

**United Republic of Tanzania**

**Final Report  
for  
Kilimanjaro Agricultural Training Centre  
Phase II Project**

September 2006

**Kilimanjaro Agricultural Training Centre  
Ministry of Agriculture, Food security and Cooperatives**

**Japan International Cooperation Agency**





**PIRSMA course (Class room)**



**PIRSMA course (Practical session)**



**PIRSMA course (PLA session)**



**Stakeholders' workshop  
for model site selection**

### **Pictures of training activities in model sites**

#### **1<sup>st</sup>In-field Training (Land preparation)**



#### **2<sup>nd</sup> In-field Training (Transplanting)**





**3rd In-field Training (Panicle Initiation)**



**4th In-field Training (Harvesting)**



**5th In-field training (Monitoring/Evaluation)**



**RTCPC Seminar  
(Uhuru hostel, Moshi)**



**Final Seminar  
(Movenpick hotel, DSM)**

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## List of Abbreviations and Acronyms

<b>ASDP</b>	Agricultural Sector Development Programme
<b>ASDS</b>	Agricultural Sector Development Strategy
<b>ASLMs</b>	Agricultural Sector Lead Ministries
<b>CBO</b>	Community-based Organisation
<b>CDU</b>	Curriculum Development Unit
<b>DADP(s)</b>	District Agricultural Development Programme
<b>DC</b>	District Commissioner
<b>DCO</b>	District Crop Officer
<b>DED</b>	District Executive Director
<b>DPO</b>	District Planning Officer
<b>ECARRN</b>	Eastern and Central Africa Rice Research Network
<b>EFT</b>	Extension and Farmer Training (section)
<b>FAO</b>	Food and Agriculture Organization of the United Nations
<b>FD</b>	Farming Development (section)
<b>ICDU</b>	Information and Curriculum Development Unit
<b>IF</b>	Intermediate Farmer
<b>IP</b>	Implementation Plan
<b>IT</b>	Irrigation Technician
<b>IU</b>	Information Unit
<b>JCC</b>	Joint Coordination Committee
<b>JICA</b>	Japan International Cooperation Agency
<b>KATC</b>	Kilimanjaro Agricultural Training Centre
<b>KATC I</b>	Kilimanjaro Agricultural Training Centre Phase I project
<b>KATC II</b>	Kilimanjaro Agricultural Training Centre Phase II project
<b>KF</b>	Key Farmer
<b>LGA</b>	Local Government Authority
<b>MAFC</b>	Ministry of Agriculture, Food Security and Cooperatives
<b>MT</b>	Mechanization Technician
<b>NGO</b>	Non-Governmental Organization
<b>NERICA</b>	New Rice for Africa
<b>O&amp;M</b>	Operation and Maintenance
<b>OF</b>	Other Farmer
<b>PDM</b>	Project Design Matrix
<b>PIRSMA</b>	Participatory Irrigation Scheme Management (course)
<b>PLA</b>	Participatory Learning and Action
<b>PO</b>	Plan of Operation
<b>PRA</b>	Participatory Rural Appraisal
<b>RC</b>	Rice Cultivation (section)
<b>RTCPP</b>	Regional Technical Cooperation Promotion Programme
<b>SADC</b>	Southern African Development Community
<b>SPFS</b>	Special Programme for Food Security
<b>VAEO</b>	Village Agricultural Extension Officer
<b>WARDA</b>	West Africa Rice Development Association
<b>WM</b>	Water Management (section)
<b>ZIE</b>	Zonal Irrigation Engineer
<b>ZIO</b>	Zonal Irrigation Office





## Preface

Tanzania, like many other African countries has been struggling for many years to improve agricultural production and productivity of its various crops with limited success. Many rural improvement programs have come and gone, but much still remains to be desired when one looks into the situation of the rural areas which are still characterized by low productivity of land and labor, insufficient food, ignorance and disease to mention only a few. Kilimanjaro Agricultural Training Center Phase II Project which aimed at increasing productivity of rice in six irrigation model sites has achieved remarkable results in those schemes through KATC training. The methodology and approaches used by the project to transfer irrigated rice cultivation technologies to small-holder farmers combined with the commitment of KATC trainers and the support and guidance of JICA and other stakeholders were the key to the impact the project experienced in the model sites over such a short period of time. It is probably too early to call it a breakthrough in Tanzania's rural development endeavors, but it is in deed a significant contribution which should be taken seriously by planners and policy makers. Not only should the lessons learned from KATC II Project be adopted by other rural development institutions, but KATC should continue to be supported by the Government and the donor community so that it will be able to play its new role of spreading its techniques to all other institutions for the benefit of small-holder farmers throughout the country. We at KATC are very confident that, as more and more agricultural service providers adopt the KATC Approach, what may have started as a rather expensive experiment will eventually become the most cost effective way of stimulating sustainable development in the rural areas.

In the spirit of TICAD II (Tokyo International Conference on African Development), KATC Phase II Project implemented the Regional Technical Cooperation Promotion Program (RTCPP) in the neighboring countries of Kenya, Malawi Uganda and Zambia. These countries are now anxious for more of such programs and would like to continue collaborating with KATC in their efforts to improve irrigated rice farming. KATC II laid the ground work for collaboration and cooperation among Eastern Africa countries through the JICA supported program. This is another significant achievement of KATC II Project at the international level, something Tanzania should be very proud of, having become the pioneer in trying out one of TICAD II resolutions. What remains is for these countries and any others which may want to join, to recognize what has been achieved by KATC through the RTCPP and to look into possibilities of scaling up such collaborative efforts.

We sincerely hope that rural development stakeholder including central and local government authorities, international donors, NGOs and CBOs will find the contents of the KATC Phase II project final report both interesting and challenging.

Richard J. Shayo  
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and KATC Principal



## Summary

The effective agricultural services delivery of proven agricultural technologies is critical in creating enabling environment for improving agricultural productivity and profitability, for improving farm incomes, for reducing rural poverty and for ensuring household food security.

Under such circumstances using "Model Site Approach" with advocacy of "Farmer to Farmer Extension" as a different approach and methodology to redress agricultural training and service delivery in the country and other Regional Countries, the Governments of Tanzania and Japan, through JICA support, a five year Project from October 2001, as a Second phase (KATC II) succeeding the Kilimanjaro Agricultural Training Centre (KATC) Phase I Project. The Project, aimed at further strengthening the technical capability of the KATC personnel in developing training programmes in compliance with the different conditions of irrigation schemes. Broadly the project aimed at increasing the productivity of rice in the model sites.

During KATC Phase II Project in six selected Model Irrigation Schemes a number of activities were implemented, among which Residential Courses were conducted at the Centre, followed by series of Infield Training, Monitoring and Evaluations at farmers rice fields in their schemes. Approximately 2500 farmers from the selected irrigation schemes, covering an area of about 5,800 hectares were intensively trained on various Rice Cultivation techniques, Extension Methods, Water Management, Gender Mainstreaming, strengthening farmer's organizations etc.

From the results of the terminal evaluation, it explicitly described the project as a success. The terminal evaluation underscored several positive attributes such as smooth implemented project activities, enhanced capability of KATC personnel in terms of the training formulation and implementation, improved farmer's farming techniques, income, change of mind set and improved skills and a significant evidence of spillover to neighbouring farmers, increased net return rate and increased average yield of paddy from 3.1 t/ha to 4.3 t/ha among key indicators. Indeed the Project produced remarkable results.

As well as the Regional Technical Cooperation Promotion Programme (RTCPP) which aimed at verifying applicability of KATC training in Kenya, Malawi, Uganda and Zambia was successfully implemented during KATC II Project, revealing that the technologies, methodologies and approaches used by KATC are relevant and sustainable to Eastern and Southern Africa countries.

This remarkable achievement in enhancing the capability of the trainers and farmers training presents yet another challenge. The challenge ahead for the two partner Governments, Tanzania and Japan, is how to scale-up and disseminate these encouraging results obtained in the KATC II model site to other Irrigation Schemes, not only in an effective and most efficient way, but also consistent with the direction of the current National and Sectorial policy environment in the context of ASDP/DADP.

It is therefore recommended that efforts be made to scale-up and roll out the achievement of KATC II Project from model-sites to all other irrigation schemes in Tanzania through enhancement of training institutes, research institutes, zonal irrigation offices and other stakeholders.

# **1 Background of Project**

## **1.1 Importance of rice farming in Tanzania**

Rice farming in Tanzania has been changing significantly over the past 25 years in terms of production, consumption and imports. The rice production in Tanzania recorded a significant increase during 1980s from 291,000 tons in 1980 to 740,000 tons in 1990. Then it dropped to 640,000 tons in 2003 and in 2005 it was 680,000 tons. The average rice yield in Tanzania has been fluctuating between 1 and 2 tons per hectare over the same period, even though under irrigated conditions. The average yield of rice is currently between 2.5 and 3.5 ton per hectare. According to FAO estimates rice consumption in Tanzania will reach 1.2 million tons by 2017. Therefore, without a drastic increase of rice production, Tanzania will soon be importing from abroad more than the current 100,000 tons of rice per year. This is because rice has become the second most important food crop after maize and an important cash earner for small holder farmer because of its storability and marketability. Besides, rice is increasingly becoming a strategic food crop for both food security and poverty alleviation, considering the population growth rate of nearly 3% per year in Tanzania.

Since 2001, the Government of Tanzania (GoT) has been promoting the Agricultural Sector Development Program (ASDP) and the District Agricultural Development Plan (DADP) under the Agricultural Sector Development Strategy (ASDS). Under the ASDP/DADP framework, Development of irrigated agriculture, including irrigated rice farming is one of the pillars of the agricultural sector. It is for this reason that His Excellence the President of Tanzania Hon. Jakaya Kikwete, in his inauguration address in January 2006, promised to give the first priority to the development of irrigated agricultural in Tanzania.

