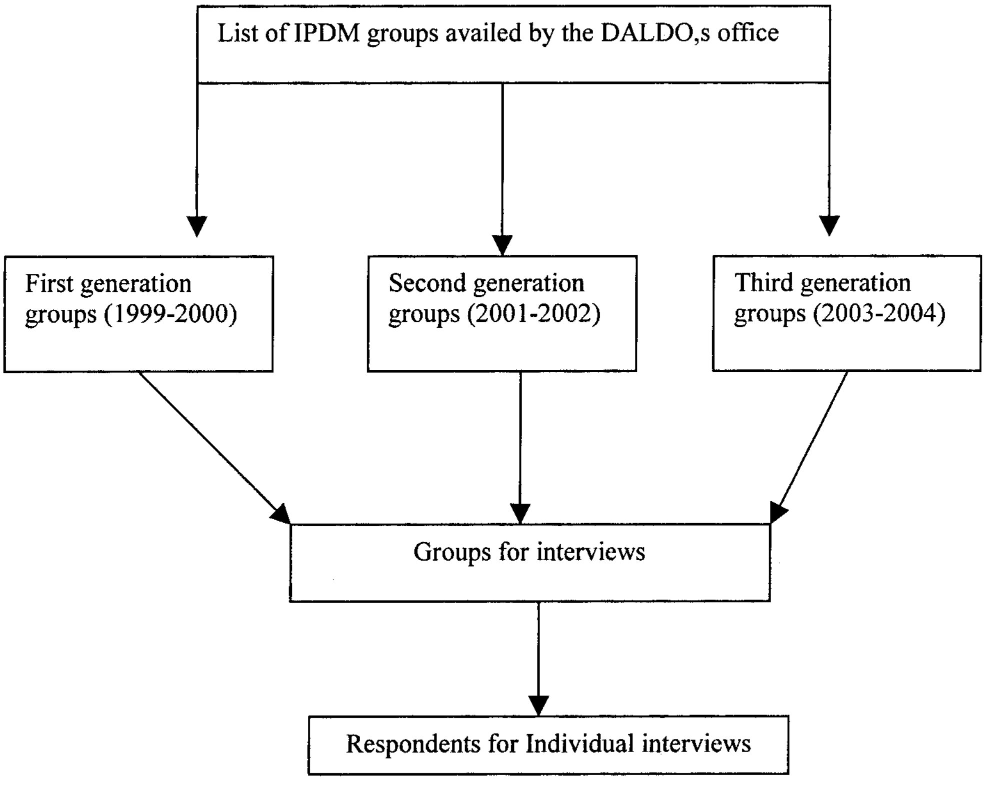
Participating farmers: A total of 136 participating farmers comprised 75 women and 61 men from different generation's groups were surveyed to gather information for the study. The table below presents the number of farmers interviewed from each generation.

**Table 3.1. Number of participating farmers selected from different generation**

| **Year started/ generations** | **Number of farmer interviewed** |
|---|---|
| 1999-2000 (First generation) | 37 |
| 2001-2002 (second generation) | 60 |
| 2003-2004 (third generation) | 39 |
| **Total** | **136** |

The selection of participating farmers was based on the list of IPDM groups from the DALDOs office. The study team categorized the groups into three depending on the age of the group in the project and then random sampling was used to select the individual farmers from each category for the interviews. Random sampling of individuals for interviews followed the identification of the groups is described in Figure 3.1

Figure 3.1. Selection of participating farmers for survey interviews




### 3.7 Group interviews

Data collection involved 39 farmer groups in 27 villages in Hai district. Data collection started with a pilot study (Pre-testing of questionnaires) at Mungushi village. The aim of the pre-testing exercise was to ascertain the quality of the data collection tools (questionnaires) and to familiarize the study team with the dynamics of data collection process and the implementation of IPDM project activities by farmers and other stakeholders.

### 3.7.1 Surveys

Two different questionnaires were used in gathering information from participating and non-participating farmers in the study area. The questionnaires (Appendix 1) were introduced and used in the community to examine farmers' awareness and perception on the effectiveness of the IPDM technologies in reducing insect pests and diseases. In addition, the second questionnaire was used to assess the extent of adoption or non-adoption of the various IPDM technologies, the benefits obtained from using the technologies and involvement in farmer research groups.

### 3.7.2 Focus group discussion

Focus group discussions (FGDs) were strategically conducted in selected villages (Table 2) after the surveys to explore information on the issues raised during the surveys. Focus group interviews were also used to explore the effectiveness of the farmer research groups in the dissemination and adoption or rejection of the IPDM technologies.

### 3.7.3 In-depth interviews

In-depth interviews were used to gather information from key informants. This tool was used to assess the awareness and perception of policy makers, a representative of one of the most active NGOs operating in Hai district community, farmer community members in MUVIMAHA and other community members.

### 3.8 Data analysis

Descriptive statistics and qualitative method of data analysis were used to analyze the information gathered during the surveys. The statistical package for social scientists (SPSS) and Microsoft Excel were the tools used for quantitative and qualitative data analysis. F requencies t ables, p ivot t ables a nd c harts w ere t he p rincipal t ools f or data analysis. Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis was the tool adopted for analyzing qualitative information.

**Limitation of the data collection**

- Some farmers were not available for interviews because they were working on their farms and or were busy on harvesting their crops.
- The climate situation was bad in that year and many farmers lost their crops due to unreliable weather. The few farmers who had a good crop were obliged to harvest early or to guard their crops due to widespread theft in their fields.
- Sometimes the study activities were delayed by other community functions including funerals
-

# Chapter four

## 4.0 Data presentation and discussion

### 4.1 Introduction

This chapter presents analyses and discusses the findings in relation to the research hypotheses and objectives. These are organised into four main parts. The first part discusses the social economic characteristics of farmers in the study area, the second part presents the perception of farmers towards bean IPDM technologies, the third part assesses the effectiveness of IPDM groups on the adoption and dissemination of the technologies and the fourth part analyses the social economic benefits of bean IPDM technologies to bean farming communities in Hai district.

### 4.2 Social economic characteristic of farmers

#### 4.2.1 Education levels, marital status and age composition of farmers

Table 4.1 describes the education levels, age, marital status, and activities of farmers in the study area. The data in the table shows that 95% of farmers attended formal education and reached different levels where 80% have primary school education, 13% have ordinary level secondary education and only 5 % of the interviewed farmers had no formal education. The study observed that 7% of interviewed farmers are employed and 24% engage in different businesses to supplement their household income. The data further shows that all farmers who engage in other activities like small businesses or are employment have at least finished primary school education. This implies a positive relationship between education level and employment or engagement in different businesses.

**Table 4:1 Social economic characteristics of participating and non participating farmers in the community**

| Characteristics | Participating farmers | | Non participating farmers | | Total | % (N=236) |
|---|---|---|---|---|---|---|
| Education level | Male | Female | Male | Female | | |
| No formal school education | 2 | 4 | 3 | 2 | 11 | 5 |
| Primary school education | 49 | 58 | 35 | 47 | 189 | 80 |
| O' level secondary education | 9 | 11 | 7 | 3 | 30 | 13 |
| Advance level secondary education | 1 | 1 | 2 | - | 4 | 2 |
| Diploma/degree level | - | 1 | - | 1 | 2 | 1 |
| Total | 61 | 75 | 47 | 53 | 236 | 100 |
| Marital status | | | | | | |
| Married | 61 | 59 | 39 | 44 | 203 | 86 |
| Not married | | 7 | 6 | 4 | 17 | 7 |
| Widowed | | 6 | 2 | 2 | 10 | 4 |
| Divorced | | 3 | - | 3 | 6 | 3 |
| Total | 61 | 75 | 47 | 53 | 236 | 100 |
| Age Composition | | | | | | |
| 21-30 | 2 | 9 | 6 | 11 | 28 | 12 |
| 31-40 | 11 | 15 | 12 | 17 | 55 | 23 |
| 41-50 | 15 | 31 | 14 | 13 | 73 | 31 |
| 51-60 | 14 | 17 | 6 | 8 | 45 | 19 |
| > 61 | 11 | 2 | 8 | 3 | 24 | 10 |
| Don't know | 8 | 1 | 1 | 1 | 11 | 5 |
| Total | 61 | 75 | 47 | 53 | 236 | 100 |
| Employment | | | | | | |
| Teacher | 2 | 2 | 1 | 2 | 7 | 3 |
| Medical attendant | 2 | 2 | 1 | - | 5 | 2 |
| Local government employee | - | 1 | 1 | - | 2 | 1 |
| Self employed | - | 1 | 2 | - | 3 | 1 |
| Not employed | 57 | 69 | 42 | 51 | 219 | 93 |
| Total | 61 | 75 | 47 | 53 | 236 | 100 |
| Business | | | | | | |
| Small business | 11 | 13 | 4 | 12 | 40 | 17 |
| Retail shop | 5 | 3 | 3 | 4 | 15 | 6 |
| Wholesaler | 1 | 1 | - | 1 | 3 | 1 |
| None | 44 | 58 | 40 | 36 | 178 | 76 |
| Total | 61 | 75 | 47 | 53 | 236 | 100 |
| | | | | | | |

Source: Field survey data 2004

The study observed that most farmers engage in both agriculture crop and livestock farming basically for household food and income generation. Farmers mentioned cattle, goat, chicken and sheep to be the common livestock animals in the community.

The survey data further showed that 88% of the farmers keep chicken while 69% owned cattle and 56% owned goats (Table 4.2). Interviewed farmers considered livestock to be the an important household asset or investment that can be sold when there are critical family needs and also used as a source of food (milk, eggs and meat). The study recognizes that farmers prefer to save money in kind (e.g. by buying goats, chicken, pigs, etc.) rather than depositing it in a bank account. Community members considered chicken as a woman/wife's property. Women can sell chicken to obtain cash for purchasing food and other domestic requirements (salt, kerosene, matches, soap, etc.) without consulting their husbands, fathers or brothers. On the other hand, cattle, goats, sheep and pigs are owned by men and considered as family property. It is the man/ husband/brother/father who makes the final decision in the sale or disposal of these animals to address family problems that include payment of school fees for children, building or modification of family houses, etc.

