Development Study Unit

Department of Social Anthropology

Working Paper

SOIL CONSERVATION IN KENYA:

Technical and Socio-economic Aspects of a Conservation Programme in Runyenjes Division, Embu District.

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SIDA's Minor Field Study Programme provides travel grants for advanced students and other qualified young people who are interested in issues concerning development processes and Third World countries.

Its purpose is to stimulate interest in problems related to different aspects of development assistance, by providing an opportunity to live and work for a short while in a professional capacity in a developing country.

Students at Swedish colleges and universities or similar institutions and organizations who have a fairly advanced theoretical background, but little or no practical or professional experience, are eligible to apply for MFS grants.

The Development Study Unit at the Department of Social Anthropology, University of Stockholm, administrates a number of MFS grants annually to be conducted by post-graduate students in social anthropology and sociology, as part of a general collaboration agreement with SIDA. This agreement concerns consultative and professional advisory services with regard to socio-economic and cultural aspects of development assistance.

The following report has been written by Maria Berlekom, a post-graduate student in soil biology at the Department of Physical Geography, University of Stockholm, and Rolf Larsson, a post-graduate student of social anthropology at the University of Lund. The report is a result of parallel MFS assignments arranged through the International Rural Development Center of the Swedish University of Agricultural Sciences (for Berlekom) and through the Development Study Unit (for Larsson).

The report - as were the two MFS assignments - has been the result of a joint effort and of close collaboration between Berlekom and Larsson, with the purpose of giving systematic attention to both technical and socio-economic aspects of soil conservation. To the extent soil conservation measures concern the social organization of production systems and the economic structures and political processes within local cultural settings, the joint study has attempted to integrate investigation of the dual set of factors - technical and social - which influence the operation of the SIDA-sponsored Soil and Water Conservation Programme in Eastern Province, Kenya.

Berlekom's and Larsson's report presents a valuable body of information on the soil conservation situation in Runyenjes Division, which highlights the interaction between technical and biological aspects on the one hand, and social, production-based, and attitudinal aspects on the other.

A similar, collaborative study was performed in the neighbouring Gachoka Division by Anna Falk (socio-economic aspects) and Tamiur Hunegnaw (technical aspects). In addition to this report, results from the two sets of Minor Field Studies are presented in a separate report by Tamiru Hunegnaw (available from the International Rural Development Center) and in a report which presents socio-economic profiles from Gachoka and Runyenjes Divisions, by Anna Falk and Rolf Larsson, which is available from the Development Study Unit.

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PREFACE

We are grateful to many people who helped us complete this Study. Above all to our dedicated supervisor Dr Lill Lundgren at SIDA Headquarters in Nairobi, who took genuine interest in our task and who always was ready to assist in spite of her time being very limited. Her Swedish collegues in the Programme, Mr Arne Ericsson and Mr Rolf Tjernström, also are due our appreciation for valuable insights and comments as our work proceeded.

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We also owe gratitude to the Soil Conservation Officers and to the Agricultural Officers in Embu and Runyenjes, whose welcoming and co-operative characters made our task go smoothly. In addition to providing important information, they also created a positive atmosphere of work by introducing us in the area. We owe special thanks to the District Agricultural Officer Mrs Elisabeth Mucai, to the District Soil Conservation Officer Mr Mululu, to the Divisional Agricultural Officer Mr M´Ireri, and to the Divisional Soil Conservation Officer Mr Karanja.

We want to thank all the field extension workers for allowing us taking their time to fill in questionnaires and for their patience in guiding us in the area. Their friendly and co-operative manner was of great help in our gathering of information.

We also want to thank all the farmers we interviewed, without whose co-operation this report would have been much less comprehensive. It is our hope that the report will serve its purpose of improving the soil conservation situation, and consequently agricultural potential, for the benefit of all households in Runyenjes.

Gratitude in great measure goes to our interpreters Faith and Polly, whose companionship and humour made our time in Embu pass too quickly and whose skilled performances were of great help in our conversations with the farmers.

We also want to thank the following persons for their sincere support and valuable comments as they were reading the first drafts of this report. They are Wilhelm Östberg, Eva Tobisson, Prudence Woodford-Berger, Carl Christiansson and Anders Fahlén.

SOIL CONSERVATION IN KENYA

TECHNICAL AND SOCIO-ECONOMIC ASPECTS OF A CONSERVATION PROGRAMME IN RUNYENJES DIVISION, EMBU DISTRICT

1. SUMMARY

The objective of this study, carried out in May 1986, was to assess the operation of the SIDA-sponsered Soil Conservation Programme in Runyenjes Division, Embu District, Kenya with respect to technical and socio-economic aspects.

Situated on the south-eastern slopes of Mount Kenya, Runyenjes Division is a densely populated area of intensive agricultural production. Main cash-crops are tea and coffee, often claiming half or more of the area under cultivation, and constituting the major cash-income for most households. Crops grown for food are above all maize and beans.

Both manure and fertilizers are used by almost all households, mainly on cash-crops. Apart from the production of manure, the main reason that farmers keep livestock in numbers that exceed fodder resources in the dry season, is as security to meet sudden crop failures or expenditures such as school-fees. Due to land scarcity animal husbandry is organized as zero-grazing in the high potential area, and consequently no over-grazing takes place.

The most common farms are small-holdings, in which nuclear family units form the basis of production (extended family systems are few). Average plot sizes are small, ranging from a few acres in the higher areas to about 15 acres or more in the lower, drier parts of the Division. When it comes to land available for cultivation, two processes in particular are prominent, both of them primarily a result of the fast growth in population. They are the rapid fragmentation of land and the recent clearing of practically all land available for permanent cultivation.

The intensification of land-use - including deforestation and cultivation on very steep slopes - partly explains why soil erosion has increased during the last decades. Erosion is today a serious problem in the Division, affecting almost every farm in the form of clearly visible sheet erosion and rills, and to some extent also gullies forming from roads and culvert outlets.

When it comes to soil conservation, generally little has been achieved, and what has been carried out is to a very large extent ineffective or inappropriate. There is also a very striking bias towards mechanical measures at the expense of biological ones.

Terrace-works in coffee, which the farmers are obliged to construct, are often in poor condition, primarily due to lack of maintenance. In foodcrops, structures are either absent, wrongly located or of the wrong type, so that the purpose for which they were constructed is lost. There seems to be confusion, both among extension workers and farmers, concerning the reasons for which a particular structure is made. Many of them mix up cut-off drains with fanya-juus and fanya-chinis (channel terraces), and cut-off drains dominate in a very unproportionate way over other measures, probably because money was provided for their construction until 1984.

The use of biological measures in soil conservation is underdeveloped in Runyenjes. Inter-cropping, crop rotation systems and use of fertilizing agents, for example, are widely spread practices. They are, however, undertaken randomly without being directed at preventing soil erosion, but rather used (especially fertilizers) for the general purpose of improving crop yields.

There is a striking lack of knowledge among farmers and field workers when it comes to viewing biological conservation measures as part of farm management. A lot could be done to improve this situation.

In spite of the District and Division headquarters taking various measures of conservation into account, the fact remains that conservation by most people involved is equated almost exclusively as the digging of cut-off drains and terraces.

Despite the District decision in 1984 to withdraw funds for paying farmers and casuals to dig cut-off drains, the main objective of the Programme in Runyenjes Division still is to have farmers construct these and other terraceworks, but now by their own means.

Considering this background it is hardly surprising that the vast majority of the extension workers consider farmers' lack of time, funds and labour to be by far the most important constraints to carry out soil conservation. Naturally these are also strongly expressed by the farmers themselves.

Lack of labour and funds, however, is not only a reflection of the above circumstances, but for many households also a genuine constraint in carrying out mechanical conservation. Farmers are very preoccupied with agriculture, particularly so in the north of the Division and, as a result of land fragmentation, they are dependent on outside incomes (primarily obtained through casual labour or employment) to meet household expenditures.

Mechanical soil conservation work is mostly carried out by men. Remittances from employment outside the farm, however, is rarely used for compensating the loss of male labour by hiring casuals (upper Runyenjes being an exception), and soil conservation work will suffer accordingly. With no extra means of labour and money, the digging of terraces is hardly within the economic and labour power realities of women-headed households.

In Runyenjes today, a process is taking place by which traditional forms of labour exchange, for example between relatives and neighbours, gradually are overtaken by a kind of labour exchange based on wage labour and ruled by economic instead of social considerations. This is most evident in the high potential area, where there is a striking and increasing individualization of farmers coupled with an apparent lack of self-help groups and other traditional forms of communal work. Agricultural production, as well as soil conservation, is carried out by individual farmers or nuclear family units, occasionally with the help of casuals. No self-help groups were found to be engaged in conservation.

This individualistic attitude to conservation is further expressed through farmers´ and staff´s opinions about demonstration plots involving the digging of terraces through harambee or communal work. Such excercises, particularly when carried out on individual farms and in upper Runyenjes, are commonly spoken of as forced labour.

Farmers´ arguments and unwillingness to attend to such an excercise is a strong indication that a group approach of this kind to soil conservation, might not be the best solution in certain parts of the Division.Focusing solely on this activity, as a means of educating the farmers, may very well lead to a biased view of what conservation is really about, and create increasingly negative attitudes to soil conservation.

