Affordable Micro-Irrigation Technology (AMIT) in Eritrea Pre-feasibility Study Report (March - September, 2001)

A collaborative Project between the Centre for Development & Environment (CDE),Univ. of Bern, International Development Enterprises (IDE) & the College of Agriculture & Aquatic Sciences (CAAS), Univ. of Asmara

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I. Background

Agriculture is the mainstay of about 80% of the Eritrean population. Agricultural activities include crop production both irrigated and rain fed production, livestock production and a small portion of the population is engaged in fisheries.

Eritrea has a total potential arable land of 12,252,515 ha. Of this, 439,000 ha (3.6%) is under cultivation (FAO, 1994). Of the cultivated area, 95% is under rain fed production and 2 % is under irrigated crop production. Irrigation is concentrated around small rivers and streams, along micro-dams and sometimes in dug wells especially in the lowlands. Most irrigated crops are forage and horticultural crops such as alfalfa, elephant grass, Sudan grass, citrus, banana, mango, onion, pepper, tomato and leafy vegetables.

Currently most small scale farmers use furrow and basin irrigation systems. The land holdings per farmer in many areas is very small, usually less than a hectare. This small area makes small scale irrigation kits very suitable.

Project Description

The project on AMIT in Eritrea was therefore initiated in view of the wide presence of irrigated horticultural and forage production in Eritrea. The project aims at

- providing small scale farmers engaged in irrigated crop production with affordable high tech irrigation kits;
- addressing the shortage of irrigation water and the economical use of available water resources for useful forage and horticultural production;
- assessing the acceptance of the systems by farmers and studying the social, economical and environmental implication of the adoption;
- partially addressing gender problems by providing a feasible home garden kit that may help alleviate the domestic problems of women through the generation of cash crops or crops for home consumption.

The irrigation systems in distribution, were developed by International Development Enterprises (IDE) in India with the support of the Swiss Development Co-operation (SDC). These systems have been tested in various countries including India, South America and some African countries. They have been found successful as they have several advantages such as being very economical in the consumption of water, saving labour and time and have helped in increasing the quality and quantity of products.

The introduction of the kits and the feasibility study in Eritrea is performed and coordinated by Centre for Development and Environment (CDE) of the University of Bern. The College of Agriculture and Aquatic Sciences (CAAS), of the University of Asmara, serves as a local collaborative institute. CAAS helps in the distribution of kits, coordination of activities and the monitoring and assessment of the performance of the kits.

In year 2000 a preliminary pilot kit introductory mission was done by the CDE staff. During this time 2-3 kits were distributed to farmers through private communication and on the basis of willingness of the farmers to participate. These farmers were very keen on the kits and had a positive reception. This encouraged the project leaders to test the kits with more number of participants and also in a wider distribution of areas. This would help larger exposure of the kits to farmers and cover more representative areas as well as help in the build up of local partners in various localities.

2. Methodology and Project Sites

In the pre-feasibility study the first step was the identification of project sites. However, because the time scheduled for this activity was limiting, sites were not selected according to set criteria. The team therefore decided to speed up the data collection process by distributing the kits using two methods.

- 1. Approaching farmers who were willing to be part of the project either because they had some idea of the kits or wanted to be part of the project when approached by the team. Most of the farmers were suggested by the sub-zoba Ministry of Agriculture officers.
- 2. Collaborating with institutions such as the College of Agriculture and Aquatic Sciences, University of Asmara, the Research Division of the Ministry of Agriculture in Halhale, the Hagaz and Hamelmalo Agricultural schools and the Elaberet Estate farm. These institutions were willing to use the kits and serve as demonstration sites for farmers around the area. Both the Hagaz and Hamelmalo schools of agriculture involved their students very actively and was part of their training. This was definitely an encouragement as these students could help in the dissemination of the results much easier.

Accordingly 29 kits were distributed in areas covering a considerable part of the country (table I) (Site Map Fig I). In total, there were four kits: a kitchen garden kit, a vegetable kit, a horticulture kit and a micro sprinkler kit (Annex I).

During the time period March - Sept 2001 the project team made 2-3 visits to the sites to monitor and assess the results. This report aims to cover the results of the pre-feasibility period.