**Table 4:2** Livestock ownership by surveyed farmers in Hai district, northern Tanzania

| Livestock | Number of livestock owned by farmers | | | | | | | | | | Total farmers | % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1-3 | | 4 -6 | | 7 -9 | | 10 -12 | | >12 | | | |
| | P | N | P | N | P | N | P | N | P | P | | |
| Cattle | 61 | 38 | 27 | 17 | 5 | 3 | 3 | 8 | - | - | 162 | 69 |
| Goat | 32 | 23 | 24 | 13 | 12 | 5 | 3 | 8 | 7 | 6 | 133 | 56 |
| Sheep | 19 | 5 | 17 | 5 | 2 | 5 | - | 2 | 2 | 1 | 58 | 25 |
| Donkey | 2 | 2 | 4 | - | 1 | - | - | - | - | - | 9 | 4 |
| Pig | 14 | 10 | 7 | 6 | 2 | 2 | - | 2 | - | - | 43 | 18 |
| Chicken | 11 | 12 | 27 | 26 | 17 | 9 | 22 | 17 | 51 | 15 | 207 | 88 |
| P= Number of participating farmers, N= Number of non participating farmers | | | | | | | | | | | | |

Source: Field survey data 2004

### 4.2.2 Land ownership

Land shortage is one of the major constraints raised by farmers in the district. In all villages, hiring land to increase crop production is a common practice for most farmers. Survey data showed that only 2.5% of all interviewed farmers owned reasonably large individual fields (8-12 acres)(Table 4.3). The majority of farmers (54.2%) own small pieces of land that range in size between 1-2 acres. This is not enough for family household needs. Consequently, farmers try their level best to hire land from other farmers in the village or outside their village. A substantial number of farmers travel for 20-100 kilometres to cultivate far off fields to compliment production from their small household fields.

**Table 4.3 Land ownership by farmers in surveyed areas of Hai district communities.**

| Land size owned by individual farmers | Participating farmers | | Non participating farmers | | Participating and non participating farmers | |
|---|---|---|---|---|---|---|
| | **No of farmers** | **%** | **No of farmers** | **%** | **Total** | **%** |
| < 1acre | 12 | 9 | 21 | 21 | 33 | 13.9 |
| 1-2 acres | 68 | 50 | 60 | 60 | 128 | 54.2 |
| 3-4 acres | 37 | 27 | 14 | 14 | 51 | 21.6 |
| 5-6 acres | 10 | 7 | 1 | 1 | 11 | 4.6 |
| 7-8 acres | 4 | 3 | 2 | 2 | 6 | 2.5 |
| 9-12 acres | 4 | 3 | 2 | 2 | 6 | 2.5 |
| Farmers without own land | 1 | 1 | - | - | 1 | 0.4 |
| **Total** | **136** | **100** | **100** | **100** | **236** | **100** |

Source: Field survey data 2004

### 4.2.3 Food and cash crop production

Like other areas in Kilimanjaro region, maize, bananas, coffee, vegetables and beans are the major and common crops produced in Hai district. Farmers pointed out that maize is the most important crop followed by beans and then bananas, coffee, vegetables, sunflower and paddy. Tables 4:4 – 4:5 show ranks given by farmers to different crops based on their importance for food and household cash income generation. Data in Table 4: 4 specifically shows that all farmers ranked maize to be the number one most important crop among the five major food crops and beans were second most important. Both crops are used for food and cash income.

**Table 4. 4 Farmer ranking for different food crops in Hai district in 2004**

| | **Participating farmers (N=100)** | | | | | **Non participating farmers (N=136)** | | | | | **Total** | **%** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Crop** | **1st Rank** | **2nd Rank** | **Score** | **(n=236)** | **5th Rank** | **1st Rank** | **2nd Rank** | **3rd Rank** | **4th Rank** | **5th Rank** | **Score** | **(n=236)** |
| Maize | 121 | 14 | 1 | - | - | 90 | 10 | - | - | - | **236** | **100** |
| Beans | - | 93 | 41 | 1 | | - | 77 | 15 | - | - | **227** | **96** |
| Banana | 15 | 19 | 17 | 16 | 12 | 5 | 5 | 20 | 3 | 1 | **113** | **48** |
| Sunflower | | 4 | 35 | 8 | 14 | - | 8 | 48 | 12 | 1 | **130** | **55** |
| Vegetables | - | 1 | 9 | 35 | 11 | - | - | 10 | 11 | 3 | **80** | **34** |
| Paddy | - | 5 | 7 | 3 | - | | | | | | **15** | **6** |

Source: Field survey data 2004

The above study observed that, due to economic changes in the country, farmers have changed their perceptions about cash crops. Farmers in Hai district define a cash crop as any crop that can easily be sold on the market to obtain cash. This definition was adopted after the collapse of coffee world market prices. Coffee was the only major cash crop in the region for more than 40 years but the market prices have not been very reliable in recent years. The survey data shows that 87% of the respondents considered maize to be the first most important cash crop, followed by beans (76%) and coffee (31%) (Table 4.5). Market liberalization for coffee has created room for free trade and this allows traders to buy and sell freely at different markets and prices. The coffee market change created room for farmers to decide on the appropriate crop to produce for cash income and also for food. Farmers are now producing commodities that they perceive to be profitable to them. A high percentage of farmers in Hai district have opted to produce more maize and beans because the inputs are easily obtained in the community at reasonable prices and the products are easily marketed ld to any person from within or outside the community.

**Table 4.5 Farmers' rank for different cash crops**

| | **Participating farmers (N=100)** | | | | | **Non participating farmers (N=136)** | | | | | **Total** | **%** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Crop** | **1st Rank** | **2nd Rank** | **3rd Rank** | **4th Rank** | **5th Rank** | **1st Rank** | **2nd Rank** | **3rd Rank** | **4th Rank** | **5th Rank** | **Score** | **(n=236)** |
| Maize | 65 | 21 | - | 5 | - | 65 | 31 | 13 | 4 | 1 | **205** | **87** |
| Beans | 8 | 49 | 26 | 1 | - | 7 | 51 | 31 | 9 | 1 | **183** | **76** |
| Banana | - | - | 5 | - | - | 7 | 13 | 13 | 4 | 3 | **45** | **19** |
| Sunflower | - | - | 19 | 9 | - | - | 2 | 9 | 7 | 3 | **49** | **21** |
| Vegetables | 4 | 1 | 7 | 3 | - | 16 | 7 | 11 | 15 | 1 | **67** | **28** |
| Coffee | 26 | 15 | 4 | 5 | 1 | 12 | 4 | 3 | 2 | - | **72** | **31** |
| Paddy | 10 | - | - | - | - | - | - | 2 | - | - | **12** | **5** |

**1st rank = Most important, ................ 5th rank = less important**

Source: Field survey data 2004

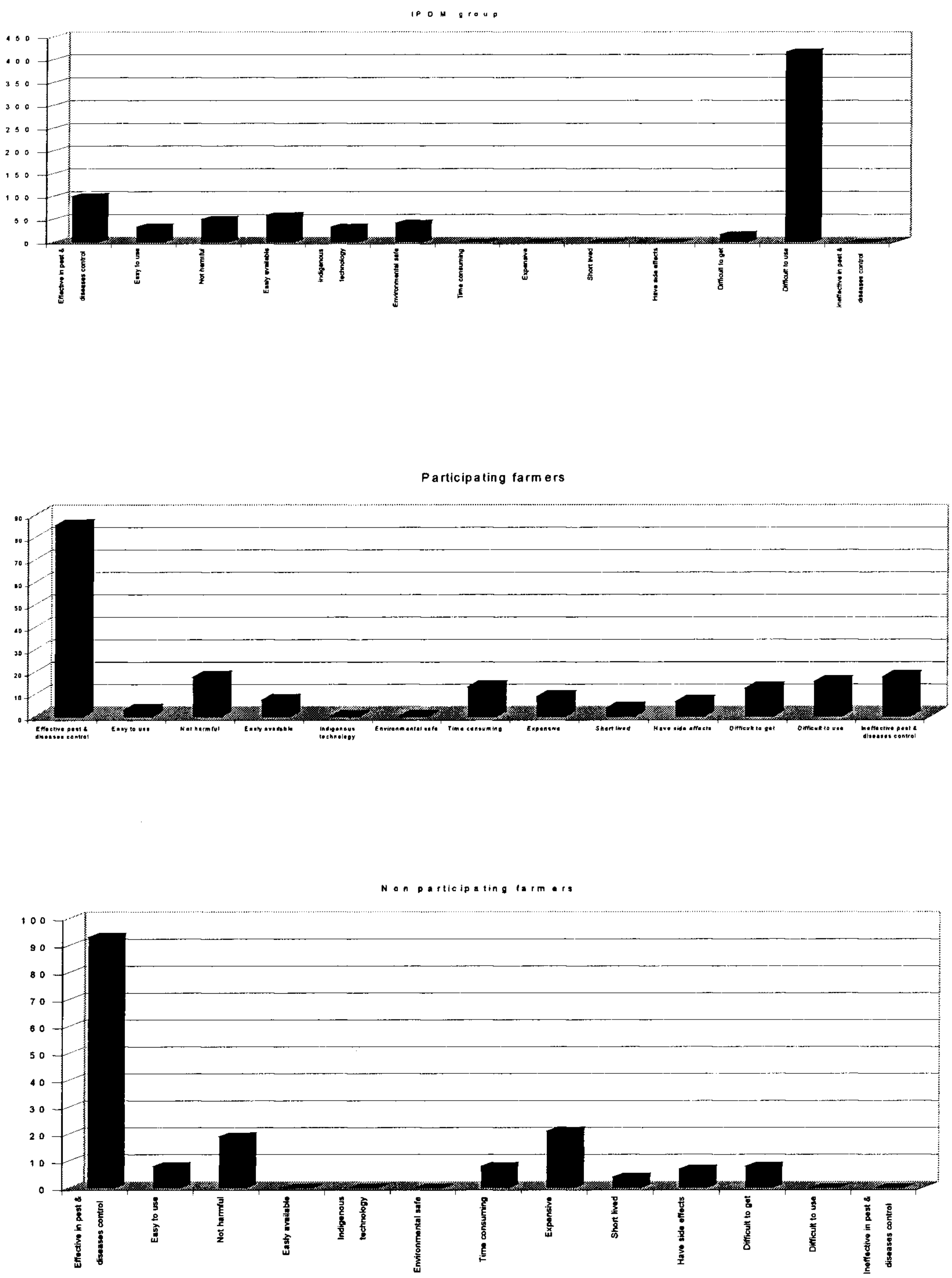
## 4.3 Perception of stakeholders on the effectiveness of IPDM technologies

Farmers may adopt some of technologies and ignore others depending on various factors. Farmers' perception is one of the most important factors that influence farmers to adopt or reject specific types of technologies. Positive perceptions toward technologies not only influence farmers to adopt the technologies but also it empowers them to share and disseminate information. Marsh and Pannell (2002) observed that the adoption of conservation technologies largely depended on whether farmers perceived them to be profitable over the long run. Limbu (1999) also observed that, the economic benefit of agricultural technologies was one of the major factors that influenced adoption of the technologies. He further noted that, adoption of agriculture technologies can be difficult to end users, because they perceive some negative implications including economic risks, contradiction to local culture or constrained by inadequate accompanying economic policies.