There is a considerable discrepancy between the District´s and Programme´s policy of stressing mechanical structures to be carried out by farmers´ own means and a) farmers´ perceptions of erosion, and b) what field workers, farmers and chiefs expect of the Programme.

For the farmers, the question of soil fertility more than anything else is a question of inputs like fertilizers, at least until erosion reaches a stage where it no longer can be ignored. In spite of obvious sheet and rill erosion in their shambas, none of the farmers visited complained about decreasing yields. Farmers do not consider erosion to be a problem serious enough to be dealt with by the hard work of themselves digging structures or paying casuals to do the work. High yields can in most cases be obtained by an increase in the use of fertilizers.

No doubt, the general direction and objective of the Programme in the Division, and particularly its previous policy of paying for cut-off drains have made people identify conservation with the digging of structures, and created expectations not only among farmers, but also among extension workers and chiefs, that conservation is Government responsibility to be paid for by Government funds. Now most people speak of the problem as one that should be solved by funds to pay farmers and casuals for conservation!

The vast majority of the extension workers who are to implement the Programme, does not support the District policy of no longer paying casuals for soil conservation work. On the contrary their strong opinion is that the District once more should provide funds for that purpose!

Most farmers, as well as many chiefs and subchiefs, share this opinion, as they commonly look upon soil conservation as a means of providing work opportunities for landless people and school drop-outs.

Considering farmers´ lack of motivation and incentives to conservation, however, it would hardly be wise for the District Headquarters to pay for structures in spite of the massive advice on behalf of field workers, farmers and many chiefs to do so. On the contrary, it strongly indicates a great need for training and information of the extension workers, and for greater efforts to deal with the problem of how to convince farmers of the long term advantages of conservation, and of how to identify suitable measures that will be accepted and that have a chance of being accomplished within most farmers´ economic and labour power realities. In other words, there is a need for a flexible approach to the implementation of conservation, taking into account the fact that households´ ability to carry out soil conservation varies considerably with respect to labour, money, perception of erosion, knowledge of conservation measures, plot-size, slope, and so on. We think that increasing the elements of biological conservation measures in the implementation of the Programme is a step in this direction.

Training and information are suggested to be extended to chiefs and subchiefs. This appears as a frequent request from the field workers, who complain about lack of interest and commitment in conservation on behalf of the administration.

Very few of the field workers demand legal action against farmers who do not undertake conservation. On the contrary, many of them emphasize that no force ever should be used in the Programme, and instead stress the need for increased training of farmers.

The problem of farmers training is associated with the Training and Visit System. The Technical Assistants (TA´s) complain about the schedule of the T&V System being too tight, with new subjects coming up too frequently. With the common absence of contact farmers and the lack of attendance of follow farmers, the disseminating effects of the training are decreased. Many TA´s expressed the opinion that the T&V System only allowed them to teach theory, not to give practical demonstrations of soil conservation. The most common suggestion for solving this problem was to employ more extension workers or special staff members to deal with soil conservation only.

We think that the T&V System basically is sound. It provides a feasible tool for integrating soil conservation, especially biological measures, in general farming practices. The difficulties encountered by the TA´s we partly see as a result of the present bias towards mechanical measures. Obviously, the T&V System has some limitations with respect to schedule, transport for staff, contact and follow farmers attendence, etc. When it comes to soil conservation, however, we feel that rather than employing extra personnel, which in no way automatically ensures success, the stressing of biological measures might easen the frustrations of the extension workers, as such measures more easily can be integrated into the general training of farmers.

The disseminating effects of the soil conservation message, and other subjects as well, we think would increase by regular changes of contact farmers. Such measures would also allow special attention to be given to households facing particular problems.

Recommendations emanating from the technical assessment:

- More emphasis should be put on biological measures within the Programme, including all levels of training, to balance the present bias towards mechanical measures. Biological measures that can be improved are for example:

  - tree planting and agro-forestry, i. e. with fruit trees and nitrogen fixing species, such as Leucaena leucocephala.

  -establishment of tree nurseries closer to farmers, and improved distribution of seedlings. The nurseries should provide agro-forestry species, and also fodder-grasses.

  -generally, livestock should be part of an integrated farming system. The lack of fodder could be used to motivate farmers to plant, i e. fodder producing trees, leguminous plants in a crop rotation cycle, and grass-strips along the contour (which in the future can be transformed into fanya juu terraces).

- Restrictions in the measuring and digging of cut-off drains.

- Training of the extension workers in biological conservation measures and on soil conservation as an integrated part of farm management. They also need basic training on mechanical structures; why a certain type is constructed, in what places, simple rules of dimensioning and its performance in practice.

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2. INTRODUCTION

An important part of the Soil Conservation Programme in Kenya is to assess how the Programme actually is proceeding in different parts of the country. Therefore, over the last years several studies - some technical, some economic and some socio-economic - have been conducted in various districts.

This report deals with the soil conservation situation in Runyenjes Division in Embu District. It consists of two parts, a technical study and a socio-economic assessment, carried out by Maria Berlekom and Rolf Larsson respectively. Our presentation of a joint summary reflects our close collaboration and our intentions of giving as a comprehensive description as possible of the situation.

The assistance of the Ministry of Agriculture and Livestock Department, Nairobi and of the Regional Soil Conservation Unit at SIDA HQ, Nairobi, has made this report possible. The study was carried out as a Minor Field Study (MFS), our supervisors in Kenya being Mr Maurice M'begera, Ministry of Agriculture and Livestock Department, and Dr Lill Lundgren, Regional Soil Conservation Unit at SIDA HQ, Nairobi, and in Sweden Dr Carl Christiansson, Department of Physical Geography, University of Stockholm, Dr Eva Tobisson and Mrs Prudence Woodford-Berger, Development Unit, Department of Social Anthropology, University of Stockholm, and Dr Kajsa Ekholm-Friedman, Department of Social Anthropology, University of Lund.

2.1 SOME GENERAL FACTS ABOUT RUNYENJES DIVISION

2.1.1 Population and land

With its 446 km^2 (Jaetzold 1983) Runyenjes is the smallest of the three divisions in Embu District. Administratively it is divided into eight locations. The total population is 148,131 persons (1979 census) giving a density of 332 people per km^2. According to Jaetzold (1983) the area suitable for cultivation is 297 km^2, and as the total number of households is 25,291 (1979 census) this implies an average of about 2.9 acres of land available per household.

2.1.2 Agro-ecological setting

As Runyenjes is situated at an altitude of 1,300 to 2,000 meters on the south-eastern slopes of Mount Kenya, factors such as topography, soils and climate - and with these agricultural potential and erosion hazard - vary considerably as one ascends the mountain. Annual mean temperatures range from 22.0 degrees Celsius in the lower parts, to 15.8 in the higher areas. Annual rainfall increases with altitude, from around 900 mm to 2.000 mm, and is distributed over two rainy seasons, which are most pronounced in the lower parts of the Division.

Towards the boundaries of Gachoka and Siakago Divisions in the south-east, land is rather flat, and soils shallow and erodible with a low nutrient content (Jaetzold & Schmidt, 1983). Generally, however, the topography is rolling, reflecting the underlying vulcanic rock. Soils are well-drained, very deep, with good physical properties and with a moderate to high fertility.

The combination of fertile soils and abundant rainfall makes Runyenjes an area of high agricultural potential, and accordingly land use is intensive. In general, farmers obtain two harvests each year. Main cash-crops are coffee and, in the highest parts, tea. Tobacco and cotton can be found in the lower, drier areas. Maize and beans are the most common crops grown for home consumption, complemented by several other common annual and semi-perennial crops, such as cassava, sweet potatoes, Irish potatoes, arrow-root and bananas, as well as fruit trees like mango, pawpaw, citrus and avocado.

Since the early sixties, all land has been demarcated and public land is virtually non-existent. Due to population growth, more and more land has been put under permanent cultivation and plots have been divided into smaller and smaller portions. In upper Runyenjes, practically all land is now cultivated, whereas there still exists some uncultivated land in the lower areas. The latter area, however, is subject to a steady influx of people from upper Runyenjes purchasing extra land for cultivation or for their children to inherit.

Land scarcity has led to changes in farming practices. Fallowing has become uncommon and livestock is nowadays almost entirely zero-grazed (except in the lowest areas). The extensive use of fertilizers and manure coupled with the introduction of new crop varieties have increased harvests considerably. The maize harvests are in fact said to have doubled over a ten-year period.

2.1.3 Soil Conservation in Runyenjes

The following facts are taken partly from the Soil Conservation Workplan 85/86 for the whole of Kenya, and partly from an interview with the Soil Conservation Officer in Runyejes Division.

The SIDA sponsered Soil Conservation Programme started in Runyenjes in the fiscal year of 81/82 and since then it has been extended every year. In the Division,soil conservation works are concentrated on gully control, digging of cut-off drains and fanya-juu terraces, and on afforestation. Since 1984, the digging of cut-off drains is not paid for in Embu District (in contrast to the rest of Kenya).

As the Division is not treated separately from the rest of the District as far as budgeting is concerned, the following figures are for the entire Embu District. Because of the intensive cultivation on the slopes of Mount Kenya, however, most soil conservation funds have so far been allocated to Runyenjes Division.