Table I: Distribution	of Kits in	Eritrea
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Site	Contact Person	Type of Kit			
		Bucket	Horticult ure	Vegetabl e	Micro sprinkler
Adi Jemel	Solomon G/kidan	I			
Afdeyu	Semere and Daniel	I			
Akurdet	Osman Damer	-			I
Asmara	Dr. Josef Muller	I			
Barentu	Hadera Hagos		I		
CAAS, Univ.	Dr. Bissrat Ghebru	I	I	I	I
of Asmara	Abrham Mehari				
	Samuel Asghedom				
Adi Keih	Meri Gida Farm				I
Elaberet	Ahmed		I		I
Gaden, Ala	Isayas			*	
Valley					
Gaden Ala	Sium Fesshaye	I			I
Vallye					
Gahtelay	Berhane	I			
Hagaz	Teodros			I	
Hagaz Agri-	Brother Amilcare	I	I	I	I
cultural School					
Halhale,	Ermias Adhanom	I		I	
Research	Horticulturalist, Selome				
center MOA	Tadesse Agric. Eng.				
HamImelao	Solomon Tesfahun	I	I		
Agricultural	(Fafa)				
School					
Mendefer	Alemseged Kiflai	I			
Menshib	Shibili and Yemane	2			
Village					
Shiketi	Beyene Kiflet	I			
Total		13	5	5	6

* Incomplete set

3. Description of Affordable Micro Irrigation Technology (AMIT)

Pressurized irrigation systems (sprinkler and drip) were introduced in the early 1900's. Compared to the conventional surface irrigation systems, pressurized irrigation systems produce a higher quality and greater quantity of high value crops with less water, time and money.

Until 1980's, however, most of the poor small holder farmers in many developing countries have been deprived of this modern irrigation technology mainly because of its high initial investment cost and the fact that it is too big for tiny (less than a ha) plots.

In recognition of the above problem, the International Development Enterprises (IDE) have recently developed a range of AMIT kits. The kits are suitable for the poor small holder farmers for the following main reasons:

The kits need very low initial investment. Their cost ranges from about 150 to approximately 800 Nakfa;

- 1. The kits are easy to assemble and dissemble and do not need high technical abilities for operation and maintenance; and
- 2. The area coverage of the kits ranges from 20 to 100 m^2 .

During the pre feasibility study of the validity of AMIT kits in Eritrea, the kitchen garden/ bucket, vegetable, horticulture and micro-sprinkler kits were assessed. The main features of these kits are summarized in table 1.

Features	Bucket	Vegetable	Horticulture	Micro - sprinkler
Major components	Main and lateral lines, micro tubes, filter, fittings, pegs			
Irrigable area (m²)	20	100	130	160
Number of emitters	36	150	50	15
Minimum & maximum number of plants	36 & 144; for spaced & row crops	150 & 600; for spaced and row crops	50	mainly used for closely spaced crops
Head required (m)	1	2	2	10
Emitter discharge (l/h)	2 to 3, depending on the head of the water source	2 to 3; depending on the head of the water source	2 to 3; depending on the head of water source	2 to 3; depending on the head of water source
Required size of water storage bin	20 l bucket	200 I barrel	200 I barrel	500 I barrel
Types of crops	Vegetable crops	Vegetable crops	Perennial fruit crops	Vegetable, flowers, pulses, cereals, etc.

Table I: Main features of AMIT kits

4. Project Activities in Eritrea: Assessment by Site

Hagaz Agricultural School

Hagaz agricultural school is located about 29 km away from Keren on the main road to Aqordat. The school has middle level agricultural students and was selected as one of the sites where students could learn and disseminate the technology to others. The director of the school, Brother Amilcare, the teachers and the students were very co-operative.

Three kits namely bucket, vegetable, and sprinkler were demonstrated and installed in Hagaz agricultural school in the month of March. The students were very keen to work with the kits. Groups of students were formed to work on the kits. The structures made to support the bucket and vegetable kits were very interesting and have impressed the team.

Different vegetables were planted both in the bucket and vegetable kits. Due to very high temperatures (> 40 $^{\circ}$ C) and windy condition, most of the vegetables could not perform well. The school has experienced that it is impossible to grow vegetables under the harsh climate of the months of March-May. However, it was encouraging for both the students and teachers and the team to see the healthy and rapid vegetative growth of groundnuts.

The major technical problems encountered with the vegetable and bucket kits was the frequent clogging of the micro tubes. As evidenced, this is mainly due to the poor quality of water: high amount of suspended matter and salinity. The sprinkler kit was used for the plantation of alfalfa. The sprinklers were properly spaced. The distribution uniformity of the water and plant coverage was about 90 %. Three sprinkler nozzles malfunctioned and were replaced.