As a matter of fact, Japan International Cooperation Agency (JICA), West Africa Rice Development Association (WARDA) through Eastern and Central Africa Rice Research Network (ECARRN) and several other organizations have started promoting research and dissemination of improved rice cultivation technologies, including New Rice for Africa (NERICA) varieties to emphasize the importance of rice farming in Tanzania. In cooperation with JICA, Ministry of Agriculture, Food Security and Cooperatives (MAFC) organized the NERICA Research Network in Tanzania in 2005.

## **1.2 Problems in rice farming in Tanzania**

The rice production in Tanzania recorded a significant increase during 1980's from 291 thousand tons in 1980 to 740 thousand tons in 1990. However, it decreased to 680 thousand tons in 2005 after achieving some increase in late 1990's. The increases in the rice production were mainly brought about by the increase in the cultivated areas since the average rice yields during the period have fluctuated between 1 ton and 2 tons per hectare without showing any constant tendency. Furthermore, the self-sufficiency in rice has not been achieved in Tanzania, therefore a significant amount of rice has been imported during the period and a great amount of foreign currency was spent. From 2000 to 2005 only, 778 thousand tons of rice was imported and 197 million dollars was paid as the cost.

The one of the leading causes for the low rice yield in Tanzania is attributed to the unstable rainfall during cultivation season because most of the rice in the country had been grown under rain fed condition. Therefore, the government of Tanzania has constructed many irrigation schemes targeted for rice cultivation in order to increase the rice yield so as to boost the rice production to meet the national demand. However, the intention had not been realized in most of the schemes mainly due to the inadequate scheme management skills and proper knowledge and techniques on irrigated rice cultivation on the side of farmers. Although the infrastructures of irrigation schemes were constructed through the joint efforts among beneficiaries, governmental organizations and donors, the software aspects such as scheme management know-how and proper cultivation techniques were not covered in most of the cases. Moreover, there was a very few extension agents or governmental institutions fully equipped with systematized rice cultivation knowledge and techniques to instruct and lead the rice farmers.

### **1.3 Necessity and ground for KATC projects**

#### **1.3.1 KATC phase I project**

Kilimanjaro Agricultural Training Centre (KATC) was established in 1994 as a JICA supported Project later to be known as KATC Phase I Project. Situated in Lower Moshi, the Centre was acquired from Kilimanjaro region by the Ministry of Agriculture, Food Security and Cooperatives\* with the aim of disseminating the successful experiences of small-holder rice farmers in Lower Moshi to all other irrigated rice growing areas in the country through training. KATC Phase I project purpose was to strengthen the institutional and pedagogical capacities of KATC so that it will be able to train agricultural technical personnel mainly Extension Officers and key farmers in the field of irrigated rice farming. To achieve this purpose, five basic courses were developed. They include;

- i) Irrigated Rice Cultivation Course for Extension Officers
- ii) Irrigated Rice Cultivation Course for Key Farmers
- iii) Water Management Course for Irrigation Technicians
- iv) Rice Mechanization Course for Mechanization Officers
- v) Tractor Operators' Course

It was expected that by training key farmers and extension officers together the training would have greater impact because of the closer relationships developed and the participatory action planning exercises in which farmers and extension officers participated actively. It was emphasized from the beginning that key farmers would start assisting extension officers in training fellow farmers through method and result demonstrations. By June 1999 when the Project was due to end 1,392 participants had attended KATC Training. The Project received a two years extension period so that it could carry out follow-up of ex-participants and outreach training activities. By the end of the two years an additional 605 participants had been trained in the field, bringing the number of participants contacted directly during KATC Phase I Project to 1,997 in total.

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\* Then it was Ministry of Agriculture and Cooperatives (MAC)



It was observed during the two years follow-up activities that the performance of ex-participants was still unsatisfactory and that there was still a lot to be done. As for the Centre, the capacity had been greatly improved.

### **1.3.2 KATC phase II project**

Majority of the people in Tanzania live in the rural areas and depend on agriculture for their livelihood. However, living conditions in the rural areas of Tanzania are rather severe because of poor infrastructure and transportation facilities, water shortage, low level of technology in farming, shortage of trained development workers and lack of credit facilities.

Under such circumstances, KATC Phase I Project managed to register some positive changes in some areas where farmers adopted improved farming techniques after the training. Therefore, the Government of Tanzania proposed new project to further strengthen the technical and pedagogical capabilities of KATC trainers so that they would be able to carry out result oriented residential and outreach training courses to enable several irrigation schemes to become model sites. These are expected to be the core centers for technology exhibition and dissemination as well as good examples of irrigation scheme organization and management for all other schemes in the irrigation zones. Besides, through enhancement of KATC trainers, other stakeholders in the field of irrigated rice farming improvement are demanding KATC services for all their farmers training needs. As the Project comes to an end in September 2006, the Center's role as a service provider will definitely ensure its sustainability.

A Regional Technical Cooperation Promotion Program (RTCPP) which aimed at verifying applicability of KATC training in Kenya, Malawi, Uganda and Zambia was also successfully implemented during KATC II Project, indicating that the technologies, techniques and approaches adopted by KATC are relevant to Eastern and Southern African countries.

## **2 Project implementation**

### **2.1 Overview of activity**

At the beginning of the Phase II, Japanese Experts together with Tanzanian counterparts held a series of discussions to clarify meaning and contents of the Project Design Matrix (PDM), Plan of Operation (PO) and the Monitoring and Evaluation Plan (M&EP) in order to avoid any form of misunderstanding among them.

It was agreed that the Project Purpose should be "Productivity of rice increases in the model sites through the KATC's training" and that the objectively verifiable indicators should be as follows;

- Average rice yield per unit area of sample farmers in model sites increases by 12-43% by 2005 compared to 2002.
- By 2005, the net return rate from rice in all the model sites increases compared to those of 2002.
- By, 2005, properly irrigated area increases in all the model sites compared to those of 2002.

It was further decided that expected outputs of the Project would be as follows;

- The concept of and approach to the model sites are established.
- The capability of KATC in identifying training needs is improved.
- Technical training programs are strengthened to meet local needs.
- Training programs for improving institutional framework of irrigation scheme are strengthened.
- The capability of KATC in collecting and providing useful irrigated rice cultivation information is improved.
- The concept and approach to mainstream gender into planning, implementation and monitoring technical training on irrigated rice production are established.

A detailed PO was also set in the early stage of the KATC II Project through discussions and workshops attended by important stakeholders. (see Annex 3)

In order to ensure that all the expected outputs and the Project Purpose were realized by the end of the Project, the following important activities were implemented in accordance with the stated PO;

- 1) In February, 2002, training on plan making with participatory approaches and gathering of information from key farmers, scheme managers and Extension officers from 40 irrigation schemes in Tanzania was implemented through a series of training courses known as "Participatory Irrigation Scheme Management Courses" (PIRSMA). The 40 Schemes were the candidates from which six model sites were selected.
- 2) In May, 2002, the first Joint Coordination Committee (JCC) meeting was held to approve the first proposed PDM and PO.
- 3) From June to August, 2002, the Project set the criteria for selection of model sites, through which six irrigation schemes were proposed, (one from each Irrigation Zone) and presented to the stakeholders' workshop attended by 27 District Executive

Directors (DEDs) and six Zonal Irrigation Engineers (ZIEs) among others. The workshop which was held in Morogoro and Chaired by the Permanent Secretary – Ministry of Agriculture, Food security and Cooperatives approved the following six irrigation schemes to become model sites;

- |                               |           |                  |
|-------------------------------|-----------|------------------|
| • Mombo Irrigation Scheme     | Korogwe   | Kilimanjaro Zone |
| • Mwega Irrigation Scheme     | Kilosa    | Morogoro Zone    |
| • Mbuyuni Irrigation Scheme   | Mbarali   | Mbeya Zone       |
| • Nakahuga Irrigation Scheme  | Songea    | Mtwara Zone      |
| • Mwamapuli Irrigation Scheme | Igunga    | Tabora Zone      |
| • Nduguti Irrigation Scheme   | Shinyanga | Mwanza Zone      |

- 4) From September to November, 2002, baseline survey was conducted in the six model sites to collect data on actual conditions and situations in each scheme, as well as information on the training needs of schemes beneficiaries. Based on the data and information collected, training curricula with special emphasis on participatory approaches were formulated.
- 5) In February, 2003, the Implementation Plan (IP) in each model site was decided upon by the first Steering Committee Meeting attended by District Planning Officers (DPO) / District Crop Officers (DCO) from the six concerned districts, Village Agricultural Extension Officers (VAEO), Irrigation Technicians (IT), Mechanization Officers (MO) and farmers organization leaders from the six model sites.
- 6) From March, 2003, residential key farmer courses for the 6 model sites were implemented. Main topics covered included basic rice cultivation techniques, water management, use of simple farming tools, participatory plan making, principles of farmer to farmer extension, and keeping of farm activity records.
- 7) In May 2003, the second Joint Coordinating Committee (JCC) meeting was held to approve the project purpose and the annual plan of activities.
- 8) From July 2003, first season in-field trainings in the six model-sites were implemented. For each model-site, five trainings were conducted in one cropping season each having duration of five days. Also several specialized residential courses were conducted at the same time.
- 9) In May 2004, mid-term evaluation for the Project was conducted to determine its progress. The Evaluation report which underscored good progress of project activities in the model-sites was received and approved by the Third Joint Coordinating Committee (JCC) meeting after the meeting agreed to improve some articles in the Project Planning Matrix (PDM) and the Plan of Operations (PO). It was further agreed that a modified, more cost conscious training package should be tried by the Project so as to prepare KATC for its future role in the context of ASDP/DADP
- 10) From October 2004, efforts were made to strengthen the capability of KATC in collecting and providing useful irrigated rice cultivation information as well as mainstreaming gender in its training activities.
- 11) From May 2005, preparations to implement the modified approach were initiated in terms of its parameters, site selection, meetings with stakeholders and conduct of

baseline surveys. The results of the preparations were presented and approved by the forth JCC meeting held in September 2005.