According to the Workplan 85/86 720,000 KSh were budgeted for Embu District, of which 314,200 KSh were reserved for the digging of cut-off drains. The Workplan aimed at digging 49,875 metres of cut-off drains and providing 1,425 farms with fanyaa juu terraces within this period. Both targets had been achieved and surpassed by the 31st December 1985. The Workplan further aimed at producing 15 000 fruit trees and 100,000 forest/fodder trees. This had not been achieved by the 31st December of 1985, but is likely to have done so during the long rains in April/May of 1986.

Specifically, in Runyenjes, 183,546.8 m of cut-off drains had been laid out by the technical assistants (May 1986), out of which 4,775.5 m actually had been dug! What concerns fanyaa-juu terraces 58,643.9 m had been measured up to the same date.

Parallel to the SIDA sponsered Soil Conservation Programme there are some other minor soil conservation projects in the Division, financed and run by the Rural Works Programme (RWP).

The main period for soil conservation work occurs in August and September, and to a certain extent in January and February.

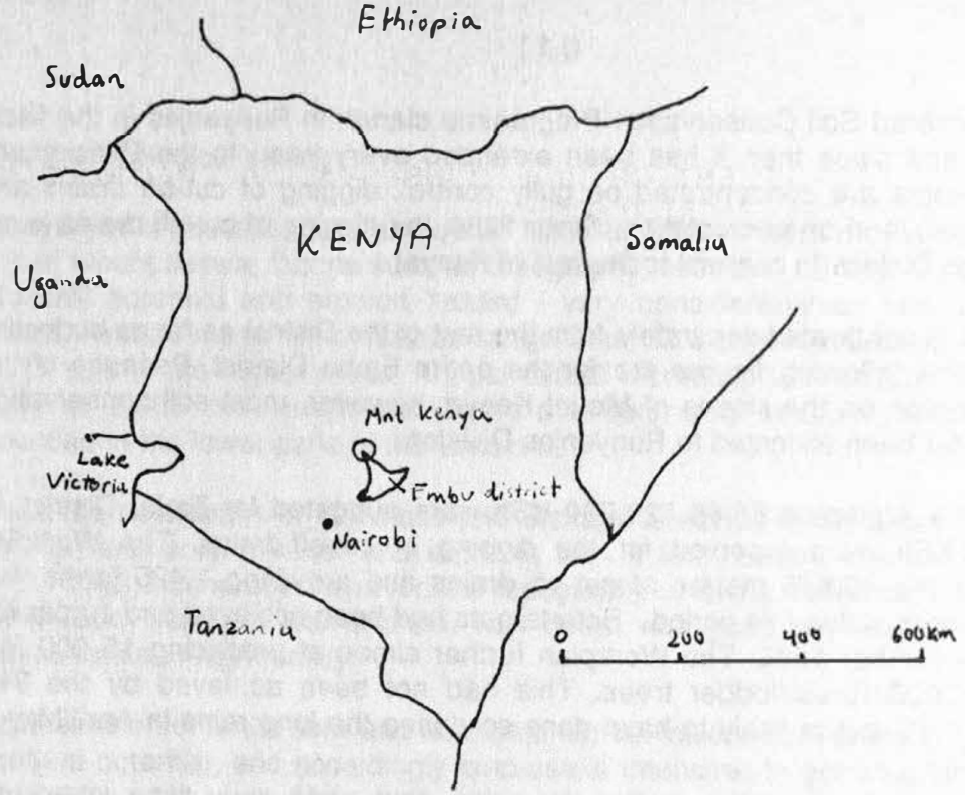

Fig 1. Map of Kenya with Embu district

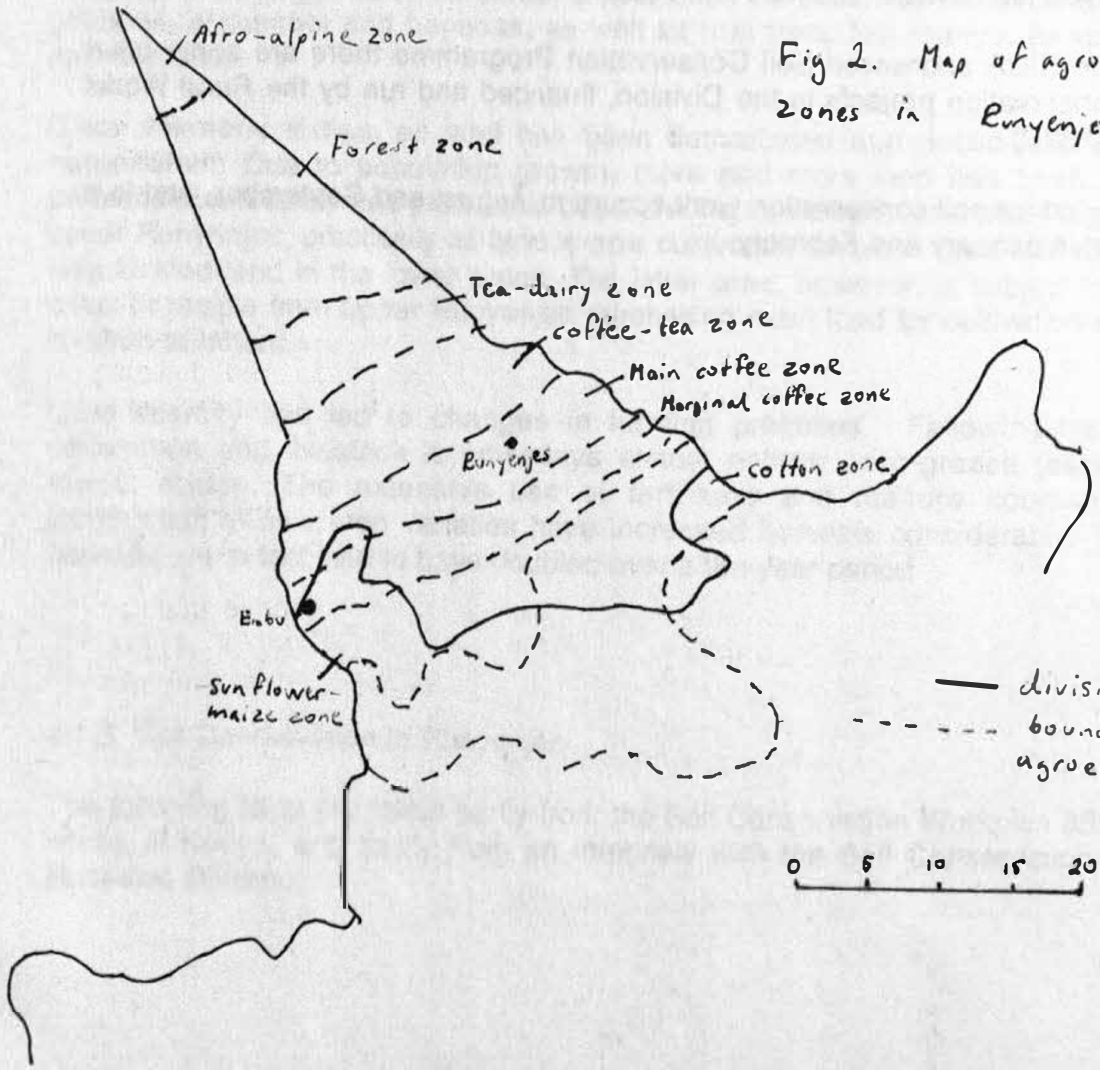

Fig 2. Map of agroecological zones in Runyenjes division

3. TECHNICAL ASSESSMENT OF SOIL CONSERVATION PRACTICES IN RUNYENJES DIVISION, EMBU DISTRICT

Maria Berlekom

3.1 METHODS

The basis of this assessment was a questionnaire (Appendix III) - slightly revised - formulated by Bancy M. Mati (Mati 1984), and further developed by Anders Fahlén (Fahlén 1985). The farmers were interviewed on subjects such as farm size, crop rotation practices, amount and type of fertilizers, year of construction of mechanical structures in conservation, maintenance routines, etc. Measurements of slope, terrace spacing, terrace width, etc were also taken.

The field study was carried out during the long rains, between the 28th April and the 30th May 1986. As interpreters acted Technical Assistants (TA´s) - the agricultural field extension staff in the locations.

Out of a total of eight locations, four were visited, all of them in the lower parts of the Division. The four locations in the tea and dairy zone were excluded for three reasons. 1.) Due to the cold and rainy climate, a very small portion of land is planted with food-crops. The plots are mainly used for grazing or for growing tea. 2.) Properly grown tea gives a very dense ground-cover thus effectivly preventing soil erosion. Therefore, from a soil conservation point of view this area is less problematic, and less interesting to study. 3.) Furthermore, it is easier to analyze the data collected when the ecological conditions do not vary too much from one farm to another.

In the locations visited, three sublocations were chosen at random and at least five farms in each were selected. Altogether 68 farms in 12 sublocations were investigated. A random sample of farms was obtained by driving along roads and deciding beforehand at which interval of distance to stop. The farms selected were stated not to be larger than six acres.

On 20 of the 68 farms, soil samples were collected, both from plots planted with coffee and plots with maize. The samples were sent to the National Agricultural Laboratories in Nairobi for chemical tests and texture analysis.