### 4.3.1 Reasons for adoption

In Hai district, farmers adopted different technologies because they perceive them to be effective, available, easy to use, low cost, not harmful to themselves and the environment and they have knowledge on their use. Figure 4.1 shows the perception of Hai district farmers on the effectiveness of IPDM technologies in the management of bean insect pests and diseases.

Figure 4.1. Farmers' perception of the effectiveness of bean IPDM technologies in Hai district



The data shows positive and negative perceptions from farmers on the effectiveness of the IPDM technologies. The three groups (participating farmers, non-participating farmers and group discussion) mentioned effectiveness as the leading and important factor of the IPDM technologies. This was followed by cost effectively, availability and safety. The surveys also showed that farmers perceive different technologies such as botanicals, farm products (e.g. cow urine) and synthetic pesticides to be most effective in reducing bean pest and disease incidences. Other cultural practices technologies such as post harvest tillage, crop rotation, timely planting, use of improved clean seed, weeding, etc. were also noted by farmers to be useful. Although farmers explained the cost and availability of the technologies to be the main factor for adoption, this did not apply to all technologies. A number of farmers complained about the high prices for synthetic pesticides, weeding costs and time spent on the preparation and application of botanical products.

**Table 4:6 Farmers' ranking of reasons for adoption of IPDM technologies.**

| **Reason for Adoption** | **Ranking** | | | | | | |
|---|---|---|---|---|---|---|---|
| | **1st** | **2nd** | **3rd** | **4th** | **5th** | **Total** | **Percentages (%)** |
| Effectiveness of IPDM in pest control. | 67 | 17 | 7 | 1 | 1 | **93** | **67** |
| Availability of the technology/ easy to get | 4 | 13 | 10 | 1 | 1 | **29** | **21** |
| Low cost/ cost effectively | 19 | 28 | 12 | 1 | 1 | **71** | **51** |
| Easy to use and maintain | 0 | 7 | 3 | 0 | 0 | **10** | **7** |
| Safety (Not harmful) | 15 | 30 | 9 | 2 | 0 | **56** | **40** |
| Knowledge of the technologies | 28 | 34 | 3 | 4 | 0 | **69** | **50** |
| ****1st =rank most important, ……. …, 5th rank = less important** | | | | | | | |

Source: Field data 2004

Most farmers (67%) ranked the effectiveness of the technologies to be the main factor that contributed to the adoption of the different technology options. Low costs (51%) and traditional knowledge about the technology (50%) were both ranked seconds. Surveyed farmers viewed chemical fertilizers and pesticides to be the most effective technologies in pest and disease management. A large number of farmers confirmed that they were using commercial chemical fertilizers and pesticides because of their effectiveness. Furthermore, farmers in the area ranked costs of the technologies to be the second factor for the adoption. Farmers explained this by describing two main costs associated with the technologies: "monetary cost" and "time cost". Monetary cost is the cost in terms of money and time cost can be defined as the total time spent by the farmer to prepare or to use a specific technology. It was observed in the present study that farmers sometimes reject technology options because of the cost either in terms of money or time. Farmers mentioned the use of commercial fertilizers and chemical pesticides as examples of the technologies that cost more money but require less time to apply.

Although commercial chemical pesticides and fertilisers were mentioned by farmers as the most effective technology options, Figure 4.2. show that a large proportion of farmers opted to use botanicals and other farm products, indicating that there are other factors that contribute to the selection of the technologies besides effectiveness and/or cost. The source of the technologies, experience in use and availability are among the other factors that were mentioned by the farmers.

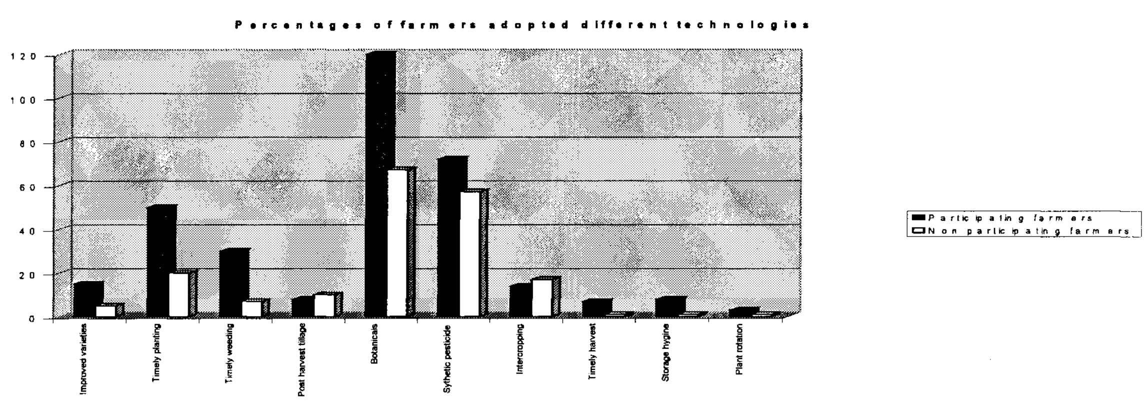
### 4.3.2 Adoption rate

Farmers mentioned different IPDM technologies like planting time, timely weeding, post harvest tillage, use of improved varieties, etc. as some of the strategies for bean pests and disease management.

Figure 4.2 Shows the number of project participating and non participating farmer adopters of different IPDM technologies.

Other stakeholders, policy makers, religious leaders and representatives from other NGOs argued that, IPDM technologies are most appropriate for bean farmers in the area based on the fact that they provide an opportunity and empower farmers to choose the technologies since farmers differ in terms of wealth, gender, education levels, etc. Furthermore, these technologies help the farmer to select the accessible, available and affordable technologies depending on the time and location where farmers need to use them.

Figure 4.2. Adoption of bean IPDM technologies by participating and non participating farmers in Hai district



The above data shows that, botanicals (including crude extracts from plants with pesticidal properties and other farm products such as cow urine, wood ashes, etc.) are the leading technologies adopted by a large proportion of participating and non-participating farmers in the study area. Use of commercial chemical fertilisers and pesticides was the second option in crop management. Crop rotation, timely harvesting and storage hygiene are the technologies that were adopted by few farmers.

The low rate of adoption of crop rotation option is associated with the existing land shortage problem. Farmers complained about the problem of land shortage so it is difficult to practise crop rotation that needs a large space.

It was observed in this study that farmers are taking serious control measures to address specific constraints when they arise rather than prevent them before happened. Poverty and the level of education are the main reasons for some farmers opting for curative rather than preventive measures in addressing farm production constraints. In most cases this is based on the assumption that the problem may not occur or if they occur they may not be serious.

### 4.3.3 Modifications effected on the IPDM technologies by farmers

A substantial number of farmers that were interviewed during the surveys indicated that they had modified the IPDM technologies after testing (participating farmers) or observing (non participating farmers) them at the demonstration fields during farmer meetings and training sessions. About 12% (28 farmers) of the total farmers interviewed modified the technologies and in this case 43% of them did some modifications to make the technologies more effective and 25% did it to suit their environment/needs. Farmers argued that they make different modifications on the technologies such as adding new things, quantity change and integrating different technologies to make them more effective or to suit their environment. The data shows that participating farmers have a greater percentage 16% of farmers who modified the technologies compared to non participating farmers (only 6% of them modified the technologies). The ability to modify technologies can be attributed to the level of understanding and experience. Participating farmers had more opportunities to access new information, participate in training sessions and meeting different stakeholders and other farmers compared to non participating farmers. This was possible because participating farmers work in groups that are clearly known by different community members and leaders, research institutions, policy makers, traders and NGOs. Such exposure enabled participating farmers to interact, learn and exchange ideas and experiences that empowered them to analyze different situations and develop solutions to various constraints including technological problems. Furthermore, the data shows that education level is an important factor in enabling farmers to modify technologies. The percentage of farmers who modified the technologies was directly related to the level of education (Table 4.7).

Table 4:7 Modification of IPDM technologies by farmers in Hai district

| **Education levels** | **Number of total respondents** | **Number of farmers who modified IPDM technologies** | **Percentages** |
|---|---|---|---|
| No formal school education | 12 | 0 | 0 |
| Primary education | 189 | 22 | 12 |
| O' level secondary education | 30 | 4 | 13 |
| A' level secondary education | 4 | 1 | 25 |
| Diploma level | 1 | 1 | 100 |
| | | | |

Source: Field survey data 2004

### 4.4.The effectiveness of IPDM groups in the dissemination of the information on the technologies

The project focuses on the improvement of livelihood of the households through the provision of the wide IPDM option to deal with bean pest and diseases in the community. A participatory analysis of the problem of bean pest and diseases was the entry point for the emergence and development of the IPDM project. Farmers, NGOs', research institutions, DALDOs office, political and religion leaders actively participate in the planning and implementation processes. The stakeholders meeting propose the uses of group's technique for learning and dissemination of the IPDM technologies. Achieving success in this project, the stakeholders believe that local farmers' groups have to be well-organized and linked with other farmers, local government, DALDOs office, research institutions and NGOs' operating in the community. . A number of farmer groups have been formed in different village since 1998 for the purpose. In many cases, local farmers' groups are not well organized, in spite of their high potential. Briefing and training of farmer groups is therefore a priority to support the promotion of the IPDM technologies. The table below presents the number of village, groups, demonstration plots and farmers who actively participate in doing trials of IPDM technologies.