During the follow up visits an agreement was reached with Brother Amilcare, the Director of the school, that the school could be a back up site to train, and supervise surrounding farmers. The school has a short term training program for farmers that could incorporate this project as a package.

Hamelmalo Agricultural School

Hamelmalo Agricultural School is located at about 20 km north east of Keren City. In the agricultural field of the school both bucket and horticultural kits were installed. Due to the harsh climatic situation during the months of March - May, the tomatoes and other vegetables could not sprout and the bucket kit was dismantled to be tested between October and January. Papaya trees were planted in each of the micro tubes of the horticultural kit. For comparison purposes micro basin irrigation was used for 5 papaya trees.

Both the teachers and students in the school were surprised to see a papaya tree reaching a height of about 1.5 meters by the supply of water from just one micro tube in only two months. The data collected by the student's show that although the vegetative growth of the papaya under the kit and the micro basin was comparable, the amount of water utilized, the time and labour spent in the kit was only one third of that applied in the micro basin irrigation system.

During the last visit of the team, Ato Biniam, the teacher in charge of the kits, organised a group of farmers from the surrounding area to observe the performance of the kits. Many of the farmers had a positive impression on the kits and asked if they could also get the chance to test it. The farmers showed high interest to use and test the kits.

Hamelmalo is also selected as a base station to back up the project.

Aqordat

Aqordat is one of the main cities in Eritrea located about 172 km west of the Capital Asmara. The suburbs of Aqordat are well known for fruit and vegetable production.

Based on the advice of the relevant staff of Aqordat sub-zoba Ministry of Agriculture office, an individual farmer Ato Damr and his sons were consulted and briefed on the different types of kits. The sprinkler kit interested them most as they were engaged in forage production for their dairy cattle and tomato seedlings.

In Aqordat, during the month of May, temperatures rise as high as 50 °C. During the teams follow up tour, the team observed dogs and big birds bathing in the furrow irrigation canals and lied in the sprinkler irrigated forage area. According to Ato Damr sons', the fine discharge of water of the sprinkler provided a perfect cool climate for the birds which constantly lied on the area and hindered the growth of the grass by picking the seeds and causing direct physical damage to the sprouting seedlings. The team suggested that a shade could be made with cheaply available plastic sheets to prevent the landing of birds. If the kits are to work on cooler seasons such problems might not exist.

Alongside the sprinkler field, the farmers set a macro basin field for comparison purposes. Their estimation is that almost half of the labour and three quarter of the water they utilise under the basin system could be saved by the introduction of the micro irrigation kit. They would however like to have a minimum of 10 kits to appreciate the harvest. The farmers planned to use the kit to raise tomato seedlings for the next season.

Barentu

Barentu is the Gash Barka province main city. It is located about 230 km west of the capital Asmara.

The suburbs of the city have not been famous for the production of fruits and vegetables. Recently, however, some progressive farmers are taking the lead in the enlargement and rehabilitation of their existing farms and establishment of new irrigation systems to boost the fruit and vegetable production.

The team consulted Mr. Hadera, one of the progressive farmers in the area and demonstrated the horticultural kit, with some customisation to fit the area. The farmer grows vegetables in basins with papaya fruits on the boundaries of the narrow basins. To fit the kits with the field layout, only two laterals were used but with additional extensions at the rare end. So basically the length of the laterals were doubled to suit the area. It was the first customisation experience to the team.

During the months of April and May, water is so scarce that almost no agricultural activities are done in the area. In spite of this fact, the team suggested to go ahead with the planting of papaya using the horticulture kit which could also help the team to assess the effectiveness of the system under harsh climate.

The papaya plants performed well and the vegetative growth was excellent during the follow up periods. The farmer was also impressed to see the plants grow successfully at that time of the year. Other neighbouring farmers did appreciate the kit and are looking to be the beneficiaries in the future.

Horticultural activities seem to be at its' inception on this area. Therefore it could be a good opportunity for the team to encourage farmers to enter into this business with simple technology.

Adi Keih

Meri Gida farm, which belongs to the Eritean Disabled Association, was one of the sites selected in Zoba Debub, Adi Keih. The farmers in this farm, grow vegetables and have dairy cattle and poultry.

A sprinkler kit was demonstrated and installed in the farm. The farmers were very much interested in the kit. They made a tap specifically for the kit and there was enough pressure to run the sprinkler. The site selected for the kit was a nursery site where different kinds of vegetables were raised.