It is important to note that the sample of farms is very small. Therefore the figures presented must be used carefully as they are not statistically significant. However, they still provide a good indication of the general soil conservation trends and patterns in the Division. Another source of error is the seasonal change. Plant growth was rapid during the period of the study, and the vegetational changes may have affected judgements of both state of crops and intensity of erosion processes. Yet another circumstance affecting the results is the tendency among people interviewed to give "ideal" answers to questions about mainenance routines, etc.

3.2 RESULTS

In this section I will comment briefly on some of the findings I will discuss at greater length, later in the report. The complete results from the questionnaires are presented in Appendix I. Results from the soil analysis are presented in Appendix II. Appendix IV contains suggestions for revision of the questionnaire.

3.2.1. Farm size, Slope and Land-use

The average total size of the investigated farms was 3.7 acres, mean cultivated area (total area minus uncultivated land and farm yard area) being 3.1 acres. The average size of the area grown with cash-crops was 1.1 acres. 25 farmers had planted a plot with napiergrass and 23 farmers had a portion of land left uncultivated (grass-, bush- or woodlot), the average areas being 0.4 and 1.2 acres respectivly.

The most common cash-crop was coffee - which was grown on 64 farms (94 %) - and a few farmers had planted tea, cotton or tobacco as well. Only on four farms did I not find any cash-crop at all.

Slope varied considerably, also within individual farms. Cultivation was found on slopes from 0 up to 110 %, but the most common values were between 12 % and 35 %. Plots with napiergrass and cultivated land were generally found on the steeper slopes; 56 % (14/25) of the former and 48 % (11/23) of the latter were noted to be on slopes more than 35 %, whereas only 13 % (9/68) of the food-crops and 17 % (11/64) of the coffee were planted on slopes exceeding 35 %.

It was observed that of the 68 farms, 13 had only slight sheet erosion, four had slight sheet erosion with small rills, five had visible sheet erosion, 22 had visible sheet ersosion with small rills, and the rest - 24 farms - had visible sheet erosion with medium to large rills.

59 farmers (87 %) kept cattle, the practice of feeding in all cases being zero-grazing. On about one-third of the farms, it was combined with grazing in the homestead area and along roads. The average number of cows on the investigated farms was 3.0. Practically all farmers kept goats as well. No erosion due to overgrazing was noted.

3.2.2. Biological erosion control measures

Planting along the contour was practised to at least some extent by 48 farmers (71 %). On many farms only a portion of the land was cultivated along the contour, particularly beans were sown without any conservation measures.

Crop rotation was practised by 60 farmers (88 %), and the most common crops involved were maize, beans and Irish potatoes. In general it was only a small portion of land that was involved in the crop rotation cycle. The base seemed to be Irish potatoes - that is, the farmer practised crop rotation on as big plot as he/she was using for Irish potatoes.

Intercropping was noticed on 64 farms (94 %), thus being very widely used. However, it was seldom a matter of intercropping in the strict sence of the word, i. e. distinct rows of alternating crops. Generally maize and beans were interplanted and scattered among them other crops were found, such as cassava, bananas and passion fruit.

Strip cropping was found on three farms.

Ridging was done on all 62 farms where Irish potatoes were planted.

Mulching was most common in the coffee fields. It was also to some extent done where Irish potatoes were grown. In a few cases the mulch had been applied in the form of trash-lines.

Manure was preferably applied on the coffee (46 farms), and on Irish potatoes (47 farms).

Fertilizers were used on all 64 farms with coffee, and 49 farmers used these on the food-crops as well. On average, some 100-150 kg/year/acre were used on the coffee, and about 75 kg/year/acre on the food-crops. The most common types were pure nitrogen on the coffee and compound fertilizers with nitrogen and phosphorous on the food-crops. Three farmers had applied artificial fertilizers on their napiergrass.

Fallowing in some form was practised on 19 farms, in eleven cases it was a plot of napiergrass that was rotated with food-crops.

Agroforestry was found on eleven farms. Miscellanous crops like maize, beans, cassawa, sweet potatoes, yams and arrow-root were interplanted at random with fruit trees, Grevillea robusta and various indigenous tree species.

Treeplanting and letting old trees remain in the cultivated fields was practised by 63 and 47 farmers respectively. Grevillea robusta was the tree most commonly planted, followed by various kinds of fruit trees. The most common source of seeds and seedlings was own collection in farm or neighbourhood. Seven farmers had bought seedlings at a nursery run by the Ministry, either at Kangaru outside Embu township, or in Ishiara in Siakago Division. Trees for fuel and timber were most often planted along farm boundaries, while fruit trees generally were planted near the homestead.

3.2.3. Mechanical Erosion Control Measures

3.2.3.1. Terraceworks

1) Terraces in coffee plantations

Excavated bench terraces were found on 58 farms, or on 91 % (58/64) of those with coffee. Slope was less than 12 % on all the farms without terraces.

In 31 % (18/58) of the cases the gradient was either variable/ondulating or more than 5 %. 72 % (42/58) were noted to have none or poor cover on the terrace risers. Runoff water had crossed the embankments on 81 % (47/58) of the farms, and on 57 % (33/58) maintenance was badly neglected. Altogether, on 48 % (28/58) of the farms with excavated bench terraces these were judged to be of poor or very poor standard.

2) Terraces on food-crop fields

On totally 40 farms (59 %) I found some kind of terraceworks, but this could be anything from one short grass-strip to several stone-terraces covering all areas needed. The most common structures were grass-strips, which were noted on 25 farms, and fanya juu terraces, found on eighteen farms. Two farms with stone terraces, and one with permanent trash-lines were also found. Six of the 40 farms had two different kinds of terraces - accordingly the total sum of terraceworks were 46.

Among the farms visited there was no correlation between slope and tendency to construct terraces (Appendix I, table 11 b)

On 68 % (17/25) of the farms with grass-strips and on 50 % (9/18) of the ones with fanya juu terraces these structures were level, that is parallel to the contour. Only one farm had fanya juus with the recommended alignment of 0.5 %. Altogether, on 13 % (6/46) of the farms the terraces had a gradient that either varied considerably or was more than 5 %.

The grass-strips were too thinly tufted with grass on 68 % (17/25) of the farms, and the fanya juu terraces were too poorly vegetated on the terrace risers on 44 % (8/18). Run-off had crossed embankments on totally 85% (39/46) of the terraceworks.

On 40 % (10/25) of the farms with grass-strips and on 28 % (5/18) of the farms with fanya juu terraces, the horizontal interval was more than doubled compared to the recommended.

Lack of maintenance was judged to be a serious problem on 28 % (5/18) of the farms with fanya juu terraces.

The summarized impression of the terraceworks - considering the looks of the structures only and not their areal coverage - was that 43 % (20/46) were fair to very good and 57 % (26/46) poor to very poor.

3.2.3.2 Cut-off drains

36 cut-off drains were noted on totally 24 farms; that is several farms had two or more.

The catchment area was generally (32 cases) cultivated land - terraced (excavated bench terraces) or non-terraced - belonging to the visited farm.

None of the drains had the proper gradient of 0.25 -0.5 %. Six drains (17 %) had a gradient between 0.5 and 1 %, and another six had a gradient from 1 to 3 %. The rest were either level (six cases), or had a gradient that was more than 3 % (seven cases), or variable/ondulating (eleven cases).

The average depth was less than 0.3 m in 24 cases (67 %) - only four cut-off drains deeper than 0.5 m were found. 53 % (19/36) had an average width of less than 1 m.

From three cut-off drains only (all on one farm) the water was discharged into a kind of waterway. From 25 % (9/36) it was diverted onto foot paths, and in two cases the water was discharged out on a road. The remaining 61 % (22/36) were closed ended. Overflow was noted from fifteen drains, twelve of these being closed ended.

The embankments were far too low on 61 % (24/36), and on 47 % (17/36) they were not sufficiently covered by grass. Wrong alignment was found on 50 % (18/36) of the cut-off drains - on 64 % (23/36) if also the level ones were considered. Erosion at the outlet, leading to development of gullies, were noted in all the nine cases where the water was discharged out to foot paths. 20 cut-off drains were wrongly located, i. e. in the middle of a slope, just below the slope close to a stream, etc. In all cases where several cut-off drains had been constructed in the same farm all but one was unnecessary and therefor they were judged to be wrong conservation measures taken.

Altogether, 25 % (9/36) were considered to fulfill their purpose - to divert excess run-off water and discharge it safely - fairly well. The rest, 75 %, gave a poor to very poor impression.

3.2.3.4. Artificial waterways

No proper artificial waterway was noted. On one farm only, I found something that is best described as a mixture between a cut-off drain and a waterway, crossing the slope diagonally. It was laid out by a TA, and discharged water from three cut-off drains and three fanya juu terraces.

3.2.4. General impression

Area covered: Ten farms completely lacked mechanical conservation measures. On 22 farms less than half of the area needing conservation was covered, and on another eleven less than 3/4 was properly protected. Fifteen farmers had constructed terraces on almost all areas needing conservation.

The general impression - taking into account both biological and mechanical measures as well as areas covered - was that the soil conservation done was fair to good on 28 % (19/68) of the farms and consequently poor to very poor on the remaining 72 % (49/68).

3.3. DISCUSSION

3.3.1. Farm size, slope and land-use

Clearing of land in Runyenjes has led to deforestation and cultivation on very steep slopes - this is part of the explanation why the intensification of land-use during the last two decades has increased erosion. Another cause of soil erosion, though less important, is run-off from roads; gullies forming at culvert outlets are commonly seen.