**Table 4.8. Groups and villages adopted and disseminate the technologies**

| Year | Number of village | Number of groups | Number of demonstration plots | Number of participating farmers |
|---|---|---|---|---|
| 1997 | 0 | 0 | - | - |
| 1998 | 1 | 1 | 3 | 14 |
| 1999 | 3 | 6 | 8 | 86 |
| 2000 | 5 | 10 | 17 | 278 |
| 2001 | 13 | 22 | 27 | 1,786 |
| 2002 | 26 | 48 | 54 | 2,116 |
| 2003 | 36 | 56 | 86 | 3,518 |
| 2004 | 52 | 77 | 102 | 5,500 |

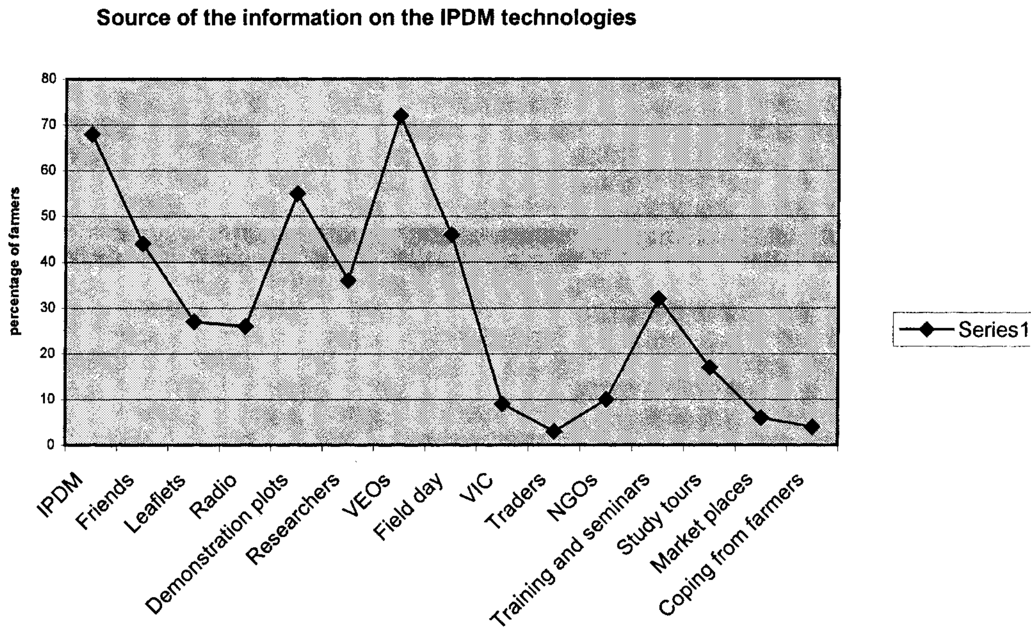
Source: District agriculture and livestock development office (DALDO)- Hai district, 2004

The data shows that, in the year 1997 there was no any group existing in the community. The first group started in year 1998 (one group only) and increased from 1 to 77 within seven years (from 1998 –2004). About 5,550 farmers joined IPDM group to try different IPDM technologies like botanical pesticide, timely weeding, timely harvesting, proper storage, industrial pesticide and intercropping. About 102-demonstration plot were started by 2004.

### 4.4.1 Source of the information of technologies

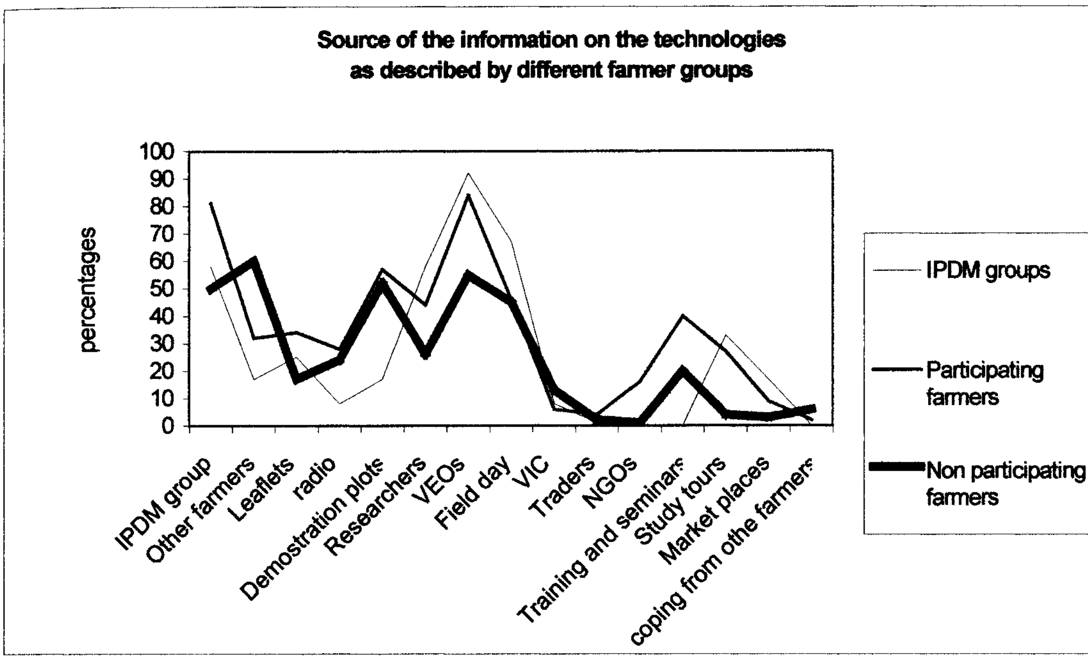
The study recognised that, every IPDM group member is aware and practices a number of IPDM technologies. The source of information on the technologies differ between groups although most of the groups claimed to get the information from VEOs', researchers from different institutions, field day conducted by other IPDM groups, attending different seminars and VICs. The chart below describes sources of information on the IPDM technologies as explained by farmers interviewed during the study.

Figure 4.3. Source of the information for the technologies




The chart above shows that 72% of farmers interviewed mentioned village extension officers to be their sources of information on the technologies followed by 68% IPDM groups 55% demonstration plots and 46% field days. The study observed that, about 96% of village interviewed have access to village extension officers (VEOs') who are working and living in the villages to support farmers at the village level. VEOs' tend to work with different groups operating in the district because it is very easy to access a big number of farmers by using groups. To facilitate the dissemination of the technologies in and outside of the community the stakeholders (farmers, IPDM project, DALDOs office, donor etc) recognise the importance of training and empowering a number of village extension officers to facilitate the dissemination of the technologies and to make the project sustainable. CIAT in collaboration with DALDO's office has been organising different seminars and studies tours and facilitate Village extension officer and IPDM group in the dissemination of the technologies. The study observed that about 97% of the village extension officers are living in the district and engage in agriculture activities. Empowering village extension officer though training and seminars is like empowering any community members who has knowledge and experiences on the problem facing farmers in the area. Village extension officers and farmer groups establish demonstration plots as sites for learning where by farmers from within and outside the community invited to share experiences on the technologies. This is the simplest way mentioned by both farmers and village extension officers in the district because it takes short time to transmit the technologies and sharing experiences from different farmers. Although village extension officers mentioned by the biggest percentage of farmers interviewed, the sources of information differs between categories of farmers as described in the chart below:

Figure 4.4. Source of the information for the technologies among different farmer groups




The data shows that, while 84% of Participating farmers ranked VEO's to be their sources of the information, followed by 81% IPDM group members and 57% demonstration plots, 60% of non-participating farmers interviewed mentioned other farmers to be their source of information followed by VEO's 55% and demonstration plots 52%. The focus group discussions shows that 92% of the IPDM groups interviewed got the information from VEO's followed by field day conducted in different villages 67% and IPDM group member 58%. The data reviled that, IPDM group members are the main source of the information for non participating farmers living in the community. This is because, IPDM group members are living in the community and practice their agriculture activities in the same community where it is very easy for non participating farmers to see, learn and copy what Participating farmers do. Further to this, non participating farmers tend to go and ask for agriculture advice from IPDM group members because IPDM group members are perceived to have more knowledge on dealing with agriculture problems. Discussion with some of the farmer groups reveals that, farmers' views IPDM group to be the center of information on the technologies. Some farmers don't like to join or form the groups but they tend to go and ask for advice from IPDM group members when they face agriculture problems such as bean pest and diseases. The table below shows the number of both participating and non-participating farmers who asked for agriculture advice by other farmers in the community.

**Table 4.9 Participating farmers asked for advises by other farmers**

| **Category of farmers** | **Farmers asked for agriculture advises** | |
|---|---|---|
| | Total number | Percentages |
| Participating farmers (136) | 115 | 85% |
| Non- participating farmers (100) | 24 | 24% |

Source: Field data 2005

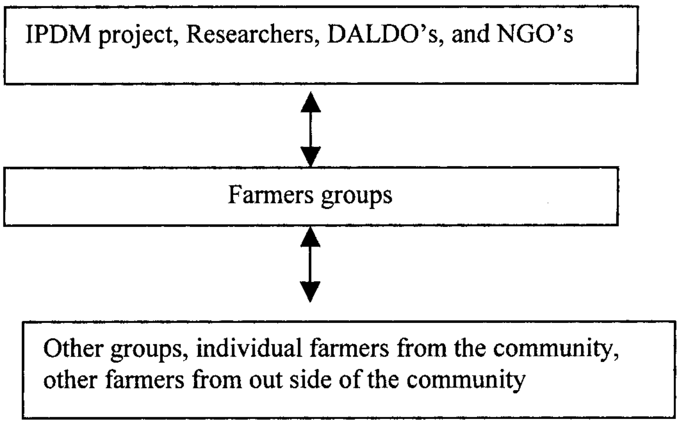
While a total of 115 (85%) of participating farmers interviewed asked for agriculture advises, 24 (24%) of non participating farmers asked for advises by other farmers. According to the discussion with different farmers, farmers are normally asking for advice from other farmers when facing agriculture problems and they prefer to ask for advice from the person whom they believe that he/she has knowledge on the problem.