- 12) From November 2005, modified training programs were conducted at Mkombozi and Muungano Irrigation Schemes in Babati District and Lemkuna in Simanjiro district, Manyara Irrigation Zone.
- 13) In May 2006, final evaluation of the Project was conducted by a joint evaluation team comprised of Japanese and Tanzanian members. The final evaluation report was presented and discussed at the fifth JCC meeting. It was generally agreed that the project purpose had been satisfactorily achieved and that the project would be terminated as planned on 30th September 2006. However, model-site evaluations were to be finalized in Nduguti and the modified training model-sites during the remaining period.
- 14) In August 2006, a KATC II Final Seminar was held in Dar-es-Salaam to present the project result to stake-holders including Officials from the Ministry of Agriculture, Food security and Cooperatives (MAFC), Ministry Projects and Programs, Embassy of Japan, Donors, 27 District Councils, 7 Zonal Irrigation Engineers and Kilimanjaro Regional Office. As a result of the seminar, outputs of the KATC II project are expected to be widely used by many service providers in the development of irrigated rice farming in Tanzania.

## **2.2 Approaches adopted by Project**

As already pointed out in the previous section, the KATC II Project was aimed at improving the productivity of rice in the model sites through training. The beneficiaries were trained in both technical and organizational aspects so that they can implement effectively and efficiently their activities in their schemes which are geared towards improving the rice farming conditions. In order to achieve the project purpose of rice improvement in the model schemes the project adopted various approaches and methodologies. Basically participatory approach was used in all stages of project cycle, right from the planning stage up to implementation and monitoring and evaluation stages. All stakeholders were involved in all stages of project so that they could actively participate in all the project activities.

Other approaches adopted by the project in order to achieve the project purpose include farmer to farmer extension and gender mainstreaming just to mention a few. Twenty Key farmers and one extension staff from each model scheme were selected and trained at KATC for three weeks and were required to select and train intermediate farmers (five for each key farmer) after receiving training at KATC. Then each intermediate farmer was required to select and train two other farmers. There fore, through farmer to farmer training the knowledge and skills learnt at KATC could spread to a wider extent in the scheme. Apart from farmer to farmer extension KATC II Project arranged in field trainings in the model sites to enhance the key and intermediate farmers' knowledge and skills in irrigated rice farming.

The sustainable improvement in the living standard of farmers' through the improvement

of rice farming could be achieved only when the farmers acquire and implement all the necessary knowledge and practical know-how by themselves.

Therefore, basic, simple and effective techniques to increase rice yield that are easy for farmers to learn and adopt, were carefully selected and introduced for in-field training in each model site.

The model sites were used as a training ground for other irrigation schemes in the irrigation zone where it belongs. The district council and the irrigation zonal unit were required to facilitate the model site which lies in their area of jurisdiction to disseminate the improved farming techniques to other schemes in the irrigation zone.

### **2.2.1 Model site**

A model irrigation site was selected in each irrigation zone of the country in order to verify the effectiveness of KATC training in different agricultural and socio-economic conditions. There were six irrigation zones in the country at the beginning of the project, therefore six model sites were established covering the whole country.

The training methodologies and approaches which can realize the actual increases in the yield and profitability in rice farming were developed and embodied in the model sites through the close collaboration among the relevant stakeholders led by KATC. Therefore, very specific and clear targets on the productivity were set by each scheme for the period of direct intervention by the project.

Each model site was also considered as the demonstration site of improved irrigated rice farming for the farmers in each irrigation zone and to be utilized as one of core tools for diffusing the improved rice farming techniques within the zone.

The results by the KATC trainings in the model sites were later evaluated and synthesized to formulate a training package for the improvement of productivity on rice farming.

### **2.2.2 Participation**

Implementation of the project was assigned to key stakeholders at different levels namely KATC, Farmers, District councils and the Zonal irrigation offices. Involving the stake holders were thought to be essential for project sustainability and smooth implementation.

KATC considered farmers active participation as a pillar of the project in all training sessions. In 2002, before starting the trainings, KATC conducted PRA/PLA in the six model sites in order to enhance farmers' motivation for participation in the programs. During the trainings, Farmers were involved right from problem identification; decide on the solutions and preparation of the action plan to be implemented so as to achieve the target yield. KATC facilitated in theory and practice, conducting field and farmers' days, follow up of the implementation of action and operation and maintenance plans.

As mentioned above, the participation of stakeholders namely District and schemes was also very important in the whole implementation of the project. On the cost sharing aspect the schemes provided training venues for theory and practice, some inputs for

demonstration and trials, fuel wood, cooking utensils and cookers. Some schemes also provided food items like, rice, vegetables and sometime chickens. The districts enhanced the staff to participate in the training and some District contributed soft drinks in the field day and farmers' days and sponsored farmers for study tours and Nane-nane agricultural shows. Some zonal irrigation offices dispatched the staff to attend the trainings.

### **2.2.3 Gender mainstreaming**

The gender mainstreaming was very important component of the project because rice farming in the fields had been undertaken by both men and women. Without consideration of the gender issue, women's participation for the trainings would be significantly less than men and also the objective of the project which was the increase of productivity would be difficult to be achieved. The concept of gender mainstreaming in the project was to ensure equity of opportunity and equality of result for both men and women. In order to confirm equal opportunities, firstly the planning of the training took consideration on training needs of both gender, secondly during implementation of residential/infield trainings, the project encouraged participation of the both gender by setting the arrangement of 50:50 men to women ratios. In order to ensure equal result for the both, the project considered fair allocation of resources, properties, labor and income from rice farming through trainings.

### **2.2.4 Farmer to farmer extension**

Farmer to farmer extension was recommended since KATC phase I to supplement official extension services which proved to be inadequate due to various reasons including insufficient budgetary, low staff motivation and limited facilities. Farmer to farmer extension was done by selecting key farmers whose farming methods and personal attitudes are so superior that their operation can serve as a model for others to follow. Some criteria were used to select Key farmers as below.

Twenty key farmers were selected from each model scheme and get residential training at KATC. After going back to their scheme each key farmer selected five intermediate farmers using criteria such as: Participating fully in rice farming with not less than two years experience, able and willing to transfer technology to other farmers (teach other farmers) and be a resident in the scheme. A group of twenty KFs and one hundred IFs was obtained and took part in the infield training. In the field days and farmers' days each IF had to invite at least two other farmers, it means totally two hundred other farmers were selected in each model site. After each field training the group of KFs, IFs and OFs meet regularly to learn and apply knowledge and skills taught by KATC. Through this process the dissemination of rice cultivation techniques to more farmers was effected in an easy and cost effective way.

#### Criteria for Selecting Key Farmers

- 1) Representative from each block/ village
- 2) Able to read and write
- 3) Participating fully in rice farming with not less than two years experience



- 4) Able and willing to transfer technology to other farmers (teach other farmers)
- 5) Should have good cooperation and acceptance to fellow farmers
- 6) Should be a progressive farmer
- 7) Resident in the scheme
- 8) Age range between 18 to 65 years old  
Age 18 to 45 years old: 80% (16 persons), 46 to 65 years old: 20% (4 persons)
- 9) Gender balance: male 50% (10 persons) and female 50% (10 persons)
- 10) Active member in farmers associations/ organizations (e.g. paying contribution)
- 11) Elected by majority of the scheme members/ appointed by scheme executive committee
- 12) Endorsed by District Executive Director (DED)

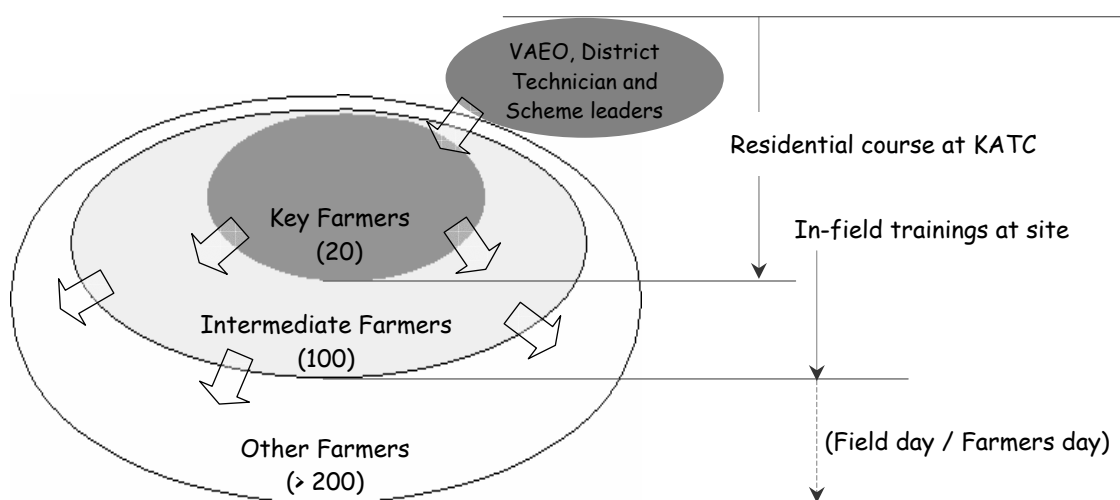


Fig Extension flow and target participants of KATC trainings

### 2.2.5 Appropriate techniques

In KATC trainings, focusing and mastering the basic knowledge and techniques on irrigated rice farming were emphasized consistently because almost all the farmers in the model sites had very little technical know-how before the project intervention. Therefore, the strengthening of the capabilities of farmers on basic technical know-how was the most important and prioritized activity by the training. The knowledge and techniques taught by KATC were simplified so that they could be easily understandable and adoptable by all the farmers in any circumstances. Moreover, the field techniques were made practically simple to be adopted by farmers using only the locally available materials with no or a little new investment. The proper seedling preparation, bund making, field leveling, line planting, timely weed management by simple weeding equipment, proper water management at various stages of rice and farming management analysis were the core farming techniques stressed in the training.