No doubt soil erosion constitutes a serious problem in Runyenjes Division; on as much as 46 farms (68 %) I noted clearly visible sheet erosion in combination with rills. However, the severity of erosion varied a lot with many factors, i. e. land-use, slope, farming practices in general and soil conservation measures taken.

To directly correlate the degree of erosion with slope was not possible on plots with coffee, as the farmers are obliged (by the parastatal Kenya Coffee Board) to construct bench terraces on these. Less effort is spent where food-crops are planted, and consequently it is easier to relate soil erosion to slope. But even here the trends are far from uniform. As expected, soil loss increases with steepness. Making a broad generalization it seems as one finds: none to slight sheet erosion on slopes less than 6 %, visible sheet ersosion with small rills on slopes between 6 % and 20 %, visible sheet ersosion with medium sized rills on slopes between 12 % and 35 %, and visible sheet erosion with larger rills or gullies on slopes steeper than 20 % (Appendix I, table 4).

Due to the fact that livestock in the studied area are almost entirely stallfed, no ersosion caused by over-grazing was observed. Feeding the animals is nevertheless a big problem; many farmers stated they experienced a general scarcity of fodder and consequently, many of them planted plots or strips with napiergrass, a practice which has become very common as land availability has decreased.

3.3.2 Biological Erosion Control Measures

Cultivation always leads to a steady removal of plant nutrients and organic matter. This process is particularly obvious when land-use - as in Runyenjes - is intensive, with several harvests taken every year and land never being left in fallow. The soils in the Division have a medium to high nutrient content and their physical properties are good (Appendix II), so the erodibility is quite limited. Still a rapid depletion of both plant nutrients and organic matter can be expected within a short time if these components are not restored.

Biological erosion control measures aim at controlling soil loss by, for example, restoring desirable properties which improve soil structure (i. e. crop rotation and fertilizing); keeping a dense vegetation cover that decreases amount and velocity of surface run-off (i.e. time of planting and harvesting, intercropping and agroforestry); and keeping of animals in an appropriate way (planting fodder trees, green manuring, avoiding overgrazing, etc). Most of these practices fulfill several purposes at the same time.

But the use of biological measures is still an undeveloped field in Runyenjes. Today biological measures are seldom used purposely to prevent soil erosion. Therefore very muchis left to be done.

Planting along the contour, intercropping and various forms of crop rotation systems seemed to be well known and widely spread practices among the farmers, but these measures could, and should, be used to a wider extent and with more knowledge than today. For example, almost 30 % of the farmers did not plant along the contour at all; intercropping - or rather some kind of mixed cropping - was commonly practiced, but it was more seldom done in an optimal way. The same holds for the crop rotation systems in use.

All farmers seemed to be aware of the necessity of applying fertilizing agents, but the types and amounts varied a great deal between different farms. Most favoured were the coffee plantations, followed by the fields with Irish potatoes - reflecting the fact that these crops brought money to the households, thus being most valuable for the farmers.

Mulching with crop residues used to be a widely spread practice in Runyenjes - and generally the mulch was laid out as trash-lines, which were moved seasonally or annually. (The lower parts of Runyenjes have always been an exception; termites are too big a problem here, eating both standing crops and residues.) Nowadays the crop residues are in general given to the animals, therefore if mulching is done weeds or leaves are used.

Feeding crop residues to the livestock, however, is not the best way of using them. Maize stalks, for example, have a low nutritional value and could better be utilized to improve the organic content of the soil. Therefore, composting could be a useful practice in this area (note: some farmers obviously did mix manure from the cattle with crop residues in the cowshed. There was some unclarities in the terminology during the interviews, so the extent of this practice is not known).

Fertilizers were very commonly used, mainly on the coffee, but also to a wide, and increasing, extent on the main food-crops. The farmers were well aware of the advantages (i. e. increased yields), but there seemed to be little knowledge of what nutrients the plants require and the best types of fertilizers to use. Especially on the coffee plantations more varied fertilizing is needed. In general the farmers apply nitrogen solely; some kind of compound fertilizer containing phosphorous should be used at least in one season every year.

In all the eleven examples with mixed cropping including woody perennials ("agroforestry") the annual crops did poorly. Obviously they were disfavoured by the presence of the trees in the competition for nutrients and, above all, light. With another composition of species this problem could probably be avoided.

Although most land was intensively cultivated, many farmers had left old trees in the fields: trees giving i. e. fruits, fuel-wood or timber. There was also a great interest in planting seeds and seedlings, but several farmers experienced difficulties in obtaining enough of these. Most of them collected their own seedlings, either in the farm or in the neighbourhood, the reasons for this generally being price (too expensive to buy according to some farmers), and shortage of seedlings in tree nurseries. Three farmers had deliberatly planted Grevillea robusta along the contour (in two cases on terraces), but generally the seedlings were planted along farm boundaries or at random in the shamba.

Considering the interest among the farmers (especially for fruit trees) as well as the many advantages that can be obtained by using trees for soil conservation purposes, there is a lot to be gained by concentrating more on tree planting, specifically factors like availability, siting and species selection should be looked into:

- Availability of tree seedlings could be increased by starting small local tree nurseries, i. e. chief nurseries.

- Information on where to plant should stress the possibility of planting along the contour as a kind of "macro-strips" or reinforcements of terraces.

- Emphasis should be put on the importance of integrating tree planting with the rest of the farming activities, by introducing trees that can be used for many purposes. Agroforestry should be encouraged.

- Beside fruit trees, species that produce fodder would probably be of interest for the farmers (as lack of fodder is a big problem on many farms). One example of a tree that should do well in Runyenjes is Leucaena leucocephala, which also has the advantage of fixing nitrogen.

Another practice which at the same time results in fodder and could be used for soil fertility improvements is green manuring with nitrogen fixing leguminous species. These could for example be included in a crop rotation cycle.

3.3.3. Mechanical Erosion Control Measures

3.3.3.1. Terraceworks

1.) Terraces in coffee plantations

91 % of the farmers growing coffee had dug excavated bench terraces, but in surprisingly many cases these were in poor condition. The slope on the terrace was too steep, alignment was neither level or graded but undulating, and run-off had crossed the terrace-risers on 81 % of the farms. The main reason was inadequate maintenance, which reflects both a lack of interest and/or lack of labour.

2.) Terraces on food-crop fields

Very generalized: Terraces on food-crop fields were on the whole not constructed. Or more accurately: terraceworks were done to some extent (some structure found on 40 farms), but very little, very randomly and most often insufficiently maintained and not fulfilling any purpose. Obviously, the farmers were not motivated and did not realize the advantages. One could expect an increased tendency though, for motivation to increase with need (that is with increasing slope) and probably it does, but my sample of farms was too small to allow this to show up.

Only a few farmers (18 cases) had made fanya juu terraces, and most did not seem very inclined to dig them. Generally where they were found there were only one or two, and they were often not maintained properly.

The most common structures were grass-strips, but they were seldom satisfactory. Grass-strips could be a good measure, even on steep slopes if: a) they are spaced at proper intervals (vertical interval not more than 1.5 m), and b) the grass cover is wide and dense enough. As with all mechanical structures grass-strips might severely increase soil erosion if they are incorrectly constructed an poorly maintained!

It would probably be quite easy to motivate the farmers to plant more grass-strips than they do at present. Many have separate plots with grass, or strips randomly sited on the farm (not along the contour), or plant napier along the contour, in order to get fodder for their animals. This grass could probably just as well also be planted along the contour. Another advantage with grass-strips is that they are less labour-demanding to make than fanya juu terraces or other dug structures. The farmers should therefore be encouraged to plant grass-strips, maybe with the aim of combining them with shoveling up soil to reinforce them into fanya juus in the future.

3.3.3.2. Cut-off drains

The main object of a cut-off drain is to safely discharge excess surface run-off water. This cannot be overly stressed.

Most cut-off drains (75 %) I found were very unsatisfactory, not at all fulfilling this purpose. There seemed to be a big confusion among the Technical Assistants and the farmers about the reason for their construction. This was reflected in siting (laid out at a place where it is not needed), numbers (on many farms several cut-off drains were found), dimensioning (not wide and deep enough) and alignment (being either level, undulating or having too high a gradient). Both farmers and many TA´s seemed to mix cut-off drains with both fanya juus and fanya chinis (channel terraces). Furthermore, most of the cut-off drains I found were very insufficiently maintained.

According to the recommendations from the Ministry of Agriculture and Livestock Development and SIDA, cut-off drains should be constructed so that they cross several farms. I found no cut-off drain crossing two farms. Another thing to be noted was the big discrepancy between the numbers of cut-off drains measured 85/86 by the extension staff (183,546.8 m) and the length actually dug (4,775.5 m)!

This points to two facts: 1) the farmers seem to require the TA´s to lay out cut-off drains on their farms, but they do not want to dig them (at least not immediately), and 2) the TA´s are more concerned with cut-off drains than with fanya juus (only 58,643.9 m of fanya juus were measured 85/86).

To summarize: There is a great lack of knowledge about why a cut-off drain should be constructed, and the farmers are not sufficiently motivated to maintain those already existing. Still, many cut-off drains are laid out by the extension staff, and there are unproportionately many cut-off drains constructed compared to the numbers of fanya juus and grass-strips.