The data reveal that, farmers in the community views IPDM group member as the farmers who have more knowledge and abilities on dealing with agriculture problems.

### 4.4.2. Dissemination of the IPDM technologies

Participation of the local community i.e farmers, farmer groups, DALDO's office and IPDM project is essential for the dissemination of the IPDM technologies in the community. Strong commitments by government, CIAT and farmer groups promote the participation of farmers from within and outside of the district to learn and adopt the technologies. It is observed that, farmers, farmers groups, village extension officers, religion leaders, political leaders, CIAT, DALDO,s office, etc participate in the dissemination of the IPDM technologies to other farmers. The data shows that 83% of group and 79% of the farmers interviewed participate in the dissemination of the information of the IPDM technologies by using different methods that facilitate the flow of the information on the technologies. There are different ways used by stakeholders to facilitate the flow of information on the technologies as described below;

Figure 4.5. **Information flow of IPDM technologies**



The data show that IPDM project collaborate with DALDO's, researcher and NGO's operating in the district to facilitate the flow of information via IPDM groups to other farmers in the district. The study observed a number of leaflets, field day ceremonies, VICs', and demonstration plots facilitated by the IPDM project in collaboration with DALDO's, other researchers and NGOs to strengthening the good flow of the technologies in the community.

However, several NGOs, IPDM project and DALDOs offices are currently engage in promoting improved flow of information on the IPDM technologies in the community. According to survey results, IPDM groups and IPDM group members are fully participating in the transmission of the information on the technologies to other farmers by using different ways that facilitate the information flow.

One member of the Kiengia group said, "Since every farmer likes to have better life, the simplest way we do is to have demonstration plots along the road where by every person passes and see whatever we do. Normally, these plots differ from other plots, by seeing; people can predict the best production from the plots. This makes other people to seek for the technologies".

With the increase of the knowledge of IPDM group members on the wide range of the IPDM technologies, IPDM group members use different technique to disseminate the information on the technologies. The data shows that there are two main approach used by these farmers. The first approach is the one called group approach were group members organizes field day, demonstration plots, attending village meetings to disseminate the information. Individual approach is the one that individual farmers talk to other farmers or demonstrates on their plots different options of the technologies. The table below present different techniques used by IPDM groups and group members to disseminate the information on the technologies.

**Table 4. 10. Dissemination of IPDM technologies**

| Means of dissemination | IPDM groups | | Participating farmers | |
|---|---|---|---|---|
| | Number | Percentage * | Number | Percentage** |
| Demonstration plots | 7 | 58% | 124 | 92% |
| Field day | 4 | 33% | - | - |
| Radio | 2 | 17% | - | - |
| Markets | 1 | 8% | - | - |
| Religion places | 3 | 25% | - | - |
| Village meetings | 4 | 33% | - | - |
| Talk to other farmers | 9 | 75% | 118 | 87% |
| Leaflets | - | - | 3 | 2% |

* Percentage of groups interviewed (12 groups) * *Percentage of participating farmers interviewed (136 farmers)

Source: Field data 2005.

Moreover the IPDM groups with the support from DALDO office, research Institutions and NGOs operating in the district organize field day where by IPDM group gets chance to show and explain about the technologies. Farmers from different villages, districts and regions, researchers, NGOs, political, government, religion leaders and the community at large invited to attend the day.

The groups mention other dissemination methods such as advertising in mosque/churches, talk to neighbours talk to relatives from within and outside the village, radio interview and attending nane nane (nation farmers' day). As the result of these efforts, the focus group discussion estimated the number of farmers who know and apply some of the IPDM technologies ranging from 40% to 80%. According to the data this range relate to the year that the IPDM technologies facilitated in the village. In the villages where there are the groups started in the first generation the percentage is high and the percentage is relative low for the villages of the third generation groups.

### 4.4.3. Means of the dissemination of the technologies

Dissemination of the technologies is the process that requires a certain level of understanding and technique that could be accepted by both parts (the provider and receiver of the information). The data shows that 114 (84%) which compose 54(40%) men and women 60 (44%) of participating farmers interviewed use different means to disseminate the information on the technologies in the community as shown in the table below;

**Table 4.11. Means of disseminating the technologies**

| Means of dissemination | Male (n=54) | Female (n=60) | Total farmers (n=114) |
|---|---|---|---|
| Demonstrate on my own/group plot | 42(78%) | 38 (63%) | 80 (70%) |
| Talk to other farmers | 27(50%) | 38(63%) | 65 (57%) |
| Leaflets | 10(18%) | 3(5%) | 13 (11%) |

Source: Field data 2004

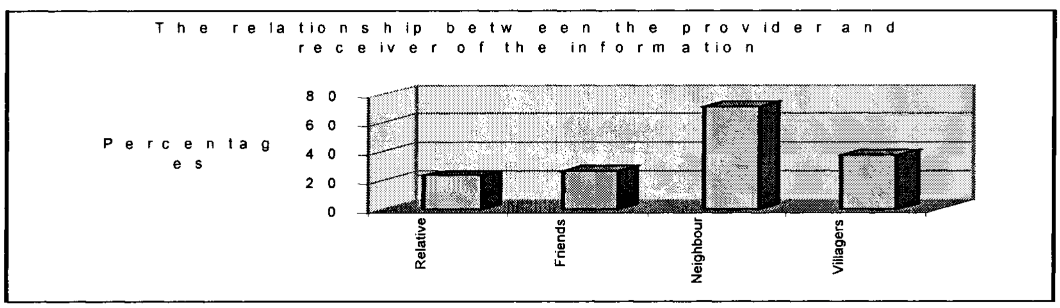
The table above shows that about 70% of the participating farmers interviewed use demonstration plot to disseminate the information. Here farmers mentioned that they some times demonstrate the technologies at their own farms or at the group demonstration plots. 57% meet with other farmers and discuss about the technologies. Mostly this happen when farmers experience agricultural problems and seek for advice's from the participating farmers. 11% mentioned leaflets as their dissemination channel. The data reveals that, the large percentage of farmers prefer the system of learning by seeing and not reading. This can be contributed by the fact that, by seeing farmers can understand and it is will be not easy to forget the process. Lack of materials for reading and poor conditions of the VIC can be the causes for few farmers (10%) to select leaflets as the means of dissemination of the information.

Further to this the data shows that there are differences between men and women in the selecting means of dissemination of the information. The data shows that, while 78% of the male farmers who disseminate the information use demonstration plot, 50% meet and talk to other farmers and 18% use leaflet, 63% of the female farmers use demonstration plots, 63% meet and talk to other farmers and only 5% use leaflets. The significant different between men and women in the dissemination of the information of technologies to other farmers influenced by the culture of the community. Men are the one who has the autonomy over the land so it is easy for them to invite other farmers in the field. This is different to women who are some times had to ask for the permissions from their husband. This can contribute to the higher percentage of men to use demonstration plots for dissemination of the information than women. The good relationship among women contributes to the large percentage of women to have chances discussing their social and economic issues. The study observed that women tend to women to seek for either advises or material assistance like asking for salt, matchbox etc. This provides a room for them to discuss their matters.

**4.4.4. The relationship between the provider and receiver of the information**

Relationship among farmers is very important factor for dissemination process. Based on the frequency of responses, dissemination flow starting from neighbours, villagers, relatives and friends. Normally farmers are disseminating the information to the person that they know. This is because through social interaction farmers can be able to talk or ask about different technologies to control pest and diseases.

Figure 4.6. **The relationship between a providers and receiver of the information**




Source: field survey data 2004

The majority of respondents (71%) disseminate the information to their neighbours. Followed by 37% who disseminate the information to other villagers and 26% and 23% who disseminated the information to their friends and relatives respectively. The study reveals that, relationship and distance between farmers playing the important role in the dissemination process.

**Table 4.13. The relationship and distance between the provider and receiver of the information**

| Relationship | Distance | | | |
|---|---|---|---|---|
| | Closely to my home | Same village | Same district | Other district within the region |
| Relative | 28 | 22 | 10 | 1 |
| Friend | 33 | 29 | 9 | 1 |
| Neighbour | 84 | 51 | 13 | 0 |
| Villager | 43 | 49 | 12 | 1 |

Source: field data 2004

The study observed that, there are two types of neighbours mentioned by the respondents, neighbours at home place neighbours at field place. The data shows that 84 farmers disseminated the information to their neighbours at their home place and 51 farmers disseminate at their field place but living in the same village and 13 farmers are neighbours at field place but living in other villages in the district. The study observed that, some farmers are living very far from their field place and employ labours to support their farming activities, this limit the owners to communicate and discuss their agriculture problems. Daily meeting between farmers provides a room for them to discuss different issues including bean pest and diseases.

### 4.4.5. Dissemination of the information by gender

While a total of 27% (11% men and 16% women) of participating farmers disseminated the information to more that 20 farmers each, 11% of women and 4% of men did not disseminate the information (table 4.13). Based on response frequency, both men and women participate in the dissemination of the technologies. The variation on the percentage of women and men farmers who not participate in the dissemination of the technologies can likely contributed by the African culture that socialize women to stay and work at home place.