### 2.2.6 Institutional capacity building

Institutional capacity building was one of the important key issues that the project strived to address during the project period. During the baseline survey, it was vividly found that weak irrigators' organization was one of the major problems for poor performance of irrigation schemes. Therefore, it was anticipated that through institutional capacity

building, the beneficiaries could be able to implement their scheme activities efficiently and effectively thus helping to achieve scheme sustainability in the long run. In order to achieve that, the following activities were organized and conducted in the model sites:

- Training of leaders, key and intermediate farmers on how to strengthen irrigators' organizations,
- Facilitating the model sites to prepare farm operation calendars, O&M plans and Plans to strengthen irrigators' organizations. These plans were aimed at improving the implementation of the scheme activities.
- Preparation of guidelines for strengthening irrigators' organizations that could serve as a guide to the irrigation schemes.

The activities for improvement of the institutional framework in the model sites were successfully implemented in all model sites and some improvement in the management, organization and operation of the irrigators' organizations were noted especially in participation of farmers in O&M activities, payment of O&M fees, by-laws enforcement, etc.

### **2.2.7 Modified training**

The Government of Tanzania has adopted an Agricultural Sector Development Strategy (ASDS) which sets the framework for achieving the sector's objectives and targets. An Agricultural Sector Development Programme (ASDP) Framework and Process document, developed jointly by the four Agriculture Sector Lead Ministries (ASLMs), provides the overall framework and processes for implementing the ASDS. Development activities at national level are to be based on the strategic plans of the line ministries while activities at district level are to be implemented by Local Government Authorities (LGAs), based on District Agricultural Development Plans (DADP).\*

Taking this into account, the project stakeholders confirmed during Mid-term evaluation conducted in May 2004 that it would be quite important KATC would tune itself to enable LGAs to utilize the centre's training services in implementation of DADPs.

On the other hand, it had been pointed out that the in-field training component/package developed for six model sites was carefully attending to every aspect of rice production but it was rather high in implementation cost. Thus for providing easier access to Districts and any other collaborators to achieve ultimate goal of Government policy/programme, the project undertook modification of training tried out at model sites especially with regard to improvement of cost effectiveness.

Later from June to July 2005, the project collected information and made brief surveys of candidate schemes with an assistance of Manyara Zonal Irrigation Office.

Three irrigation schemes; namely Mkombozi (Babati District), Muungano (Babati District) and Lemkuna (Simanjiro District) were finally selected in September 2005.

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\* Agricultural Sector Development Programme (ASDP) Support~ Government Programme Document (September 2005)

## 2.2.8 Collaboration with FAO

At preparatory stage of phase II, JICA dispatched two missions; namely "Preliminary study team on Kilimanjaro Agricultural Training Centre Phase II project in Tanzania" (June 2000) and "Mission for the partnership programme within the framework of Special Programme for Food Security and Kilimanjaro Agricultural Training Centre Phase II Project" (Feb-March 2001), to look into possible collaboration between FAO and JICA.

During series of discussions, both experience in farmers' water management and organizing farmers & water users association of FAO and irrigated rice farming of KATC were recognized. FAO, JICA and Ministry of Agriculture and Food Security finally came to agree on collaboration and complementary activity that SPFS\*\* was expected to transfer experiences in participation of farmer and farmer organization while KATC II was expected to provide trainings to each other in July 2001.

According to the above mentioned agreement, the concerned parties have implemented the following;

### Joint Meeting

The first joint meeting was held on 28th May 2002 and the second one was on 16th October 2003. Besides, SPFS and KATC II had several informal meetings upon necessity. Through these meetings, the SPFS-KATC II linkage has been established at Mombo model site of KATC II with farmers from SPFS sites of Chekelei, Kwa Mngumi, Kwa Mazandu and Manga Mikocheni in Korogwe District.

### FAO-SPFS workshop

A KATC representative attended the SPFS launch workshop on 3rd November 2002 and attained salient feature of SPFS.

### Infield trainings

Generally twenty farmers (ten men and ten women) from SPFS sites (five farmers from each site) have participated in eight training opportunities organized by KATC II;

- 1st training in season 1 (prior to transplanting) 1 ~ 5 September 2003
- 2nd training in season 1 (Panicle initiation stage) 2 ~ 7 February 2004
- 3rd training in season 1 (Harvesting stage) 15 ~ 20 March 2004
- 1st training in season 2 (Land preparation stage) 23 ~ 26 November 2004
- 2nd training in season 2 (Transplanting stage) 24 ~ 26 January 2005
- 3rd training in season 2 (Panicle initiation stage) 8 ~ 11 March 2005
- 4th training in season 2 (Harvesting stage) 11 ~ 14 May 2005
- 5th training in season 2 (Evaluation) 6 ~ 9 July 2005

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\*\* Special Programme for Food Security

### 3 Result

#### 3.1 Achievement in Project indicators

##### 3.1.1 Project Purpose level

##### (1) Yield

The original yield indicators were determined by the representatives of respective model site based on their presumptions in the implementation plan workshop held at KATC at February 2003. However they were modified as the result of the mid-term project evaluation carried out in September 2004 applying the results of farming survey conducted by the project. The modified part of the original indicators was only the rice yields before the project intervention leaving the target yields set by the model sites unchanged.

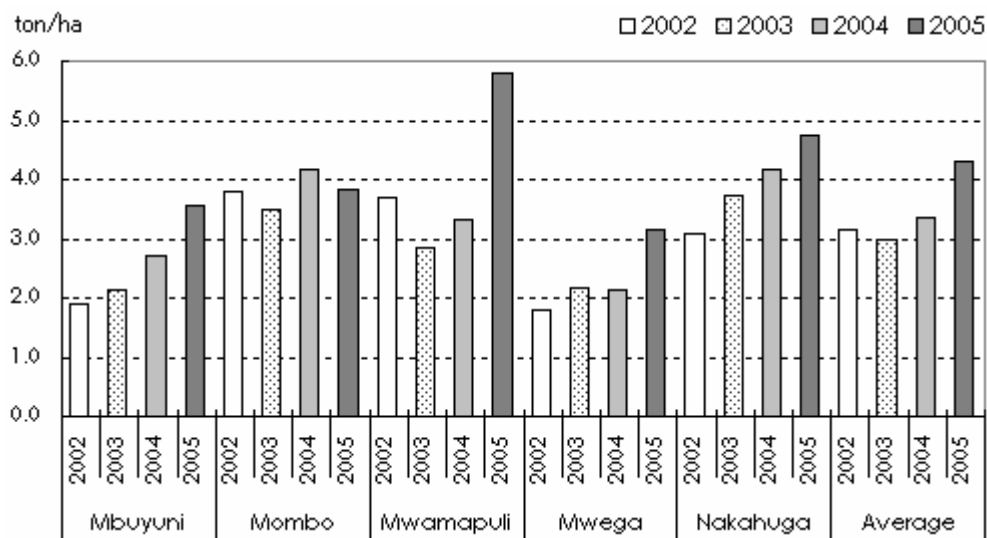
The projected increase of the rice yield in each model site was 20% of the difference between the target and base yields. It was determined based on the consensus that the target yields of the model sites should be achieved within 10 years considering the original socio-economic and technical levels of the farmers and newly introduced KATC's technical concept which valued the sustainable improvement of rice farming adopting appropriate techniques to conform to farmers' circumstances. Furthermore, since the duration of direct intervention by the project was limited to only 2 years, the yield increment would be 20% provided that the yield would increase by 10% annually. The average rice yield of 5 model sites increased from 3.1 tons per hectare in 2002 to 4.3 tons per hectare in 2005. The average rice yields of 4 model sites other than Mombo scheme in 2005 exceeded the projected ones more than 50%. Mombo scheme suffered very severe drought especially in 2005 and despite of farmers' earnest effort, the rice yield decreased compared to that in 2004 maintaining almost the same yield level in 2002. However, it can be inferred that Mombo scheme could maintain rice yield to the level in 2002 even under the most acute water shortage thanks to the new rice cultivation and water management know-how learnt through KATC training. The rice cultivation was impossible for 3 years in Nduguti scheme due to the severe drought since 2003.

Table Change in rice yield in the model sites between 2002 and 2005

Scheme	Rice yield by year				Projected Yield	Projected increased %	02-04 increased %	02-05 increased %	Result
	2002	2003	2004	2005					
Mbuyuni	1,900	2,138	2,708	3,560	2,720	43.0%	45.5%	87.4%	Yes
Mombo	3,800	3,493	4,164	3,820	4,240	12.0%	9.6%	0.5%	No
Mwamapuli	3,700	2,855	3,336	5,800	4,460	21.0%	-9.8%	56.8%	Yes
Mwega	1,800	2,169	2,129	3,163	2,500	39.0%	18.3%	75.7%	Yes
Nakahuga	3,100	3,736	4,168	4,738	4,080	32.0%	34.5%	52.8%	Yes
Nduguti	3,300	-	-	-	3,840	16.0%	-	-	-
Average	3,140	2,978	3,362	4,300					

The results on rice yield indicate clearly that the farmers in the model sites succeeded to increase their rice yield following the technical know-how learnt in the trainings. Therefore, it can be concluded that KATC training increases the rice yields of irrigation

schemes in Tanzania under normal climatic condition.