Some reasons behind these contradicting facts might be:

-Both farmers and TA´s seem to associate soil conservation above all with cut-off drains. Information and campaigns have created an awareness among the farmers that the Government holds soil conservation to be a necessity (which is not the same as the farmers themselves realizing the need) - and much of the information has concentrated on the cut-off drains. This could in part explain the unproportional amount of measured cut-off drains. The TA´sare much inclined to recommend them. Farmers wanting to "do something" express a wish to have them measured, maybe with the aim at digging them some time in the future.

-Before 1984, the District Agricultural Administration in Embu paid for the digging of cut-off drains but not for any other structure. This probably made it easier for the technical staff to motivate the farmers to have cut-off drains dug - even if the farmers themselves did not feel the need to do so. Another effect of paying for cut-off drains can have been that many farmers dug cut-off drains instead of fanya juu terraces.

-Maintenance, however, has never been paid for. And few farmers today seem interested in maintaining a structure they never fully realized the advantage of in the beginning.

Two special problems with cut-off drains, which are closely linked to each other, are the questions of alignment and discharge of water. Practically all cut-off drains I found were either level or undulating without any outlet at all, or had a gradient higher than 1 % diverting the water out to a foot path at the farm boundary where it was causing gully erosion.

According to the recommendations (Wenner, 1981, etc) a cut-off drain is supposed to have a gradient between 0.25 - 0.50 % in order to divert water without causing erosion. Furthermore, the water has to be discharged to a natural and an artificial waterway down slope. But artificial waterways require much space, therefore the farmers understandably are negative to constructing one on their farm. Waterways at the boundary of two farms are better, demanding less land of each farmer. On the other hand it can cause a controversy between the neighbours. To overcome these difficulties with constructing artificial waterways, the District Agricultural staff now recommend the TA´s to lay out level cut-off drains. Thereby the functioning of the cut-off drains changes from diverting water to retaining it.

My knowledge in the matter is still limited, so I find it difficult to make definite statements on this particular issue. Still I want to stress some general observations about cut-off drains:

-Taking into consideration all the problems associated with cut-off drains (very laborious to dig, farmers seldom really motivated, TA´s obviously very often not being able to lay them out in an adequate place with proper dimensions and alignment, problem with diverting the water, etc). I deem it important to be very restrictive with this structure and always assess thoroughly if cut-off drains really are the correct measures to take before constructing them.

-Generally I also advise not digging cut-off drains without proper discharge of water.The damage caused by overflow from a wrongly constructed cut-off drain can be very severe.

-And lastly, a cut-off drain should not be constructed unless other measures (such as planting along the contour, grass-strips, etc) also are carried out.

3.3.4. General impression

The mechanical measures performed were generally quite unsatisfactory. Still, there was on the whole too much emphasis put on this kind of measure. Both TA´s and farmers seemed to associate soil conservation mainly with digging different kinds of structures, especially cut-off drains. Biological measures were more seldom used deliberately (though many practised i. e. contour planting, intercropping, applied fertilizers, etc) to prevent soil erosion. This is not surprising as the entire Soil Conservation Programme in Kenya is concentrated on mechanical measures.

In Runyenjes, the farmers were not motivated enough (at least not yet) to undertake the heavy task of i. e. digging fanya juu terraces on their shambas. This might be due to the fact that land very recently has become scarce. Therefore the farmers have not yet perceived soil loss as a problem. Also, many farmers apply a lot of fertilizers (which they do not regard as soil conservation), in that way compensating for - and increasing - their yields which otherwise would have decreased.

In conclusion there are a few things I would like to recommend:

-It is very important to stress biological measures in dialogue with the farmers such as: tree-planting, agroforestry, crop rotations, green manuring, composting, etc. Soil conservation is not something seperate from the rest of the activities on the farm, but should be integrated into general farm management.

-Farmers should be encouraged to plant grass-strips along the contour, with the double aim of providing fodder for livestock and establishing developed bench terrace (these structures could be transformed into fanya juu terraces, when and if the farmer wants to in the future).

-The TA´s should be better informed about biological measures

-The TA´s should also be trained on mechanical measures and their use: i. e. purpose of various structures, dimensioning and how to use line-levels.

-Cut-off drains should be constructed restrictively, and only where they really are needed, and where the water can be safely diverted.

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4. SOCIO-ECONOMIC ASPECTS OF SOIL CONSERVATION

Rolf Larsson

4.1 INTRODUCTION

The Minor Field Study that developed into this socio-economic report had two explicit purposes. The main one was to investigate the progress of the SIDA-sponsered Soil Conservation Programme in Runyenjes Division, thereby identifying the most serious socio-economic constraints on the success of the Programme. Another aim was to critically appraise the tools by which such information is gathered. For practical reasons the report has been divided into two seperate parts:

- Socio-economic Aspects of Soil Conservation

- The Soil Conservation Profile

The first part, presented on the following pages, deals with socio-economic factors influencing soil conservation in Runyenjes Division. It gives a picture of the situation regarding land, income, and labour issues. It also contains a general discussion of the Programme policy in relation to farmers´ and staff´s attitudes to conservation, and how the Training & Visit System is perceived by the extension-staff.

The Soil Conservation Profile provide a concise account of how the Programme is performing and of its socio-economic aspects and implications. It is presented in accordance with the Programme´s guide of how to make Soil Conservation Profiles (Östberg 1984; Östberg and Madsen 1984; Report from a Study Tour on Soil Conservation in East Africa 1985), thereby allowing comparisons with the situation in other parts of the country where similar studies have been carried out. Basically the Profile deals with the same findings as the more detailed first part of the report. Should the reader wish a fuller account of the study, its methodology and its findings, the first part, "Socio-economic aspects of soil conservation", can be consulted.

The Profile is presented together with one dealing with the situation in Gachoka Division, Embu District, carried out by Anna Falk, social anthropologist and MFS-student in the same party as the undersigned. The Profiles include an Appendix containing remarks on the use of the extension staff questionnaires previously used for collecting data. data. In course of the fieldwork a modified questionnaire directed to extension staff was developed and evaluated, reflecting our experiences of the excercise and suggesting possible guidelines to future revisions of questionnaires used in the monitoring of the Programme.

4.2 METHODS

Reviewing the Soil Conservation Situation - Methods and Approach of the Study

'This report is based on several kinds of information from the field. Thirty-seven farmers were interviewed about their socio-economic situation for the purpose of getting at their attitudes towards conservation. Each interview lasted between one and three hours (Appendix V). For the interviews two interpreters independent of the Ministry were contracted. When starting the interviews a lot of effort was put into having the farmers understand that they were free to express their opinions on the subject. Their answers were given anonymously. The majority of the farmers (who were selected "at random" using the method described in the technical part of this joint report) were also visited by the technical co-investigator, biologist Maria Berlekom, thereby allowing direct and fruitful comparisons between the situation of erosion and agricultural practices on the one hand, and on the other, socio-economic conditions and farmers´ attitudes to conservation. Preference was given to smallholders in the selection of farms (for details see the technical part of the report), as they are the principal participants in the Programme, and by far the most common type of landholders in Runyenjes.

In addition, thorough interviews and discussions were completed with seven of the field extension staff1 (six male, one female), with the Divisional agricultural and soil conservation staff, and with administrative personnel. A harambee[2] - a communal working day on soil conservation at Locational level (Gikuuri South) - was attended on June 6th and subsequent interviews carried out with the people concerned.

An important part of the report is based on a survey among the entire field extension staff. A questionnaire (Appendix VI) was administered to the extension workers on May 6th and 8th, when they assembled for their fortnightly training within the T&V System[3]. The respondents completed the questionnaires in groups of two or three working in the same Sublocation. Locationwise the field workers were distributed as follows:

Area/ Location:	Designation: Field Officer	T.A.	J.T.A.	Student/ Trainee	Not Stated	Total	Females
Kagaari North		4	4	2	1	11	1
Kagaari South		2	9	4		15	4
Kyeni North		2	6			8	1
Kyeni South		4	4	4		12	3
Gatuuri North	1	6	4	1		12	2
Gatuuri South		5	9	1		15	3
Ngandori		4	5	6		15	7
Nginda		2	5	1		8	2
Totals	1	29	46	1	1	96	23

The findings that are presented in this report are not strictly statistically valid and should not be treated as such. Nor do they represent any unbiased or absolute state of affairs. The purpose of the study was to identify the most serious constraints on the success of the Programme in the area, not necessarily to state that a certain percentage of the farmers are likely to perform in a given manner under certain specified circumstances. The picture that emerges is one seen through the eyes of primarily the farmers and the field extension staff. Priority has of course been given to relevance and authenticity of findings when interpreting the information. In some cases the presented findings are accompanied by additional comments and conclusions made by the author of the report, who of course himself is responsible for the final views expressed.

A request from the District Agricultural Officer in Embu, and from Programme Headquarters, was that the Study should concentrate on the southern part of the Division, where erosion problems are felt to be most acute. All the interviews with farmers and field staff were therefore carried out in the four southern Locations (Kagaari S., Kyeni S., Gatuuri S., and Ngandori), and there particularly in the high potential main coffee zone. The questionnaires directed to the extension staff, however, were distributed all over the Division, including the Locations in the tea growing area.