Table 4.13 Men and women disseminates the information of the technologies

| **Number of farmers contacted** | **Number of farmers disseminated the information** | | | | **Total** |
|---|---|---|---|---|---|
| | Men | | Women | | |
| | Frequency | percent | Frequency | percent | |
| None | 5 | 4% | 15 | 11% | 20 (15%) |
| 1-5 | 2 | 1% | 12 | 9% | 14(10%) |
| 6-10 | 11 | 8% | 13 | 10% | 24(18%) |
| 11-15 | 6 | 4% | 3 | 3% | 9(7%) |
| 16-20 | 6 | 4% | 4 | 3% | 10(7%) |
| >20 | 15 | 11% | 22 | 16% | 37(27%) |
| Don't know | 16 | 12% | 6 | 4% | 22(16) |
| Total | 61 | 44% | 75 | 56% | 136(100) |

Source; field survey 2004

### 4.4.6. Strength, Weaknesses, Opportunities and Threats of IPDM groups in the dissemination of the information

Although the IPDM groups considered as the major tool for dissemination of the information on the technologies in the community, the study recognized that, the groups faced with some strength, weaknesses, opportunities and threats in the dissemination process. A SWOT analysis carried out with the participation of farmers groups in the community is summarized below;

**Strength;**

- Good leadership strengthening the group that led to group development
- Good cooperation's among group members' influence the good flow of the information on the technologies to group members and the community at large.
- Members are actively participating in planing, implementation and monitoring of the group activities.
- Improved knowledge on the IPDM technologies among group members makes them able and more confident in providing information on the technologies to other farmers.
- The stability and development of the group influence the formation of other groups
- Participatory learning by group farmers irrespective of sex and age, and empowerment of the rural poor.

**Weaknesses**

- Poor organizational capacity among rural farmers due to pre-existing personal disputes and lack of capable group leaders to facilitate group activities
- Land shortage among the group members limit farmers to carry out trials
- Lack of commitment among group members limits the group to implement some of the group activities that facilitate dissemination of the technologies in the community.
- Lack of capital limit the ability of group to buy agriculture inputs, carrying agriculture duties

**Opportunities**

- Availability of NGOs' that provide training loans and advises on agriculture issues builds the capacity of farmer groups on dealing with agriculture problems.
- Groups are known and accepted by the community members, local government, NGOs and other stakeholders. This situation helps the groups to get information on the technologies easily and disseminate to other farmers.
- Good cooperations between farmers groups and DALDOs office help them to access different information on the technologies.
- Participatory planing, implementation, monitoring and evaluation of the technologies among the stakeholders help them to learn more about the technologies.

**Threats**

- Poor and unpredictable weather makes difficulties for farmers' groups to practice some of the IPDM technologies.
- High price and lack of the inputs limit farmers groups to practice some of technologies.
- Shortage of credit institutions in the community limits farmer groups and individual farmers to access loan for agriculture activities.
- Donor regulations on the provision of assistance or loan are hindering some farmers to access their services.
- Poor infrastructure and market problems hinder the dissemination process.
- Theft and destruction caused by livestock affect the production

### 4.5. Social economic benefits of IPDM technologies

To assess the social economic benefits of using IPDM technologies on beans in Hai district, the present is study proceeded beyond the direct effect of project products to try to assess the effects of those products on the livelihood of community members at the household level. The study was basically assessing the social and economic benefits of the technologies to the farmers' household.

- Economic and social benefits

Literature suggests that economic benefits of technologies should be assessed by comparing the cost of the technologies and the returns from using them. The cost of technologies includes cost of labour, price charged for the technologies and other costs that emerged as a result of the adoption process. The promotion of IPDM technologies in Hai district was associated with the formation of research groups and it involved stakeholders' participation in analysing the problems, training on pest management, planning, implementation, monitoring, evaluation and dissemination of the technologies. Based on this, the analysis of the social economic benefits of the IPDM technologies include an analysis of the benefits resulting from the formation of the IPDM research groups and the participation of stakeholders in the promotion of the technologies.

- Technology cost

This is the most important factor that influences small holder farmers to adopt or reject the technologies. The study observed that, due to the implementation of some of the

Structural Adjustment Programs (SAPs) conditions that require the government to reduce its expenditure by removing subsidies on farm inputs, the price of farm inputs have increaised to very high levels. These high prices for farm inputs have made small holder farmers to reject some of the technologies that they were unable to afford. Furthermore the cost of labour an important factor that farmers take into consideration before adopting or rejecting new technologies. The cost of labour is assessed by investigating its percentage in the total production cost. The present study observed that the high labour costs for non commercial -chemicals technologies (pesticides and fertilizers) needs a close follow up. The preparation and application costs for most botanicals was mentioned by a number of farmers as one of the set backs in the adoption process. According to discussions with farmers, IPDM technologies are labour intensive. The study recognised that, the low income and poverty among small holder farmers in the community, has contributed to the high proportion of farmers who adopted the IPDM technologies to address bean insect pests and diseases because they can afford to supply their labour power.

- Productivity and income

The productivity and income generated though the use of the technologies is assessed by comparing situation before and after adoption. This was not captured in the study because most farmers had stopped growing beans for some years due to insect pests, diseases and other constraints in the community. To capture the productivity of the IPDM technologies farmers' compare the yield obtained by adopters and non-adopters. The discussions with participating farmers revealed that, adopters harvest about four to five times more than non-adopters from the same piece of land. Up to 91% of interviewed farmers considered IPDM technologies as advantageous and mentioned a number of advantages that they gained from using the technologies. The remaining 9% of the farmers were not unable to talk about advantages because they were from newly formed groups that had just started to practice with the IPDM technologies in the current season

4.5.1. Increase in production (Food security and household income)

Increased production is the major and important advantage mentioned by 86% of surveyed farmers (Table 4.14). The increase in bean production led to the improved food security and increased cash income among farmers in the community. The study observed that, beans are among the crops that have a better price and better market opportunities compared to the other crops produced in the district. The increases in the production of beans have a direct effect to the smallholder bean farmers in the community.

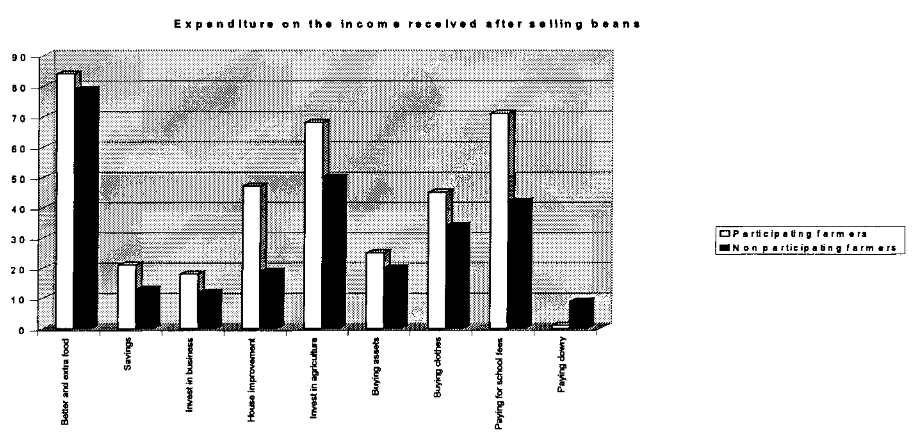
**Table 4.14 Advantages of using IPDM technologies**

| Advantages | Frequency | Percentages |
|---|---|---|
| Increase in production | 209 | 86% |
| Safe to use | 43 | 18% |
| Relative cheap | 41 | 17% |
| Easy to use | 12 | 5% |
| Easy to get | 10 | 4% |

Source: Field survey data 2004

The survey data showed that there are differences in the expenditure of the income generated from sales of surplus bean grain between participating and non-participating farmers (Figure 4.7). Some 85% of participating farmers spent their money on buying extra and better food, 72% pay school fees, 68% invest in agriculture and 48% on house improvement. Meanwhile, 80% of non-participating farmers spend their income in buying extra and better food, 50% invest in agriculture, 42% pay school fees and 34% buy clothes.

Figure 4.7 **Expenditure of the income received after selling beans**




The data revealed that, both participating and non-participating farmers understand the importance of having enough and better food for their households. Farmers used their income to buy food to cope up with food shortages that frequently occur in the community due to drought, pests and other constraints. The idea of having extra and better food (food security) has direct and indirect effect on health and behaviour of the people. Food insecurity contributes to the household and community poverty because it limits personal thinking, productivity and become the source of conflicts among people/ communities.

While the participating farmers mentioned paying school fees as their second area for spending their income from beans, non-participating farmers mentioned investing back in agriculture. This difference could be due to the fact that participating farmers spend most of their time to practice a number of IPDM options in addressing agriculture problems, whereas non participating farmers do not spend enough time on their fields to concentrate on solving some of the agriculture problems. By not doing so, non-participating farmers have to use more money to address agriculture problems.

4.5.2. Safety in using the IPDM technologies

Table 4.14 shows that 18% of surveyed farmers viewed IPDM technologies are good for human health and environment friendly.

The study observed that, before the introduction of the IPDM project in the community, farmers were aware and practicing some of the IPDM technologies to address different agriculture problems. Some community members considered these technologies as an inferior way of addressing the problems and opted to adopt chemical fertilizes and pesticides. The adoption of chemical fertilizers and pesticide was based on the fact that they were available, easy to use and they worked more quickly in the control of insect pests and diseases compared to some of the IPDM technologies. Recently, a substantial number of farmers have become aware of the very serious negative effects of chemical pesticides and have learned to use chemical fertilisers and pesticides more judiciously by adopting the IPDM practice. Farmers in the district viewed that, most of them would like to reduce the use of conventional chemicals because because of the negative effects associated misuse and results in the destruction of the environment and human health.

4.5.3 Community participation through the formation of IPDM research groups

The community approach adopted by the project has facilitated closer links between local government, NGOs, other institutions and farmer groups. The process has empowered farmers and restored their confidence in traditional technology application. This has enabled farmers to initiate community development projects. With the support from various institutions including NGOs, the private sector and the government, farmers have organized themselves into groups and these groups have united to form and manage a community based organization in the district – the Union of development groups in Hai district (MUVIMAHA – Muungano wa vikundi vya maendeleo wilaya ya Hai).. MUVIMAHA has enabled farmer group members to access loans by offering collective guarantees and security.

The formation of IPDM groups enhanced linkage among the stakeholders. Based on survey findings, farmers were encouraged to form common interest groups based on the social dynamics to meet and share needs or resolve common problems. Farmers have been empowered to form different groups based on common needs for example, several groups are based on income generating activities, others on savings and credits, some are health groups, etc.