During the follow up visit, the team observed that the sprinklers were working properly and the vegetables on the nursery were growing perfectly.

On the teams' last visit to the area, the kit was dismantled (because of the rainy season) and was properly stored to be used for the next season. The group of farmers are eager to see more of the kits for vegetables and Alfalfa.

About seven kilometres from Adi Keih, there are a number of farmers, which could be a target group for the test phase.

Shiketi

Shiketi is located south of Asmara on the way to the town of Debarewa. The team from Switzerland on its first mission gave the kit to one housewife. The bucket kit on our first visit had an interesting and nice fence with good structure to lift the bucket. The lady managed the garden and the kids fetched water from a well by donkey everyday. The transplanted lettuce was performing well. Only few have to be replaced after planting. The lady told the team that she liked the kit very much and the yield she got from the farm were helpful for household consumption.

The distance that the kids had to travel and fetch water was one of the problems she mentioned and the group felt that distance of the water source has to be studied as a major factor in the test phase.

Halhale

Halhale is located 35kms away south of Asmara, where the Research Centre of the Ministry of Agriculture is based. The team selected this place as on of the sites for demonstration. The team demonstrated all the kits in this area and left a bucket, a vegetable and a sprinkler kit.

Some vegetables were available in the nursery, and by chance, it happened to be a good timing. On the second tour, the team members planted the vegetables for the bucket and vegetable kits. Three varieties of Pepper (Alaba, Marcofana, and Slimlong) were planted in the bucket kit. The bucket was filled twice a day and the pepper grew successfully according to report from the staff of the research centre. The healthy growth and development of the pepper impressed the team and the yield was interesting. The pod size was one of the remarkable changes that we saw compared to the same varieties on the other surface irrigated plots. The researchers have proposed that some scientific studies can be conducted on such indicative observations. Fetching of water was not a problem, yet they explained that the ease of filling the bucket twice a day compared to the water application for the basin irrigation in the nurseries.

Five different varieties of tomatoes were planted using the vegetable kits. Each line of the laterals received one variety of tomato. The tomato plants grew very well, much better than the same varieties of tomato in the furrow irrigation system. Fruit size however were observed to be smaller than those grown on furrow irrigation. Although it was difficult to reason out the cause for this, the researchers suggested that it would be interesting to conduct an experiment on this issue.

Clogging was observed in the drips due to the salty nature of water and the attendant had clean the drippers regularly. The researchers explained that the time spent on maintaining of the kits due to clogging is comparable to the time needed for weeding or other agronomic practices. It was not possible to install the sprinkler kit in the College of Agriculture & Aquatic Sciences (CAAS) for there were no seedlings ready to be transplanted using this system. The team approached the Forestry Unit of the research center and requested if they could use it raising seedlings but there was not enough pressure on the taps. As a result, the team agreed that they will be supplied on the next phase when they are ready with the taps and the kit was installed in another site.

Mendefera

Mendefera is located 56 km south of Asmara. A bucket kit was demonstrated and installed at a compound of a progressive Gardener. At the beginning, he felt that there wouldn't be enough water for his vegetables from such kits but was very keen to practically see how the kit works.

During the follow up, the team observed that the kit was properly installed and that the gardener was irrigating his peppers very well. At the time of transplanting of the peppers the gardener was sceptical that, the transplanted seedlings at a distance from the exact spot of micro tubes couldn't grow properly. However, he practically observed that the seedlings performed better than the ones he planted very close to the micro-tube position.

The pepper was growing very well and that he picked quite considerable amount of pods from the plot. The yield as compared to the pepper plots in the backyard with furrow irrigation was almost double. The gardener appreciated the system very much and he is looking to have bigger kits for his backyard vegetables.

The gardener clearly put it that by using this kit he is saving almost half of the time, labour and irrigation water he spends in his furrow irrigation system.

The team would like to underline the great interest and responsibility of the gardener which could be an asset in promoting the technology in the area.

Gaden

Gaden is located 17 km away from Dekemhare city. It is one of the major citrus production areas in Eritrea. Farmers are also involved in the production of vegetables like tomato and pepper.

In the first visit, a horticulture kit was demonstrated in a farm, which belongs to five brothers, among which Ato Isayas was our contact person. Nevertheless, he was interested more on the vegetable kits because of the land holding problems. Like most growers in the area, he doesn't own the land. It is rented land. Therefore, he was not willing to grow fruit trees which need more time to give fruits. Therefore, on its second visit, the team gave a vegetable kit to Ato Isayas. During the follow up however, the kit was not in place. The team found out that the main line was missing and due to lack of spare parts, it was not possible to install the kit.