4.3. LAND

4.3.1 Land availability

Ecological factors related to land potential (such as rainfall patterns) are far from the only ones influencing farm sizes and agricultural practices in the area of the study. Counting only a few decades back, Runyenjes has experienced profound social, political and economic change (any elderly farmer would talk at length about this) affecting virtually every aspect of human life. When it comes to land available for cultivation two processes in particular have been very prominent. They are the rapid fragmentation of arable land, and the increasing scarcity of "virgin" land or new land for cultivation.

The information from the authorities on land registration and farm sizes is therefore rarely accurate. A farm registered as - let us say - six acres may in reality be divided by inheritance into several smaller plots. It is common to find families cultivating two acres or less (sometimes on steep slopes) in the high potential areas of Runyenjes.The most evident reason behind the steady trend towards smaller and smaller plots is a genuine and fast growth in population. An increasing number of households find themselves with too little land to support their families, and the subsequent dependency on outside incomes to pay for food or for school-fees have put them in a vulnerable economic situation.

In the high potential parts of the Division all land is now under cultivation, while in the drier lower ones fallowing is quite often practised and virgin land is still to be found. These, however, are no doubt characteristics of temporary duration. There is a steady influx of people purchasing land in the lower rainfall areas of Runyenjes. The majority of them seems to originate from the high potential parts of the Division, reflecting the high pressure on land resources there. This is contrary to the situation in the neighbouring Division of Gachoka, where people from other parts of the country mix with the original ethnic populations. The population of Runyenjes Division is homogenous with respect to language and culture, a fact that most certainly should facilitate the implementation of the Programme.

The most important reason stated by farmers for the possession of more than one plot of land gives further evidence of land fragmentation and of virgin land scarcity. To have more than one plot is a rational way of securing enough land for children to inherit. According to the extension staff, about one quarter of the farmers possess more than one plot at least a kilometer from one another. It is very common for the main land for cultivation to be in the high potential parts, while the purchased one is situated in the drier ones.

To summarize, the situation can be described as one of increasing competition for arable land and grazing or fodder resources, and as an effect of land fragmentation and a subsequent dependency on outside incomes, also over job opportunities.

4.3.2 Land-use

Agriculture is by far the most dominant use for land in Runyenjes. Emphasis in this report is on conservation in the intensively cultivated areas of Runyenjes. There are, however, two types of agricultural practices that should be mentioned here which concern the dry part of the Division. One is the communal use of private bushland for grazing and firewood collection. In this case the land is often owned by someone living elsewhere, who keeps it as a profitable investment or for future cultivation. The neighbours use the land to graze their animals and to collect firewood. Without any control, activities such as these could finally result in overgrazing and erosion.

The other practice is the habit of ploughing up and down hill, instead of along the contour with oxen. As this, according to the TAs in the area, often is done as an entrepreneurial enterprise (the ox-owner hires casuals to do the ploughing and the farmers in the vicinity pay him for the service), the individual farmers stand small chances of changing such a practice into what would mean a more costly and time-consuming procedure.

4.3.3 Rent of land

Lease or rent of land only takes place in a few cases, according to the respondents, and then not on long term contract but as land-lending free of charge (as a token) to close friends or to relatives cultivating on a seasonal basis. The motivation to practice conservation on such rented land is probably very low. The rent of land, however, does not seem to be a common enough feature to be a constraint that seriously affects conservation.

4.3.4 Landlessness

Landlessness (defined as people without any land to cultivate) is not perceived by the extension staff as being a particularly prominent phenomenon as yet. It is, however, a growing problem, again indicating the increasing pressure on land resources. Together with farmers unable to live off their too small plots, the landless form a considerable number of people looking for casual labour opportunities or for other kinds of income sources. Coffee-picking, and to some extent land preparation, will provide some jobs for people in the vicinity who, however, have to compete with migrant workers from surrounding areas.

4.3.5 Land ownership and income: subject to increasing differentiation

Respondents hold land ownership and particularly income to be connected to an increasing inequality among farmers, especially in upper Runyenjes. The high dependency on cash-crops and other incomes has for many households created a difficult situation when it for example comes to food provision, ability to pay schoolfees, or for that matter, labour availability for practising soil conservation.

Other households, however, seem to have experienced the contrary development. For them, the market has provided a higher standard of living, economic security, better food, good housing, piped water, education, etc. It is among the farmers in upper Runyenjes (in the coffee and tea zone and in the tea and dairy zone) that these better-off households generally are found, but it is also in this area where inequality is most noticed by the farmers themselves and by the extension staff.

4.3.6 Traditional land-use and conservation

Only a few decades back, virgin land was in abundance, and the practising of fallowing a common way to compensate for decreasing fertility or erosion. There was enough land for everybody.

Trash-lines and grass-strips constituted traditional soil conservation measures practised by the farmers themselves, according to one elderly TA. Crop-residues, that formerly were used for trash-lines, are now in most cases given to stall-fed cows. Grass-strips or plots of grass are still grown, but less so in a way to prevent soil erosion than to obtain fodder for the livestock.

The clan and the family formerly played a much greater role than today as administrator of land and settlement. The clan constituted a unit within which economic security was provided for its members, and where labour between friends and relatives could be exchanged on equal terms. Though the importance of the clan in today´s society should not be underestimated (it plays a crucial role for example in solving land disputes), people nowadays tend to act according to what their economic situation demands rather than to clan traditions.

The problem of erosion is not a new one in Runyenjes, nor are outside conservation programmes to fight it. The British colonial authorities took legal actions against people in their effort to convince them about the need for soil conservation. This happened during the late fifties and early sixties. The Conservation (that particularly involved the digging of terraces) was organised by the local administration and carried out as communal work. Looking back to that period elderly farmers and extension

workers argue that the British methods made people hate soil conservation, which was identified with colonial, coercive power. After independence a long period followed when farmers neglected conservation.

It is difficult to interprete what impact, if any, the British approach has on today´s attitudes toward conservation. Farmers and TA´s, when interviewed, stress that no force or legal actions ever should be used in the Programme to implement soil conservation, and they frequently refer to the negative experiences of the British methods when doing so. Only one extension worker (out of 96 who filled in the forms) stated as a special comment that the administration should take legal actions against farmers neglecting conservation. The general opinions of the chiefs and sub-chiefs on the matter are not fully known. There have been a few incidences where farmers by chiefs have been threatened of legal sanctions if they did not turn up at demonstration plots involving the communal digging of terraces. I will return to this point.

4.3.7 Prospects

Indications, supported by experiences from Nyeri (Fahlén 1985), a high potential area of similar characteristics as Runyenjes, suggest that willingness to practice soil conservation will increase with land fragmentation and virgin land scarcity. Obviously, it is easier in terms of labour and money to carry out conservation on a two acre farm than on one of six acres. In the same way one can expect increased willingness to perform conservation when virgin land no longer can compensate for erosion or decreasing soil fertility. When it comes to conservation (or rather the lack of it) in Runyenjes, one must keep in mind that land scarcity is quite a recent phenomenon. Also in the high potential areas, the farmers tell about virgin land being accessible only a few years ago.

As recipients of coming soil conservation campaigns increasingly can be expected to be young people with very small plots of land, there might be a success awaiting the Programme in the future, provided of course the above indications are correctly interpreted. One reflection by a TA points in this direction. He said that the sons, the young people, who divide their fathers´ land into small plots, are much more willing than their parents to practice conservation. They know that the land they now possess is the only one they can expect to have access to. They must rely on it for a long time, and they had better take care of it.

4.4 AGRICULTURAL SITUATION

4.4.1 Cash-crops vs food-crops

Runyenjes as a whole shows a very high dependency on market conditions for agricultural production. For a majority of the households, cash-crops such as tea and coffee constitute the major source of income. Other cash-crops, such as cotton, tobacco, sunflower, macademia nuts, pyrethrum - to name the most important - may locally provide valuable income.

Apart from cash-crops; food-crops, livestock and animal products, are marketed throughout the Division and almost every household sells at least some of these items. In the drier parts of the Division, food-crops and livestock are by interviewed TAs said to partly play the role of genuine cash-crops in the sense that they are used for meeting the same kind of expenditures that in the high potential area are paid for by tea and coffee.

4.4.2 Marketing

The facilities for marketing food-crops are very good. There are markets and storage space in virtually every Sublocation (partly a result of the famine relief programme that was brought to Runyenjes in 1984). Main marketing centres are Runyenjes township and the District and Provincial capital of Embu, where the parastatal Cereal and Produce Board operates stores and offices. Distances are short within the Division and transports are easily available; conditions that for the farmers will facilitate marketing considerably. Livestock marketing, on the other hand, is not very well developed, mainly because of Runyenjes not being a cattle rearing area. Each household keeps only a few stall-fed cows, and goats are few. Marketing of cash-crops is of course of very big importance for the household economy, and is done with the help of coffee societies.

4.4.3 Market adaptation

The diversity of food-crops formerly cultivated as a security against drought and other crop failures, has now given way to cash-crops and a limited number of staple-food crops (mainly maize, beans, potatoes, cassava and bananas). According to one respondent at the Division Headquarters, a former home economist, the severe drought in 1984 made people aware of their precarious food situation, and an increase of the cultivation of drought resistant crops, such as cassava, yams, millet, etc, followed. None of the farmers visited, however, seemed to see any connection between the severe effects of the drought and the need for soil conservation on their farms.