Graph Average Rice Yield by Model sites

## (2) Net Return Rate

The net return rate was chosen as an indicator to evaluate economically the efficiency of rice farming techniques taught by KATC. The net return rate is the proportion of net return within the gross return from rice cultivation, which means what portions of total value made from rice cultivation remains with farmers themselves. The principle concept of KATC training is to increase rice yield by applying improved farming techniques maintaining production cost as low as possible or the same level other than spending more money for the materials and labour. Therefore, the increase of gross return from rice cultivation is achieved through the increased production by the increased yield while production cost remains the same, which results in the lower production cost rate and higher net return rate to the gross return.

The average net return rate of 5 model sites increased from 66.7% in 2002 to 73.1% in 2005 (fig.3). The net return rate increased in Mwamapuli, Mwega and Nakahuga but stayed almost same levels in Mbuyuni and Mombo. The results indicate that the initial intended aim of KATC training on net return rate is achieved because 3 schemes improved their net return rates in 2005 compared to that in 2002 and other 2 schemes maintained almost the same level after the trainings. Although the net return rates of Mbuyuni and Mombo schemes did not improved, their net returns in 2002 increased significantly in 2005.

The results indicate that KATC trainings achieved the increase of gross return from rice cultivation without increasing the production cost.

Table Change in Net return rate of model site

Scheme	Net return rate by year			
	2002	2003	2004	2005
Mbuyuni	81.6%	67.2%	76.7%	79.3%
Mombo	57.4%	59.9%	65.9%	55.2%
Mwamapuli	52.3%	67.8%	76.5%	84.0%
Mwega	54.4%	75.4%	79.3%	67.2%
Nakahuga	56.4%	63.9%	87.7%	81.8%
Nduguti	96.1%	—	—	—
Average	66.7%	65.7%	76.6%	73.1%

### (3) Irrigation

One of the indicators for the project was “By 2005, properly irrigated area increase in all the model sites compared to those of 2002”.

As the meaning of “properly irrigated area” was not explicitly stipulated in the project design matrix, the water management section redefined the “properly irrigated plot” as the one meeting the following minimum conditions;

- Water distribution plan exists
- Paddy field is well leveled
- Paddy field is well bunded
- Paddy field has no drainage problem
- Enough irrigation water is supplied to the field at the right time

In order to verify this indicator, we interviewed farmers by using a questionnaire (20 Key Farmers and 100 Intermediate Farmers) in each model sites on the conditions of the above mentioned aspects before and after the trainings.

The results are as follows (Numbers in the bracket are the average of 5 schemes),

- Distribution plan (Every scheme made their distribution plan)
- Leveling (37.2% → 93.4%, increment 56.2%)
- Bund making (48.5% → 92.7%, increment 44.2%)
- Drainage problem exist (63.9% → 28.2%, decrement 35.7%)
- Water availability (49.4% → 78.3%, increment 28.9%)

Basing on these results it can be concluded that properly irrigated area increased in all model sites, so the indicator was achieved. Therefore, this indicates that the trainings enabled the farmers in the model sites to properly manage the irrigation water leading to more are being irrigated properly.

#### 3.1.2 Output level

##### (1) Establishment of the concept and approach to the model sites

The indicator of the output was “By the end of August, 2002, six (6) model sites are selected on the basis of the criteria”. The project regarded the consensus of all the



relevant stakeholders on the approaches, their roles and responsibilities as one of the most indispensable aspects in order to achieve the project purpose and to secure the sustainability of the project results. Therefore, the selection of the model sites was carried out maintaining the clarity of the procedure and participation of the stakeholders as much as possible. The 40 candidate irrigation schemes with higher development potentials were already identified during the phase I period as the first step of the selection. The training courses entitled as the Participatory Irrigation Scheme Management Course were implemented for the candidate irrigation schemes so as to enhance the capabilities of the schemes and collect necessary information for the model sites selection as well. The selection criteria for the model sites were prepared utilizing the collected information by the project after the policy; one model site in each irrigation zone; was determined by responsible authorities of both governments. The selection criteria with weighing points included the water availability for irrigation (20 points), accessibility to the scheme throughout the year especially during rainy season (20 points), irrigation infrastructure (20 points), co-operation from the scheme beneficiaries, personnel and District officials (5 points), extension officer allocated to the scheme area (5 points), representative to other schemes within the irrigation scheme (15 points), and farmer's organization (15 points). The criteria were distributed to the concerned stakeholders of the 40 candidate schemes so that the evaluation of the corresponding schemes could be carried out before the selection workshop for the model site was held. The workshop for selecting the model site candidate for each irrigation zone was held in Morogoro in July 2002 recommending Mombo scheme for Kilimanjaro zone, Mwega scheme for Morogoro zone, Nakahuga for Mtwara zone, Mbuyuni scheme for Mbeya zone, Mwamapuli scheme for Tabora zone and Nduguti scheme for Mwanza zone respectively. They were accepted as the model sites of KATC II project by the joint coordinating committee in August 2002. The roles and responsibilities of the stakeholders were clarified and confirmed during the workshop for the preparation of implementation plan held in early February 2003 at KATC. All the relevant stakeholders participated in the process of selecting the model sites and the consensus on the roles and responsibilities of each stakeholder were reached through the process.

## **(2) Improvement of capability of KATC in identifying training needs**

KATC conducted Participatory Learning and Action (PLA) in model schemes as a baseline survey for the purpose of involving farmers to identify, analyze, prioritize and look for solutions on their problems in rice cultivation. PLA tools including community mapping, seasonal calendar, daily activity profiles etc were used. Finally an action plan was made for implementation towards problem solving.

KATC prepared a curriculum for each scheme to address their respective problems to enable the farmers to solve the problems by themselves and implement their plans to achieve their objectives.

The training program was composed of various sessions, including lectures on basic knowledge of rice cultivation, leadership, irrigators' organization, farm income, and practices of land preparation, transplanting, making action plan, etc. The data below

is the degree of the satisfaction of participant for the training contents which shows that the percentages of the participants who ticked A or B were nearly one hundred percent in all trainings (A and B were the first and second best rank out of five). It means the trainings conducted by KATC were suitable for their needs and KATC has improved its capability in identifying training needs.

Table The percentage of the participant who marked A or B

Scheme	First Season				Second Season				
	1st	2nd	3rd	4th (Eva)	1st	2nd	3rd	4th	5th (Eva)
Mbuyuni	97.6	96.5	n.a *1	n.d *2	99.2	97.6	100.0	98.3	n.d *2
Mombo	99.9	99.9	n.a *1	n.d *2	99.9	99.6	99.8	100.0	n.d *2
Mwamapuli	n.a *1	97.8	98.2	n.d *2	97.8	97.8	99.9	98.5	n.d *2
Mwega	99.8	99.9	99.7	n.d *2	98.6	99.3	99.3	99.9	n.d *2
Nakahuga	99.6	99.3	99.6	99.3	99.9	99.8	99.7	n.a *1	n.d *2
Nduguti	n.a *1	n.a *1	n.d *2	n.d *2	97.8	98.2	n.d *2	n.d *2	n.d *2

n.a \*1: Not applicable

n.d \*2: Not done

The 4th in 1st season and 5th in 2nd season were evaluation of the previous trainings. Therefore daily evaluation was not conducted except at Nakahuga scheme.

In PDM the indicator 2.1 mentioned "At the beginning of every training course, more than 90% of course participants agree with the course contents as relevant to their needs.", however the project decided to stop counting the percentages because the training contents had been agreed with participants beforehand.

### (3) Strengthening of the technical training program to meet local needs

In the process of the project activities, the project established technical standards on rice cultivation in all model sites through field trial activities conducted by field personnel and key farmers and also final version of technical handbooks for each model site were prepared based on local needs.

In order to measure the achievement of the above capacity strengthening, the project set an indicator "By 2005, 80% of Key Farmers adopt at least 80% of basic field techniques learnt and 80% of Intermediate Farmers adopt at least one basic field technique learnt. (for the items of basic field techniques)" . The items of techniques were leveling degree, bund repairing, quality seed selection, planting spacing, irrigation depth at each stage, tools utilization, farming record keeping, etc. The result was satisfactory as shown in the table below. Although in the 1st season the outcome was not as good as it should have been, in the 2nd season training, which was conducted in 2005, as required in the indicator, the collected data indicated that the project had achieved to strengthen the technical program.

Table Adoption rate of field basic techniques

Scheme	First Season		Second Season	
	KF *	IF **	KF *	IF **
Mbuyuni	80%	100%	80%	99%
Mombo	94%	100%	100%	100%
Mwamapuli	50%	99%	90%	100%
Mwega	89%	100%	85%	99%
Nakahuga	94%	100%	94%	100%
Nduguti	-	-	-	-

\* The percentage who adopted more than 80% of techniques.

\*\* The percentage who adopted at least one technique.

As mentioned 2.2.7, the Modified Training was needed to be set up and developed. Later from June to July 2005, the project collected information and made brief surveys of candidate schemes with an assistance of Manyara Zonal Irrigation Office. Three schemes; namely Mkombozi (Babati District), Muungano (Babati District) and Lemkuna (Simanjiro District) were finally selected in September 2005.

In course of modification, the project tried out different approaches from the viewpoints of 1) intensity of training and 2) involvement and commitment of stakeholders. Firstly, number of in-field trainings and number of sessions and/or days per training were carefully examined. The noticeable challenge is to omit residential training for Key Farmers and VAEO and to reinforce in-field training with extra care for Key Farmers (Mkombozi and Muungano). Secondly, lunch arrangement was reconsidered. At the model site, the project used to pay for food materials while irrigation schemes took care of fire wood, cooking utensils and cooks. But under Modified Training, such stakeholders as District authority or irrigation scheme are responsible for preparation of lunch (Mkombozi and Muungano). This arrangement anticipates to (a) make training cost more financially feasible and (b) to encourage more ownership and commitment of farmer participants/scheme to their development process through training opportunities. Furthermore, each session of in-field trainings is more shortened for Lemkuna scheme than others so that participants can go through with all programs without lunch due to shortage of financial capacity to bear the cost. This was another challenge for KATC to enhance flexibility in programming training to meet various needs of District authorities and/or those who foster development of irrigation schemes. (see Annex 10-E)

#### **(4) Strengthening the training program for improving institutional framework of irrigation schemes**

Under this program the following activities were planned and implemented in each model site.