Table 4.15. Advantages of joining IPDM groups

| Advantages | Frequency | Percentages |
|---|---|---|
| Agriculture training | 104 | 76% |
| Loan and assistance | 27 | 19% |
| Known and recognized by other stakeholders | 16 | 11% |
| Social relation | 16 | 11% |

### 4.5.4. Community empowerment

Most of the activities for the promotion of IPDM technologies can be regarded to have contributed local community empowerement. The participation of small holder farmers and women in problem identification, training, planning, implementation of demonstrations, monitoring, evaluation and dissemination of the technologies has influenced and increased the capacity of farmers in understanding and addressing agriculture problems in general and bean insect pests and diseases in particular. Farmers are now able to form their own groups and search for their own solutions to address their problems. According to the MUVIMAHA leaders, there are 260 registered farmer groups in the district. The formation of these groups is one of the efforts of farmer members to address their problems of capital, market, improved crop varieties and animal breeds, other farm inputs, health and education problems, etc.

### 4.5.5. Changes in knowledge and skills of farmers

The participation of farmers in need assessment, planning, implementation, monitoring, evaluation and dissemination of technologies, capacity building through training seminars and workshops, demonstrations, field days, exchange visits, etc., all have strengthened farmers in identifying and solving various problems in their community environment. Farmer field days, exchange visits and training workshops were particularly effective in disseminating technologies. Modification and application of the technologies beyond the lvel that farmers had learnt in the groups is another indication of the improvement in farmers' skills. Farmers reported that, apart from using the IPDM technologies in the management of bean insect pests and diseases, they also use the technologies in other crops (e.g. tomato, coffee, banana, vegetables, etc.), animal and human health problems. Up to 82% of the vegetable farmers surveyed in the present study use IPDM options in the management of insect pests, diseases and soil fertility problems. These farmers believe that, it is safe to use IPDM technologies because vegetables are short duration crops and therefore, using industrial chemical fertilizers and pesticides could have residues that are harmful to humans and the environment.

### 4.5.6. The status of women

The participation of women in activities on the promotion of IPDM technologies including training sessions, on- farm trials, visits, etc. has helped them gain recognition and publicity from other women and men farmers and other stakeholders from within and outside the community. Participating women's confidence and capacity has improved substantially in all groups. The study revealed that a number of women farmers were holding leading positions in different groups and women farmers selected to attend training sessions and seminars to improve the performance of their groups and the community at large (Table 4.16). Leadership in the research groups has helped women to have confidence in discussing different issues especially those on household and community development.

**Table 4.16. Group membership by gender and their positions**

| | Positions in the groups | | | |
|---|---|---|---|---|
| | Members only | Group leader | Group Adviser | |
| Male | 36 | 24 (15%) | 1 | 61 |
| Female | 54 | 20 (18%) | 1 | 75 |
| Total | 90 | 44 (32%) | 2 | 136 |

The data shows that there is no significant difference between men and women farmers holding leading position in the groups. This situation allows for a balanced representation and participation of women in the planning and decision making at the group and community levels.

# Chapter Five

## 5.0 Conclusions and recommendations

### General conclusion

The number of farmers using IPDM technologies in Hai district more than doubled between the end of October 2002 and January 2004. The IPDM information has reached most farmers in bean and other crop growing areas in project pilot sites (Hai, Lushoto, Mbeya, Arumeru, Babati, Iringa, Chunya, Njombe, Mufindi, Moshi, Rombo and Mbozi districts) in Tanzania due to cross village and cross site visits, newsletters, TV captions, radio and printed promotional materials. Other farmers from non- participating districts in northern Tanzania and students from Sokoine University of Agriculture have exchanged information and shared experiences with participating farmers in Hai and Lushoto districts.

A few farmers have established small seed multiplication plots for the insect pest and disease resistant/tolerant and high yielding bean genotypes. Other farmer groups have experimented with botanicals as sources of pesticides for pests on beans and other crops, and superimposed soil nutrient management strategies such as animal and green manure to improve fertility for beans, maize, vegetables, coffee and other crops. Policy makers (government and political leaders) have participated in project activities and assisted with the promotion of project initiatives to cover other production systems including livestock, soil, water and environmental conservation. The Hai district council sponsored participating farmers to go on radio and air messages on IPM strategies for different audiences.

Rural farmers in Hai district participated in all project processes.. Community members formed different groups, village and ward leaders, agriculture extension employees, researchers, local government and different NGOs (World Vision, Adventist Development and Relief Agency-ADRA, TechnoServe, etc.) worked together to facilitate and motivate the changes in the community. Although the project seems to deal with the bean production losses caused by pests (insects, diseases, weeds, low soil fertility, etc.), the outcome has been the improvement of the standard of living of the rural people by increased household food production and income in a sustainable manner.

The following conclusions are based on the research findings:

- Common beans are the second most important food and cash crop after maize in Hai district, northern Tanzania.

- Insect pests and diseases are among the major production constraints that limit increased bean production by smallholders farmers in the community. Other constraints include unreliable weather conditions, land shortage, degraded soils, lack of farm inputs, high prices for farm inputs, use of unimproved technologies, poor access to information on markets, lack of capital and credit institutions, etc.

- Farmers have been using different traditional and improved technologies such as wood ash, cow urine, botanicals, commercial chemical pesticides, organic and inorganic fertilisers and other cultural practices to control pests and amend the soils.

- A high percentage of the bean IPDM project participating and non participating farmers have adopted the different IPDM options that they tested and verified to be effect in bean pest management. These options are also easy to use, environmentally safe and sustainable. The options combine indigenous and improved technologies. A few farmers rejected some of the IPDM technology options because they are time consuming, short lived, others have side effects, etc.

- Village extension officers (VEOs) and IPDM group members are the main sources of information on the IPDM technologies in the community. Other sources are training seminars and workshops, demonstration plots and field days, exchange visits and promotional materials (leaflets, posters, VICs, etc.), etc. Seventy two percent and 68% of the farmers interviewed obtained information on the technologies from VEOs and IPDM group members, respectively.

- IPDM groups reported good leadership, cooperation among group members and, farmers' participation as the major strengths of the IPDM groups in the dissemination of IPDM technologies. Poor and unpredictable weather conditions, high prices and lack of the inputs, shortage of credit institutions in the community, poor infrastructure and marketing problems were reported to be the main constraints to effective dissemination process.

- Up to 91% of interviewed farmers considered IPDM technologies to be advantageous to farm production. Eighty six percent (86 %) of farmers reported increases in bean and maize production, 18% reported them to be safe and relatively cheap, while 17% reported that they are easy to use.

- According to the survey result, farmers reported social economic benefits of using IPDM technologies that include increases in production that led to increase in household income and food security. The increase in household income has helped farmers to pay children school fees, buy extra and better food, purchase materials for house improvement, purchase better clothing, etc. Other benefits are the reduction of risk on the human health and environment that can be caused by indiscriminate use of chemical fertilizers and pesticides, facilitation of community participation and empowerment especially for the rural women.

The livelihood of the majority of people in Hai district has roots in agriculture. The problems of land shortage, poverty among farmers, infertile soils, insect pests and diseases, and unreliable weather conditions are the major obstacles to improved livelihoods of the rural households in the area. There is increased use of IPDM due to increased magnitude of these constraints (e.g. the increasing poverty, crop and animal diseases and insect pests, high prices of farm inputs and poor soils) that are affecting the social and economic development of the rural community in the district.

**Based on the research findings, analysis and conclusions, the following measures are recommended:**

The performance of IPDM technologies is acceptable and beneficial to the small holder farmers in Hai district community. There is still room to achieve more benefits if other NGOs and institutions will work together to support farmers to find reliable markets for bean and bean products.

Currently farmers prefer to apply traditional (cow urine, wood ash, soap, kerosene, botanicals, timely planting, intercropping, etc.) and improved cultural practices (quality seed, row planting, storage hygiene, etc.) to cope up with the high prices of commercial farm inputs. The limited supply of some of the effective botanicals is crucial for maximising the benefits from the traditional technologies. Sensitising farmers on the establishment of these botanicals and linking them to other projects (e.g. soil conservation, tree planting, livestock husbandry, etc.) that facilitate the increase of botanicals and soil conservation practices will benefit farmers and improve the environment in the community.

Additional and new promotional materials (leaflets, posters, reports, quality seed, small ferlitizer packaging, etc.) are required to enable the IPDM groups to successfully continue to disseminate the technologies to other farmers. This will enhance the stocking of the village information centres and help to reach more farmers within and outside of the district.

Currently, farmers perceive IPDM practice as an effective measure in the control of bean insect pests and diseases. The opportunities for expanding the utilisation of these technologies in other crops like maize, coffee, bananas, vegetables, etc. should be exploited and promoted among other farmers in other districts to make them realise the role and importance of using IPDM technologies in the management of insect pests and diseases on other crops for good health and clean environment.

It was observed that a number of NGOs, research institutions and the private sector (such as World Vision Tanzania, ADRA, FAIDA MALI, TechnoServe, SARI, SUA, CIAT, seed companies, etc.) are working in the community to support farmers' efforts in their social- economic development. The sustainability of the different projects that introduced by these NGOs' and institutions depends on the existence of active partners operating in the community. There is a need for these NGOs' and research institutions to communicate and collaborate to enable each of them to understand and participate in support for a holistic community development approach.

The livelihood of the majority of community members in Hai district has roots in agriculture. The major obstacles to improved livelihood of rural households in the area include land shortage, poverty among farmers, infertile land, insect pests and diseases, unpredictable weather conditions, etc. The use of IPDM technologies is increasingly becoming a priority due to increasing poverty, crop and animal diseases and insect pests, high prices of commercial farm inputs and poor soils in the district. Policy makers should strengthen and provide more support to the participatory group approach and use of IPDM technologies for increased social and economic development of the rural community in Hai and other districts.