The Swiss team on its first mission had however installed one bucket and one sprinkler kits in the farm which belongs to Catholic Bothers Mission run by Ato Sium and the kits were working very well. Onions and tomatoes were grown successfully with the sprinkler kit and the bucket kit was used for small garden flowers.

The old woman that takes care of the kits told the team that the kits save both labour and time. In simple terms she mentioned that "I can do other household activities while irrigating my vegetables and flowers."

5. Constraints of Implementation

Some of the problems encountered during the pre feasibility study include:

Time of distribution

In the lowlands, such as Hagaz, Hamelmalo, Shieb and Gahtelay, the kits were distributed during the hottest and windiest months where vegetable production is unthinkable. It was interesting to see (under such a harsh environment) that some kits managed to support good vegetative growth of some vegetables in certain areas. Nevertheless, as there was no vegetable production under the conventional surface irrigation systems, it was not possible to make sound comparisons.

In the highlands, the rainy season started before the vegetables raised by the kits could be harvested. This caused difficulty in making proper yield comparison between the micro-drip and the respective surface irrigation systems.

To avoid the above noted difficulties, the team suggested that both in the highlands and the lowlands, the distribution of the kits should be done in the months of October and November.

Clogging Problem

In Hagaz and Halhale, the vegetable and bucket kits showed frequent clogging problems. The seriousness of the clogging was illustrated by the staff and students in Halhale and Hagaz in the following simple terms:

"We have to clean at least five micro tubes every fifteen minutes and hence we have to be almost constantly around during the irrigation time" Hagaz students.

" If I have to take care of at least 5 vegetable kits, I think the time I would spend in cleaning the micro tubes and adjusting the pegs would almost be the same as the time I need to weed the same area under surface irrigation systems" Halhale research station staff, Tesfay. The team found out that the main reasons for clogging are the high amount of dissolved sediments and salinity in the irrigation water. These problems could however be minimised quite easily. To reduce the amount of the dissolved sediments, a piece of cloth could be used as a sieve when filling the bucket and barrels. As in the case of the large-scale drip irrigation systems, small quantity of dilute sulphuric acid could be used to neutralise the salinity and hence prevent its build up in the main and lateral lines, and micro tubes.

Packing problem and lack of spare parts

One of the vegetable kits was found to be lacking the main line. The team thinks that this is most probably due to packing problems. As about 240 kits are to be distributed during the test phase, care should be taken to ensure that such mistakes do not occur.

The team had no spare parts such as main line, lateral, the necessary fittings and even pegs. This has resulted in the non-utilisation of the vegetable kit with missing parts. It is very important that some spare parts are made available for the test phase.

6. Conclusion and Recommendations

The agricultural institutions and individual farmers who tested the low cost micro drip/sprinkler kits are convinced that the kits (as compared to the conventional surface irrigation systems) could produce higher or at least the same yield of vegetables and fruits with less amount of water, labour and time.

In some of the distribution sites in the highlands, such as Mai-Habar and Adikeih, the vegetable and bucket kits are preferred to the horticultural kits. This is mainly due to the fact that the farmers do not own the land and they are reluctant to invest in fruit trees which call for high initial investment and only produce after many years. The sprinkler kit has the least preference since it needs a higher pressure (a minimum of 10 m head) and a taped water, which are not available in the fields of many small scale farmers.

On the basis of the results from the pre-feasibility assessment, the team has come forward with suggestions on how to go about with the test phase planned as of Oct 2001 (Annex 2).

Annex

Photographic Documentation of the Pre-feasibility trials



Students of Hagaz school of agriculture tested the effect of drip irrigation on different vegetables



Vegetable growing trials with a bucket kit in Hagaz agricultural school



Sprinkler kits are tested for closely spaced crops in Hagaz agriculture school



Installation of a sprinkler kit in Gash Barka



Presentation and explanation of a drip kit in Gahtelay



Demonstration of a bucket kit in Hagaz agricultural school



Farmers attending a demonstration of drip kits in Sheeb



Customizing of a horticulture drip irrigation set for papaya trees planted along the field border in Barentu

Water pressure must be reduced when connecting the set to a conventional irrigation pump

Expert discussion on irrigation trials in Hamel Malo agricultural school

Annex 2

Preliminary Test Phase Program

On the basis of the findings of the pre-feasibility study, the team worked out the potential distribution sites, the type and quantity of kits to be distributed per site, and the modalities of distribution.