- Implementation plan (IP) for each model site was prepared and agreed stakeholders in February 2003. The implementation plan included activities to be conducted in each model site, time frame and responsible persons to implement the activities, etc.
- Farm operation calendars which include farm operation, water distribution plan, maintenance and repair plan and organizational activity plan, were made by the

end of second season. Follow-up of the implementation of these plans was also carried and where necessary some adjustments were made to suit the prevailing conditions.

- The guidelines for strengthening institutional framework was prepared as planned towards the end of the project period. These guidelines are to be used by the schemes for improving their day to day supervision and management of their scheme's activities.

The implementation of the abovementioned activities resulted to some improvements in the operation, management and overall supervision of the scheme's activities in all the model sites, though at varying degrees. The number of farmers who participated actively in repair and maintenance activities increased in all model sites except Nduguti scheme where cultivation was not carried out for two consecutive seasons due to drought. The percentage of beneficiaries who paid their annual operation and maintenance fees in the model sites also went up compared to before the implementation of these activities. Active membership in each model site also increased compared to before as indicated in the Table below. From the interviews carried out in the model sites, it was noted that by-laws enforcement had also improved in the schemes after carrying out institutional capacity building activities. All these indicate that institutional capacity building program was successfully implemented in the model sites and hope that the improvements so far achieved would be continued on a sustainable manner.

Table Increase of membership and members who paid O & M fees in the model sites

Scheme	Number of members in each year			Number of members who paid in each year		
	2003	2004	2005	2003	2004	2005
Mbuyuni	868	868	875	471	484	501
Mombo	180	190	300	180	190	300
Mwamapuli	888	888	907	798	787	820
Mwega	671	702	732	671	702	732
Nakahuga	68	100	125	24	100	120

#### **(5) Improvement of capability of KATC in collecting and providing useful irrigated rice cultivation information**

At beginning of the project, KATC was anticipated to establish Information Unit (IU) which would accumulate various information on irrigated rice farming so that KATC could be a reference center for any stakeholders on this matter.

The unit was projected to engage in; 1) collection of particulars of forty prioritized irrigation schemes from which the model sites would be selected, 2) building database for the information obtained through baseline survey in model sites, 3) establishment of information management system and 4) provision of the information to the concerned organizations and personnel related to the rice production.

This information related activity requires additional equipment and personnel. Personal computers, data storage instruments, video camera, TV monitor, VCR, color printer and authoring/editing computer soft wares were installed. Government of Tanzania had to struggle to recruit two additional for this unit. Finally in October 2002, one year after the Project had begun, information unit practically started a work.

Later in December 2004, information unit was merged with another unit of KATC – Curriculum Development Unit (CDU) – into Information and Curriculum Development Unit (ICDU). With this setup, KATC were to keep information such as publicity material, training records, future training plan, course time table, teaching materials and so forth in more intensive manner.

Under IU/CDU the following activities were done;

- October 2002 Establishment of IU
- December 2002 Publication of KATC leaflet
- - // - Publication of KATC calendar
- July 2003 Publication of KATC newsletter issue 1 (Kiswahili)
- December 2003 Publication of KATC calendar
- - // - Publication of KATC newsletter issue 1 (English)
- December 2004 Merger of IU and CDU, Establishment of ICDU
- January 2005 Former head of ICDU participated in "Agricultural Information System Technique course" held in Japan (Three months)
- July 2005 Establishment of information management system and publication system
- December 2005 Publication of KATC calendar
- April 2006 Organizing "Article writing training course" for KATC staffs (One week)
- - // - Establishment of KATC Web site

As the result, KATC II project achieved;

- 1) Particulars of forty prioritized irrigation schemes were collected through Participatory Irrigation Scheme Management course (PIRSMMA) held between January and March 2003. All stakeholders looked into obtained data and selected six model sites at "Workshop on selection criteria for Model site" held in July 2002.
- 2) The reports and pictures of baseline survey on six model sites were kept at ICDU. No special database to store results of this baseline survey has been established. But trial result at KATC's trial farm and model sites, series of farming survey data are continuously stored and analyzed at Rice Cultivation section and Farming Development section respectively.
- 3) The short-term expert in "Information Management" engaged in establishing information management system and publication system for KATC from May to July 2005. As a result, Regulation, Workflow and Manuals for information management are prepared and authorized. To meet needs and capacity of KATC, "Training output database" and "Training information database" are developed using Microsoft Excel.
- 4) Regarding provision of the information to the concerned organizations and personnel,

IU/ICDU has periodically produced nine newsletters, five in Kiswahili and four in English, and three calendars (2003, 2004 and 2005). KATC Web site was launched in April 2006 as an additional publication medium (<http://www.kilimo.go.tz/katcweb/html/index.htm>). Moreover, the Centre displays posters and distributes leaflets at various functions such as Nane-nane agricultural show, SADC exhibition (2005), Rice congress (2006), and so on.

**(6) Establishment of concept and approach to mainstream gender into plan, implement and monitor technical training on irrigated rice production**

The project activities were implemented according to the gender checklist based on Plan of Operation. Gender training needs was identified in Oct 2002 and gender checklist was prepared in the final version in November 2004. As mentioned 2.2.3, the concept of gender mainstreaming was to pursue equity of opportunity and equality of result from the project activities between both men and women. In order to achieve the concept, the project set the verifiable indicators as "Through the project period, the percentage of women participants in Key Farmers course and in-field training is more than 45% by considering gender needs in model sites". In Mwamapuli and Mbuyuni for 2nd season, the women's participation was slightly lower than the set 45%, but the consolidated figures of all six model sites were 48% and 46% for 1st and 2nd season, respectively.

Table The rate of women participants in the trainings

(1st season)	KF	IF	OF	Total
Mbuyuni	52%	45%	51%	48%
Mombo	50%	59%	46%	54%
Mwamapuli	50%	42%	36%	44%
Mwega	53%	43%	44%	46%
Nakahuga	49%	49%	44%	48%
Nduguti	40%	53%	N/A	47%
Grand Total				48%

(2nd season)	KF	IF	OF	Total
Mbuyuni	50%	40%	34%	41%
Mombo	48%	57%	58%	56%
Mwamapuli	51%	38%	33%	38%
Mwega	51%	42%	47%	45%
Nakahuga	48%	47%	49%	48%
Nduguti	45%	47%	50%	47%
Grand Total				46%

After identifying the gender needs the project conducted gender specific trainings in all schemes from November 2004 to January 2005. The training consisted of improved



stove making and family budgeting which contributed to achieve project objective. It means that improved stove could support farmers especially women to concentrate on rice farming activity by reducing the domestic labor. The knowledge of family budgeting helped participants to be motivated due to transparency of use of their income from rice farming.

Through the monitoring in 2005 and 2006 one year after in-field trainings period, many positive impacts were found by voices from participants, for instance, 1) In community, family and individual levels, women come to have confidence in their capacity, 2) Communities and men come to recognize women's capacity, 3) Access to their income became easy and transparent for both men and women, 4) Relationship between men and women became preferable, 5) Motivation for rice farming, especially of women, became higher than before, etc.

### 3.2 List of Products

During the project period the following products were produced by the project.

Item	Section in Charge*	Remarks
O &M plans	WM	Guidelines for implementing scheme activities/Technical guidance
Teaching materials (Water Management Notes) <ul style="list-style-type: none"> <li>▪ Water Management techniques</li> <li>▪ Operation, maintenance and repair of irrigation facilities</li> <li>▪ Management of irrigators' organizations</li> <li>▪ Environmental Management</li> </ul>	WM	To be stored in "Training Output Database" of IU/CDU
Guidelines for strengthening irrigators' organizations	WM	Guidelines for strengthening Irrigators' organizations/Technical guidance
Weather data	WM	Reference/planning data
Operation calendars	WM	Guideline for implementing farming, irrigation and scheme activities/Technical Guidance
Technical standard for model sites	RC	It shall have cropping calendar for major rice varieties, basic rice cultivation techniques and etc. summarized within one page or so.
Technical manual	RC	It shall describe basic rice cultivation techniques, which have been taught to participants during in-field trainings, and specialized topics, which are unique to each model site.
Trial report conducted at KATC trial plots	RC	
Teaching materials	RC, FD	To be stored in "Training Output Database" of IU/CDU
Technical manual	FD	
Farming survey report	FD	To make further analysis on technical aspect in addition to economical aspect.

\* WM: Water Management, RC: Rice Cultivation, FD: Farming Development, EFT: Extension and Farmer Training, IU/CDU: Information and Curriculum Development Unit

Guideline of Participatory methods. <ul style="list-style-type: none"> <li>▪ Participatory approaches</li> <li>▪ Participatory Planning, implementation, and Evaluation of Extension activities</li> </ul>	EFT	By compiling relevant teaching materials and handouts.
Guideline of Extension methods <ul style="list-style-type: none"> <li>▪ Extension methodology</li> <li>▪ Farmer to Farmer Extension</li> </ul>	EFT	By compiling relevant teaching materials and handouts.
Guideline of Community welfare <ul style="list-style-type: none"> <li>▪ Food Nutrition and Sanitation</li> <li>▪ Disease related to rice farming</li> <li>▪ Saving and credit facilities</li> <li>▪ Marketing</li> </ul>	EFT	By compiling relevant teaching materials and handouts.
Guideline of Gender mainstreaming <ul style="list-style-type: none"> <li>▪ Gender awareness</li> <li>▪ Gender in irrigated Rice farming</li> <li>▪ Family budgeting</li> <li>▪ Improved stove making</li> </ul>	EFT	By compiling relevant teaching materials and handouts.
Formats of Follow ups <ul style="list-style-type: none"> <li>▪ Monitoring of extension activities</li> <li>▪ Follow-up of the action plan</li> </ul>	EFT	
Teaching materials and Handouts	EFT	To be stored in "Training Output Database" of IU/CDU

## **4 Regional Technical Cooperation Promotion Programme (RTCPP)**

### **4.1 Introduction**

#### **4.1.1 Background**

Regional Technical Cooperation Promotion Program (RTCPP) was one of the activities which were implemented under KATC II Project. This activity was implemented as a trial for applicability of irrigated rice technologies accumulated at KATC to the neighboring four countries of Kenya, Malawi, Uganda and Zambia.