**Conclusion**

The results of this study indicate that, although there are some limitations in practising, adopting and disseminating the integrated pest and diseases management (IPDM) technologies, these technologies are profitable and acceptable by Hai community members and other stakeholders. This acceptability contributed substantially to the adoption of the participatory approach and processes of all projects activities. Further to this, farmers in Hai district believe that NGOs, researchers, etc. copied what was already discovered and used by their grandparents and relatives many years ago. Botanicals and other products had been used before any professional research was conducted in the community. IPDM is just a name that was introduced to better describe the old farmers' practice because the tools and processes used are the same. To most of the interviewed farmers, IPDM meant the use of botanicals to manage insect pests and diseases in the same way their ancestors trained them. Some farmers continue to emphasize on the contribution of botanicals to the definition of their present IPDM practice. When they were asked about the other practices (good seed, timely planting, intercropping, rotation, weed control, etc.), they agreed that they also use them in combination to suitable technologies from the research and extension agents. This helped to restore farmers' confidence that such technologies are not primitive and that scientifically they work well even now. Farmer are proud that they are the initiators and owners of the technologies and not otherwise.

For this reason, I recommend that a stakeholders' workshop be organised allow participants from the surveyed locations to make resolutions for future actions.

# Chapter Six

## 6.0 Implementation of recommendations

### Introduction

Since the IPDM project is participatory in nature, the stakeholders (farmers, extension officers, researchers, NGOs, other service providers, etc.) are the decision-makers of the project. To obtain recommendations for actions, the stakeholders have to discuss the results of the present study. There is therefore, a need to prepare a proposal and workshop guide to help the village extension officers (VEOs) and the other IPDM project stakeholders to organise and conduct such a workshop.

## Proposal for a workshop for IPDM project stakeholders

### Executive Summary

It is increasingly understood that integrated pest and disease management (IPDM) is required, not only to deal with pest and diseases, but also to unlock paths to sustainable development. The study on social and economic benefits of IPDM technologies to bean farming communities conducted in Hai district, northern Tanzania identify that IPDM project is participatory in nature and because of this, the introduction of IPDM technology option facilitate the increase of bean crop production in Hai district. Further to this, the study identifies different problems such lack of capital, poor market lack of farm inputs and higher price of farm inputs that hinders the IPDM adoption and dissemination processes.

Considering the importance of community participation approaches applied in learning, adoption and dissemination of IPDM technologies option for bean crop production, the study identify a need of conducting a workshop for stakeholders. The specific objective of the workshop is to share the information gathered during the study and allow the stakeholders to analyze the existing situation and plan and decide on the next steps to be taken for the sustainable development of the project.

The study proposes one day workshop to be conducted in Hai district, northern Tanzania. About 20-25 participants will invited to participate in the workshop including Farmers (Participating and non participating farmers) Policy makers, researchers, NGOs operating in the community, local government representatives and other stakeholders.

Two facilitators one from DALDOs office in Hai district and one from IPDM project will facilitate the workshop.

This workshop will help the stakeholders to understand the existing situation of the IPDM project and strengthen the knowledge of farmers in dealing with agriculture problems. Further more, the workshop will allow the participant to suggest different steps to be taken for the sustainable development of the IPDM project.

This workshop proposed to be commenced between August and September 2005.

**Project Objectives, Activities and Outcomes**

| **Objectives** | **Activities** | **Outcomes** |
|---|---|---|
| To provide feed back information to the IPDM stakeholders | Preparation of the summary of the IPDM study | Awareness on the existing situatio of the IPDM project |
| To analyze the information gathered during IPDM study | Discussion on the IPDM study findings | Knowledge on the project limitatic and achievement. |
| Plan for the next steps to be taken | Plan for the next step | Stakeholders' recommendations fo the next step will be documented. |

**Proposed Budget for the workshop**

| **Details** | **Units/ Quantity** | **Cost per unit Tshs** | **Total cost** |
|---|---|---|---|
| Transport allowance-Farmers | 20 | 3,000 | 60,000 |
| Stationers ( maker pen, flip chart, rim paper etc) | | | 15,000 |
| Soft drinks and bites | | | 20,000 |
| Transport cost- Facilitator | | | 60,000 |
| Allowances- Facilitators and other stakeholders | | | 40,000 |
| Miscellaneous | | | 10,000 |
| **Total** | | | **205,000/=** |

N:B DALDOs office will be responsible for venue.

## Proposed Workshop guide

### 1. Pre- workshop instructions

| Issues | Considerations |
|---|---|
| Size of the class | 20-25 |
| Type of participants | IPDM Stakeholders |
| Venue | The location should be based on factors such as safety, easy of access and minimal disruption. |
| Selection of participants | Representatives from all relevant stakeholders ( farmers, NGOs operating in the area, researchers, local government, DALDO's office, religion leaders, etc |
| Materials | Flipchart, A4-size papers, marker pens, masking tape and scissors |
| Gender balance | At least equal numbers of males and females |
| Facilitators | Ideally two people ( both man and woman) who:<br>-Work in the community<br>-Participated in data collection of the IPDM study<br>-Have a good interpersonal and literacy skills |
| Duration | One day |

**NB.** -The number of farmers should be about two third (2/3) of the total participants.

-The invitation letters/ information about the workshop should reach the participants at appropriate time.

-Registering book; All participants should be registered intendance sheets.

**Proposed workshop timetable**

| Time | Activity | Responsible |
|---|---|---|
| 8:00-8:30 | Registration of the participants for the workshop | Secretariat |
| 8:30-9:00 | Welcome and introduction of participants | Facilitator |
| 9:00-9:05 | Workshop Agenda and Objectives | Facilitator |
| 9:05-9:15 | Brief background of the study on The social economic benefits of IPDM technologies to bean farming communities in Hai district, northern Tanzania | IPDM project/ Facilitator |
| 9:15-9:45 | Presentation of the results of the IPDM study | IPDM project/ Facilitator |
| 9:45-10:15 | Tea break | All |
| 10:15- 11:00 | Additional issues/ Problem affecting the dissemination and adoption of IPDM technologies in the community (Those that were not captured in the study) | All |
| 11:00-12:00 | SWOT analysis of issues affecting IPDM groups on the dissemination of the IPDM technologies to other farmers (group work) | All |
| 12:00-13:00 | Group presentation and plenary discussion | Groups |
| 13:00-14:00 | Lunch break | All |

| | | |
|---|---|---|
| 14:00-15:30 | Suggestion for future actions ( group work) | All |
| 15:30-15:45 | Evening break | All |
| 15:45:16:15 | Group presentation and plenary discussion | Groups |
| 16:15-16:30 | Evaluation and closing | All |

**Workshop sessions**

**1.0 Introduction**

Objectives- knowing each other

By the end of this session, participants will be able to know the names and some of the basic personal information about the all participants and facilitators in the workshop.

Materials needed:

Piece of paper, pens etc, it will depend on the way facilitators want to make it.

Activities:

Tell the participants that it is a time for introduction and tell them how to make it. The facilitator can break the ice by starting the activities. Example;

- Each person stand up and one by and introduce her/himself first and last name, where he/she come from etc. OR
- Ask the participants to interview their neighbours for 2-3 minutes to obtain the basic information then ask them to introduce each other

NB: The facilitator should be very keen to understand the ability of each participant so that he/she will not left some of the participants behind (ability to write and read). To deal with this situation the facilitator is advised to use simple language and techniques/ methods so that every one could be understand.

**2.0 Workshop agenda and objectives**

Objectives

By the end of this session each participant will be able to understand the reasons for the workshop and the agenda to be discussed in the workshop

Materials needed

Flipchart, maker pen

Activities

The facilitator should tell the participant the reason of conducting a workshop and the area to be discussed. For example the facilitator may tell the participants that they have organised the workshop because of the following reasons

- To provide feed back information/results of the Social economic benefits of IPDM technologies to bean farming communities conducted in Hai district, northern Tanzania in year 2004.
- To discuss the findings of the IPDM study and propose the next steps.

**3.0 Brief background of the study**

Objective

By the end of this session each participant will be able to understand the following

-When the study was conducted

-Why the study conducted

-How the study conducted

-Who conducted the study

-Where the study conducted

Materials needed

A written paper explains about the background of the study.

Activities

-Distribute the materials covering the information

-The Facilitator can read the brief background information of the study on the social economic benefits of IPDM technologies to bean farming communities in Hai district, northern Tanzania.

**4.0 Presentation of the results of the IPDM study**

Objectives

By the end of the session participants should be able to understand the results of the IPDM study.

Materials needed

Written papers presenting a summary of the results of the IPDM study

Activities

The Facilitator should read to the participants about the findings of the study

**5.0 Additional issues and comments on the findings**

Objectives

To allow the participant to discuss on the findings of the study

Materials needed

Flipchart, maker pens etc

Activities

The facilitator should ask the participants to contribute on the finding of the study.

Ask the participants to discuss the problem affecting the dissemination and/ or adoption of the technologies

- Ask the participant to contribute things, which are relevant to the study but not captured in the study etc.

**6.0 SWOT analysis of issues affecting IPDM groups on the dissemination of the technologies**

Objectives

By the end of the session the participants will understand strength, weaknesses, opportunities and threats of IPDM groups on the dissemination of the technologies

Materials needed

Maker pens, flip chart etc.

Activities

Ask the participants to form four groups and give the each group an assignment to discuss one area, for example first group can discuss about strength, group two can discuss about opportunities etc.

**7.0 Group presentation and plenary discussion**

Objectives

To get in-depth information about strength, weaknesses, opportunities and threats of IPDM groups on the dissemination of the technologies.

Materials needed

Flipchart, maker pens etc

Activities

Allow each group to present their discussion and contributions from the participants

**8.0 Suggestion for the next steps**

Objective

All participants will be able to get chance for recommendations and suggestion for the next steps from the stakeholders

Materials needed

Flipchart, maker pens etc

Activities

Form groups of 4 – 6 participants and ask them to discuss about the next steps to be taken.

**9.0 Group presentation and discussion**

Objectives

To get suggestions for the next steps from the participants

Materials needed

Flipchart, maker pens etc

Activities

Allow each group to present their discussion and contributions from the participants

**10.0 Evaluation**

Objectives

All participants get chances to evaluate the workshop

Materials needed

Pens, Evaluation forms etc.

Activities

Ask the participants to evaluate the workshop

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