I. Modalities of Distribution

The agricultural schools and institutions selected in the pre-feasibility phase were helpful in the collection of reliable data. Since all of them have direct relationship with the surrounding farmer communities, they are the most appropriate sites of distribution as well as monitoring of activities. The direct involvement of the students in Hamelmalo as well as in Hagaz could be utilised to get more organised and well recorded data from nearby farmers. Both Hamelmalo and Hagaz schools have shown their readiness to be part of the test phase as well and hence this initiative should be maximised.

The irrigation kits in distribution are meant for small scale farmers with land holdings of less than 2 hectares. The kits need different pressure and are utilised for different crops. Therefore, the main criteria used for selecting appropriate site for the kits and estimation of the number of kits to be distributed to each site are type of crop, land holding, and total number of farmers.

During the pre-feasibility phase, all the kits were distributed freely. However, this way of distribution will not be sustainable for various reasons. The project team, therefore investigated alternative distribution methods through direct discussion with farmers, with ministry of Agriculture sub-zoba administration staff as well as farmers' association in Hagaz. The outcome of the discussion was that all the farmers were willing to pay the cost of the kit provided they are satisfied with the outcome. They however, wanted to see the kits functioning in their vicinity before they make their final decision.

2. Proposed distribution sites and estimated number of kits per site

The potential distribution areas and the estimated number of kits in each site are given in table 1 and 2 respectively.

Table I. Potential Distribution Sites

Location Zoba, Sub Zoba or area		Total No. of farmers	Land per househol d (ha)	Total land holding (ha)	Type of crops Grown
Anseba	Hamelmalo	68	1-2	120	lemon, orange, papaya, bamia, onion*, tomato, pepper
	Hagaz	90	1-2	130	lemon, papaya, onion*, pepper, guava, okra
Debub	Dekemhare		3		Citrus*, papaya*, apple, grape*, guava, tomato, pepper, onion, cabbage, lettuce
	Adi Quala	200	1-2	320	tomato*, potato*, carrot, cabbage, lettuce
	Adi Keih	160	0.125	70	tomato, pepper, cabbage, lettuce
	Medefera	658	0.125-2	85	tomato, pepper*, onion, cabbage, lettuce, potato*, carrots
Gash Barka	Barentu	5	1-2	8	regla, molokia, lettuce, swiss chard, papaya
	Logo Anseba	170	0.25-1	68	lettuce, swiss chard, cabbage, papaya, guava, lemon
Semenawi Bahri	Gahtelay Sheib Mirara	80	1-2	130	tomato, pepper, potato, cabbage, lettuce, coffee
Maekel	Around micro-dams	300	1-2	375	onion, tomato, cabbage, lettuce

The total number of kits required is 189, as it is indicated in table 2. This is obtained by targeting 10 percent of the total number of farmers in each site. The team believes this percent would suffice to represent the number of farmers in the respective sites to carry out the test phase. The number is subject to modification during the distribution time taking into account the modalities of distribution and participation of the farmers.

It is therefore suggested that at least 200 kits be available. The sprinkler kits should include the necessary spare parts. In addition, attention should be given to appropriate packing and labelling to avoid confusion during distribution of kits.

			Type of kits			
Site	No of small scale farmers	No. of target farmers	Vegetable	Horticulture	Bucket	Sprinkler
Hamelmalo	68	8	I	2	I	4
Hagaz	90	9	3	-	I	5
Dekemhare	100	10	2	5	2	I
Adi Quala	200	20	15	-	2	3
Adi Keih	160	16	10	-	3	3
Mendefera	658	66	40	-		15
Barentu	5	5	3	-	-	2
Logo Anseba	170	17	12	2	3	2
Gahtely/Merara	80	8	4	3	l	-
Around Micro- dams	300	30	15	2	3	10
Total	1831	189	105	14	27	43

Table 2. Projected number of Kits to be distributed in each site.

Trip routes

1	Afdeyu, Hamelmalo, Hagaz, Akurdat, Barentu	4 days
2	Mai habr, Gindae, Adi Keih	2 days
3	Halhale, Dbarwa, Emnihaili, Mendefera, Adiquala	4 days
4	Schools (Hamelmalo and Hagaz)	2 days
5	Gahtelay, Shieb	2 days
6	Halhale	l days
Total		15 days

* At least 2 follow-ups will be needed, which makes the total field days 30.