Before the implementation of this Program, KATC team exchanged views on the rice farming conditions and possibilities of conducting RTCPP in the four Eastern and Southern African Countries. During this time it was observed that these countries shared common policies with regard to the direction of national development, more especially on agriculture and were positive for participating in the implementation of the RTCPP. Following this result, JICA made minutes of understanding on implementation of RTCPP with Kenya in October 2001 and Zambia in December 2001 and thereafter with Malawi in March 2002 and Uganda in May 2002.

Baseline surveys were then conducted in the four countries to identify the possible candidate schemes and training needs. Through these surveys, one scheme from each of the four participating countries was selected before the training activities started.

#### **4.1.2 Target schemes**

From the field surveys that were conducted in Malawi and Zambia from 17th November to 1st December, 2002 and in Kenya and Uganda from 17th February to 26th February, 2004. Four schemes were selected namely; Doho Irrigation Scheme in Uganda, Southwest Kano Irrigation project in Kenya, Bwanje valley irrigation Project in Malawi and Sefula Irrigation Scheme in Zambia.

The outlines of these irrigation schemes are as given here under:

##### **(1) Doho Irrigation Scheme, Uganda**

This scheme is in the eastern zone of Uganda and was constructed by the Uganda government through the assistance of Chinese government in 1975 to 1989 at the request of the farmers to assist in the water control for better production. The construction works were done in two phases and the Chinese assistance continued up to 1993.

The Scheme comprises of 1,000ha and the number of farmers who cultivate in the scheme is estimated at about 2,350 people, out of which 700 are males and 1,650 are females. About 1,000ha are being irrigated outside the scheme, some upstream and some at the tail end of the project. The extension of area outside the scheme area keeps on increasing.

Two cropping seasons are adopted in the scheme (April to August and September to January), though sometimes are interrupted due to flooding in the scheme. Most farmers still transplant rice randomly with no defined spacing during transplanting. Due to inadequate tractors in the scheme, most farming operations are done manually.

Some of the problems in the scheme include:

- Inadequate maintenance of the irrigation system
- Siltation in the river and canals
- Breaking/Scouring of the river banks leading to river shifting
- Flooding of some fields due to blockage of main drainage canal
- Poor rice crop management
- Abstraction of water abstraction
- Poor water control
- Rice diseases and pests
- Lack of credit facilities for farming operations
- Soil fertility deterioration
- Interruption of irrigation by fishing in irrigation canals of the scheme, etc.

## **(2) Southwest Kano Irrigation project, Kenya**

This irrigation project partly lies in Nyando and Kisumu districts. It is a smallholder irrigation scheme being operated and managed by smallholder farmers through an irrigation board of directors. The board of directors is composed of 2 members elected from each of the seven locations covering the scheme area.

The total number of households involved in the projects is estimated at about 3,000, with a total number of 2,000 farmers cultivating in the project. The scheme area is about 1,110ha of which about 800ha is irrigated each cultivation season. The Project consists of 28 small schemes of about 20 to 80 ha sizes. The Scheme's history dates back to 1970's when farmers began using drain water from nearby government implemented rice scheme (NIB Ahero Pilot scheme) to grow rice. Later on in 1990's the project's water abstraction and supply infrastructure was constructed by the government and farmers started growing rice under their own operated and managed organization.

As of current, one cropping season is adopted, though due to maintenance problems, the cultivation is staggered in the schemes and it is not easy to identify the defined cropping calendar. Major varieties grown in the project are IR 27, ITA 310, Sindano and IR 54. Many farmers still transplant rice randomly and most of the farm operations are done manually.

Some of the major problems in the scheme include:

- Weak farmer organization
- Low use of inputs (fertilizers, certified seeds, etc)
- Negative influence on social or community interest on scheme progress.
- Poor maintenance of irrigation facilities and structures
- Lack of credit facilities for farmer's farming operations
- Flooding which occurs between April – May lead to delayed cropping seasons.
- Profitable marketing of paddy/rice, etc.

## **(3) Sefula Irrigation Scheme, Zambia**

This Scheme is in the Western province in Mongu district. It has a total area of 200ha, covering 17 villages. Of the total area, 89.6 ha has been developed. The average plot size per farmer is 0.25ha and the total number of farmers involved in the Scheme is about

300, of which 60% are women and 40% are men. The scheme was rehabilitated through the JICA assistance and is managed by Sefula water users' Farmer Group (SWUFG). Major crops grown in the Scheme are rice and maize. For rice, the varieties being grown in the scheme are Koshihikari, Angola, Super and Blue bonnet. Most farmers practice random transplanting and few farmers apply fertilizers in rice fields. Most farming operations are done manually using hand hoe. Most Fields are not well leveled and bunds are small and not uniform.

Some of the major problems in scheme include:

- Weak farmers' organization
- Poor and untimely maintenance of irrigation facilities
- Unlevelled rice plots and poor bunding.
- Non-adherence to cropping calendar
- Poor rice management in the fields
- Flooding in some parts within and outside the scheme.
- Few irrigation canals
- Most farmers still practice random transplanting with no defined spacing.

#### **(4) Bwanje Valley Irrigation Scheme, Malawi**

Bwanje Valley irrigation Scheme was rehabilitated and expanded by the government of Japan through JICA assistance in 1999 – 2001. The Total area under the assistance was 800ha benefiting 2,240 households from 14 villages. The number of people who cultivate in the scheme is estimated at about 1,680 farmers, out of these 1,260 are males and 420 are females. The scheme is managed and operated by farmers themselves through a cooperative known as Bwanje valley cooperative society. The major crops grown in the Scheme are rice, maize and beans. For rice, the major rice varieties grown are: Pussa 33, Faya, TCG 10 and Kilombero.

All farm operations in the scheme are done by hand only few farmers use oxen for land preparation. Hand tools used include hand hoes, pangas, slashers and sickles for harvesting. Majority of farmers use random transplanting, though some have adopted line transplanting using various spacings:

Some of the major problems in the Scheme include:

- Frequent changing of the river course because of unstable river banks.
- Unlevelled rice plots – slow rate of carrying out land levelling by Malawian government as agreed upon before rehabilitation of the scheme
- Weak farmer's organization
- Poor rice management
- Untimely maintenance and repair of irrigation facilities and structures.
- Flooding in some parts within and outside the project.
- Slow adoption of technologies by farmers
- Lack of credit facilities for farmers.

## **4.2 Overview of activity**

To begin with, the project formulated baseline survey teams to collect fundamental and current situation of the target schemes of Zambia & Malawi (17 November – 1 December 2002) and Kenya & Uganda (17 – 26 February 2003) respectively.

RTCPP was programmed to follow the approach for model sites in Tanzania, which is to train Key farmers at KATC conducting a series of follow-up in-field trainings later at their sites with larger participants.

Thirteen Key farmers accompanied by two extension workers/officers from each scheme were invited to three week courses at KATC in June (Zambia and Malawi) and September (Kenya and Uganda) 2003.

And then prior to new cropping season would begin, the first in-field training session was conducted. Two KATC tutors and a project expert teamed up and held a workshop for problem identification, objective identification and action plan making in order to set the common goal for every participant and gave introductory lectures on irrigated rice production.

Full-scale lectures of theoretical and practical aspects were provided from second in-field training up to the fifth. Team of four tutors from Rice Cultivation, Farming Development, Water Management and Extension and Farmer Training section simultaneously taught different topics in accordance with rice growth stages. RTCPP trainings were held twice in a year basically for land preparation/transplanting and harvesting through out two consecutive cropping seasons as listed below;

Course	Stage	Year	Month/Day
Group training course for extension workers/officers and key farmers (Zambia, Malawi)		2003	6/9-20
Group training course for extension workers/officers and key farmers (Kenya, Uganda)		2003	9/8-19
1st In-field training (Uganda)		2003	10/26- 11/1
1st In-field training (Kenya)		2003	11/2-8
1st In-field training (Zambia)		2004	1/17-24
1st In-field training (Malawi)		2004	1/25-2/1
2nd In-field training (Uganda)	Land preparation/Transplanting	2004	2/9-14
2nd In-field training (Kenya)	Land preparation/Transplanting	2004	7/1-7/7
2nd In-field training (Zambia)	Land preparation/Transplanting	2004	7/31-8/7
2nd In-field training (Malawi)	Land preparation/Transplanting	2004	8/8-8/15
3rd In-field training (Uganda)	Harvesting	2004	8/22-8/28
Continuing 2nd In-field training (Kenya)	Land preparation/Transplanting	2004	9/9-11
3rd In-field training (Kenya)	Harvesting	2004	11/1-6
3rd In-field training (Malawi)	Land preparation/Transplanting	2004	11/22-26
3rd In-field training (Zambia)	Land preparation/Transplanting	2004	11/29-12/3
4th In-field training (Uganda)	Land preparation/Transplanting	2005	4/18-22
4th In-field training (Zambia)	Harvesting	2005	5/21-28
4th In-field training (Malawi)	Harvesting	2005	5/29-6/5
4th In-field training (Kenya)	Land preparation/Transplanting	2005	6/5-11
5th In-field training (Zambia)	Land preparation/Transplanting	2005	12/12-16
5th In-field training (Malawi)	Land preparation/Transplanting	2006	1/9-13
5th In-field training (Kenya)	Harvesting	2006	1/16-20
5th In-field training (Uganda)	Harvesting	2006	3/6-10

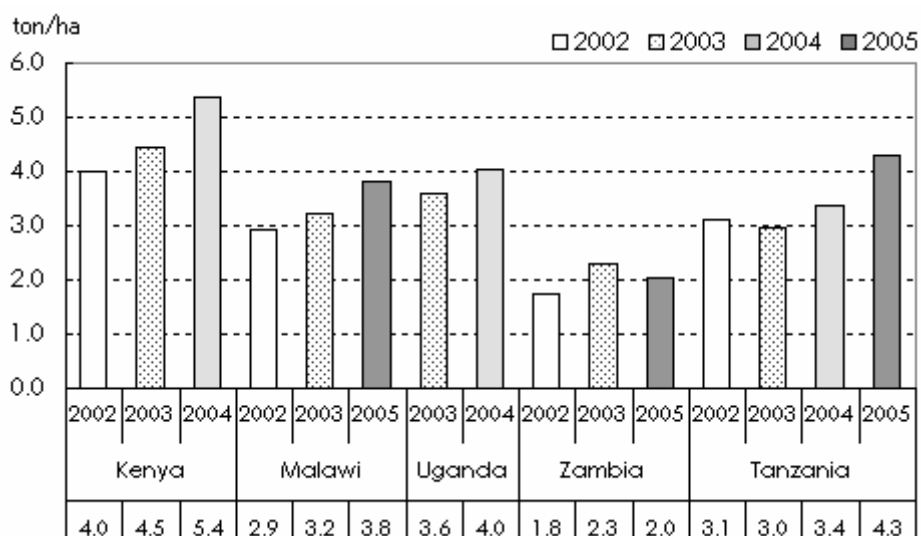
Approximately 90 farmers participated in in-field training every time. In the "Field day", where other farmers than Key or Intermediate farmers are invited to share knowledge taught and the results of Key/Intermediate farmers trained, are held, number of participants sometimes doubled. The largest was 194 farmers who attended Field day at Bwanje Valley scheme, Malawi on 2nd June, 2005.

## 4.3 Result

### 4.3.1 Productivity

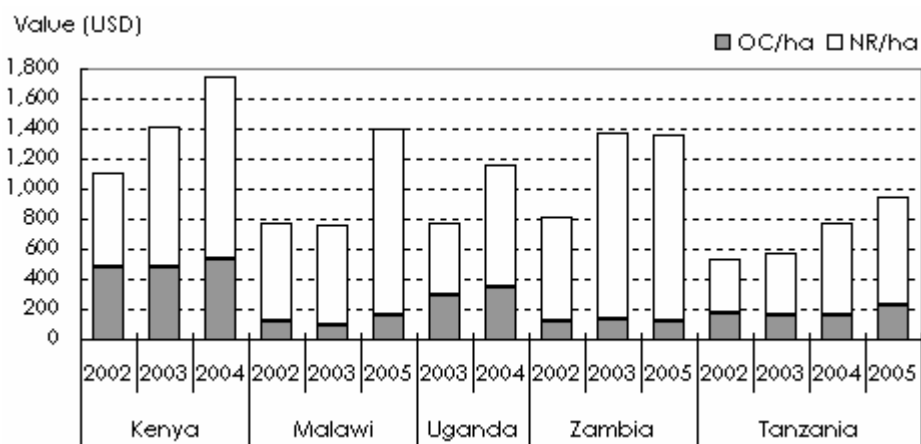
The data on yield and cost of rice production were collected from participated farmers of each country under the RTCPP however the periods of the collecting data were not identical for all the countries because it was commenced after the actual trainings were already started since it was not planned originally as a project activity. According to the analyzed results, the average rice yield increased from 4.0 to 5.4 tons per hectare in Southwest Kano scheme in Kenya, from 2.9 to 3.8 tons per hectare in Bwanje valley scheme in Malawi, from 3.6 to 4.1 tons per hectare in Doho scheme in Uganda, and from 1.8 to 2.0 tons per hectare in Sefula scheme in Zambia respectively. Although the average rice yields increased in all the schemes, the levels of increment were different by country probably due to the differences in agricultural environments and socio-economic conditions of the countries. The increase in rice yield was achieved in

all the member countries in RTCPP because the training contents and methodologies of KATC fitted the needs of the rice farmers and were applicable to their rice farming.



Graph Average Rice Yield in the Schemes under RTCPP

The gross and net returns from rice cultivation also increased in all the recipient countries of the trainings and they were resulted by the increases in the rice yield and price. The rice prices were constantly increased in Malawi, Uganda and Zambia, which suggests the stability of rice market in the area. The increased cash income by rice cultivation could contribute to improve the farmer's livelihood and life standard because the farmers in the rural areas have very limited opportunities to earn cash incomes.



Graph Operation Cost (OC) and Net Return (NR) per unit area in the Schemes under RTCPP

The profitability of rice cultivation improved in all the country increasing the net return much more than the operational cost. More money was spent for the labour other than the materials like fertilizer and chemical, which indicates that the farmers tried to apply their technical know-how learnt from the training in their fields.

The improvements in the rice yield, net return, and profitability in the member schemes in



RTCPP imply the effectiveness of KATC training on rice cultivation in Southeast Africa. The training contents and methodologies of KATC training are appropriate and applicable for the improvement of rice yield and livelihood of small scale rice farmers in this area.

### 4.3.2 Building capacity

#### (1) Residential courses

As mentioned 4.2, KATC conducted residential courses for Key farmers and extension officers from the model sites of each country. The training contents were mostly same as for Key farmers from six model sites in Tanzania.

The table below shows how many numbers of technique/skill were adopted by more than 80% of farmers and more. Key farmers who attended residential courses adopted more technique/skill than Intermediate farmers. The residential course made Key farmers active to introduce the new technologies which could bring benefits to them. It can be said that the residential courses were effective.

Table The number of the technique/skill adopted by 80% of farmers and more.

Out of 43 tech/skill	KF	IF
Kenya	28	5
Uganda	22	16
Zambia	25	16
Malawi	38	36
Tanzania	37*	28*

\* The results were counted out of 40 techniques.

#### (2) In-field training

As shown in the above table, in the case of Uganda and Zambia, Intermediate farmers, who attended only in-field trainings, adopted 16 items of 43. This must have brought the increase of the yields as shown in the 4.3.1.

Also in-field trainings can train more farmer-beneficiaries at low cost compared to residential courses, which had limited number of participants. For instance, 13 KF from each site were invited to residential course whereas about 80 farmers attended in each in-field training as Intermediate farmers, also more than 200 farmers participated in the field days as Other Farmer (OF).

In addition, positive impact on the communities was observed. For instance, some of water user's cooperatives and village councils have become active and functional after the KATC trainings as its members learned the importance of discussion within the communities through the trainings.

#### (3) Capacity building of KATC tutors

The KATC tutors conducted in-field trainings in various conditions such as different custom, field condition, and languages from Tanzania. Through these experiences, KATC tutors have built up flexibility and capacity in conducting trainings.

## **5 Implication**

### **5.1 Factors leading to attainment of project purpose**

There are several basic reasons why KATC Phase II could attain the project purpose despite the rather severe farming conditions in the rural areas of Tanzania and within such a limited cooperation period;

- The first is the consistency on the agricultural development policy of the Government of Tanzania.
- The second is the mutual trust between Tanzanian and Japanese people.
- The third is because of spending enough time for planning the implementation process of the Phase II Project.
- Tanzanian and Japanese sides made sure that the project was well managed and well staffed.
- From the very start in 1994, MAFC acknowledged KATC as a specialized training institute for irrigated rice farming and has consistently supported it financially and with manpower allocation. This is in recognition of the role of farmer training in all aspects of food security and poverty alleviation in areas practicing irrigated rice farming.
- Japan has had a long history of cooperation in the development of irrigated agriculture in Tanzania. For example, the development of Lower Moshi Irrigation Scheme in Kilimanjaro region remained an outstanding success story since the 1970s.
- During seven years of implementing KATC Phase I Project which included two years of follow-up, KATC managed to train nearly 2,000 technical personnel and key farmers all over Tanzania. This experience gave KATC a strong foundation as a specialized training institute for irrigated rice farming.
- The accumulated experience of KATC Phase I Project formed the basis for the formulation of KATC Phase II making it possible to come up with PDM and PO that addressed the needs and aspirations of the project beneficiaries, despite the fact that two years had to be spent making preparations for in-field training activities in the six model sites.

### **5.2 Way forward - Suggestions and Recommendations**

The most important achievement of the KATC II Project is the fact that we managed to influence small scale farmers to improve productivity of irrigated rice mainly through training, with almost no other inputs. It proved beyond reasonable doubt that technology transfer to small-holder farmers, when done in a participatory way, will contribute effectively to poverty alleviation in the rural areas and ensure food security for the future. In other words, the lesson learnt from KATC II Project is that farmers and field personnel are in need of technical enhancement through which relevant knowledge, skills and proper attitude is imparted to help them build self confidence in their efforts to improve production and productivity of agricultural crops.

The challenge ahead is how these encouraging results obtained in the KATC II model sites could be spread to other irrigation schemes, especially those listed up in National

Irrigation Master Plan (NIMP) and how these efforts could be realized in the context of ASDP/DADP.

It is therefore recommended that efforts be made to spread the achievements of KATC II Project from model-sites to all other irrigation schemes in Tanzania and continue making further modification/adjustment of training programs of KATC to meet various local needs together with enhancement of other training institutes, research institutes and zonal irrigation offices.