4.5 LABOUR AND ECONOMY

The favourable conditions for agriculture in Runyenjes, where normally two harvests are reaped each year, require a high labour input in farming. In the high potential area, and especially in the tea zone, the farmers are very preoccupied with agriculture throughout the year - this more than anything else depending on the good marketing of cash-crops and on the subsequent cultivation of these crops on most of the acreage - whereas the situation in the lower parts of the Division is somewhat different with a marked slack season in August-September when people can engage in other activities.

4.5.1 Women-headed and extended family households

Apart from lack of funds, most farmers complain that they lack time and labour to carry out soil conservation (the digging of structures). These factors are also stated by the TAs as being farmers´ main constraints in the undertaking of soil conservation.

Lack of labour and funds is especially relevant in cases where women and children constitute the only source of farm labour (particularly households headed by widowed women are experiencing a difficult situation). Male absence because of outside employment will also leave women and children with the farming, but provided money is brought back home, which is far from certain, these households will have at least some economic security, or additional help through their ability to hire casual labourers.

Extended families, particularly if they have access to outside incomes, are normally much better off when it comes to labour and money. There is, however, an important reservation to make in relation to this particular household category. Extended families hardly exist in upper Runyenjes in the sense of implying a common domestic economy, and mutual labour-exchange between household members of several generations or nuclear family units. In this area, the economy is individualized with nuclear family units constituting the basis of agricultural production. What at first appeared to be extended families among many of the residences visited, turned out to be two or three nuclear families living within the same compound, each having its economy seperated from the others (they were cultivating their own plots, employing their own casuals and with very little exchange of labour, money or staple-food, etc).

4.5.2 Individualization of farmers

Co-operation between neighbours and friends does not take place as commonly as it did before, according to farmers and staff. The boom in cash-crop agriculture and unequal incomes and education opportunities favouring some households´ ability to purchase land, are some reasons held by the respondents to be at least partly responsible for increasing individualism, and for the differentiation of land and income referred to above.

In the lower areas this individualism is less accentuated, and it is more common to find true extended families and labour exchange between related households, and between neighbours and friends. Obviously, a soil conservation programme has to use a somewhat different approach in these two parts of the Division.

4.5.3 Communal work

The general trend as experienced by the staff, is one of growing individualism also in the lower parts of Runyenjes. The Division as a whole has no strong tradition of communal work or self-help groups, although the situation in this respect seems to be somewhat different in the drier areas (self-help groups are more numerous). Elderly farmers and extension workers complain that what little tradition they had in this respect is now becoming lost. Self-help groups are not particularly widespread, and not very active. Of the few groups encountered, almost everyone seemed to be engaged in some kind of fund-raising or money-making activities, rather than in non-profitable work. There was one group that at first appeared to be an exception. The members of a women´s group in Kigaa Sublocation said they were helping each other in farming and conservation, though their description of their achievements was a bit inconsistent with the true situation on their farms.

4.5.4 Employment of casuals

In the lower area, only a few households were reported by staff and farmers to employ casuals at least some part of the year, almost exclusively to pick coffee (and very rarely to do soil conservation), while in the upper area almost all households hire casuals and quite a number also contract labourers for permanent employment (and for occasional soil conservation work). The TAs state that employment of casuals is a considerable household expenditure in this latter area, into which there is a steady stream of people looking for casual labour opportunities, particularly during the coffee picking season.

It is generally not difficult to find casuals to do soil conservation, as this type of work coincides with the time of the year when little other work can be found. Especially in the drier parts, soil conservation work is very much appreciated as a source of income.

4.5.5 Household expenditures

School drop-outs is something reported as very common by farmers and staff, giving further evidence to the fact that schoolfees by far is the most heavy household expenditure in Runyenjes as a whole, with the possible exception of the tea zone, where the respondents estimate that the purchase of staple-food requires about as much money as the school-fees. The reason here is the intensive cultivation of tea and the limited conditions for growing food-crops in high altitude zones.

Other considerable household expenditures in the Division as a whole are, apart from staple-food, clothes, housebuilding, and fertilizers. According to the extension workers, the proportion of households buying staple-food before they can secure their next harvest fluctuates between one and three quarters depending on Location. Compared to these items soil conservation and harambee are given low priority. They are stated to form considerable expenditures for one quarter or less of all households.

4.5.6 Household incomes

There are various ways of meeting the expenditures listed. Income from cash-crop agriculture is, as has been argued, rarely sufficient for households with many schoolchildren. In spite of presence of tea and coffee on the vast majority of the farms, it is common for farmers to earn extra money by selling of food-crops or livestock. As farms, however, are getting smaller and smaller and families increasingly larger in relation to farm size, fewer and fewer farmers are able to rely only on farm produce to meet all expenditures. They have to look for money also from outside; for example through employment or informal sector activities.

4.5.7 Sale of food-crops

Sale of food-crops gives about a quarter of the households a substantial and regular income, according to the extension staff. From what the farmers themselves say, however, sale of food-crops in many cases seems to reflect a precarious economic situation; a last resort in overcoming acute financial problems. Such a measure will of course bring a household into a difficult market dependency, as food in most cases later on will have to be replaced, but at a higher price than it was sold for.

4.5.8 Informal sector activities

Informal sector activities, such as charcoal burning, beer brewing, handicraft, or petty trade, may for some households generate a most important income. In most cases, however, they seem to form supplementary incomes.

4.5.9 Outside employment

Employment or casual work by the men are common ways of raising cash for households with only a limited acreage available to grow cash-crops on. According to the TA´s, about one quarter of all husbands, and more frequently the sons, are absent for at least two months every year in most parts of the Division (the figure, however, increasing in the northern Locations).

As is the case for cash-crop incomes, money from employment is almost always controlled by the men. According to the TA´s, men are also the ones who decide about farm management in spite of the fact that women carry out most of the practical work.

The remittances from outside employment are rarely used for compensating the consequent loss of labour by hiring casuals (upper Runyenjes being an exception), thereby leaving women and children with the practical agricultural work. Rather these incomes will cover school-fees, purchase of staple-food, etc, and soil conservation work will suffer accordingly. Contrary to many other districts (Östberg 1984), the TAs state that soil conservation work in Runyenjes almost exclusively is carried out by men, either by the farmers themselves, or to some extent by casuals. No self-help groups, and very few women, were in practice found to be engaged in conservation.

4.5.10 Animal husbandry - means of security

Apart from milk production and the production of manure, the most important reason for farmers keeping cattle (cows) is for the security of being able to meet expenditures like school-fees or sudden crop-failures. Together these reasons are more than anything else stated to be responsible for the fact that the number of animals in most cases far exceeds the fodder or grazing resources in the dry season. Bridewealth is another factor to be considered for overstocking, although cattle nowadays tend to be substituted for or turned into cash.

Quite a number of farmers have to buy fodder-grass regularly from their neighbours, also when the rains are favourable. In the dry season such a situation might deteriorate into one where the farmers are forced to sell off their cattle or to slaughter them. Grazing along road-sides, or in some cases on crop-residues after harvest, are other means of providing for the animals. This is a last resort, as the keeping of cattle in a permanent place is necessary to obtain the manure that is so important for soil fertility. In the high potential area the situation can be described as one of over-stocking under zero-grazing[4] conditions!

4.5.11 Conclusions

Household ability to hire casuals to do soil conservation (financial situation) varies considerably, as does availability of labour within the farms. Considering the individualization of farmers (nuclear family households constituting the most common

basis of agricultural production), the rare occurance of self-help groups, extended families, etc., the prospects are probably poor of succeeding with mechanical conservation on farms headed by women or which otherwise lack adult male labour. This with respect to womens' general workload and financial resources (especially widowed households), and to the fact that soil conservation is men's work. The problem seems difficult to overcome, for example, by organizing women's groups, at least in the high potential areas.

4.6 PERCEPTIONS OF SOIL CONSERVATION AND PROGRAMME POLICY

The first thing that came to farmers' and extension workers' minds when asked about soil conservation, was the digging of cut-off drains and terraces.

4.6.1 Background

The domination of these structures in the minds of people, and to judge from the technical part of the report also very strikingly on the farms, is most likely due to the direction of previous campaigns on conservation in Runyenjes. Generally speaking, this domination can be seen to generate from the high status and political rewards of such structures, which when being achieved are used as feed-back to Programme Headquarters. Who whould take notice of so and so many farmers being convinced to do contour-planting or other biological conservation measures, if such information ever would surface in an annual report?

The bias towards mechanical structures has no doubt been further emphasized by the Programme policy of paying farmers (and casuals) to construct cut-off drains as a way of stopping water flowing over their own and neighbouring farms.

Despite the Programme policy to pay for cut-off drains in the rest of the country, this was abandoned by the District agricultural authorities in Embu in 1984 , with the exception of small localities, where money generated from the Rural Works Programme (RWP) still is spent on paying casuals to do soil conservation work.

It is difficult to judge what influence the RWP money has on farmers' perceptions of what to expect from the Programme. The funds previously provided by the Ministry through the Programme, however, were very much appreciated by the farmers who got free structures on their farms, although in many cases without fully realizing the reasons for these.

Lack of maintenance of structures paid for, and very few terraces dug by the farmers themselves were primary reasons for the District Headquarters' withdrawing the allocation of Programme funds for paying for the construction of cut-off drains. Yet another reason was that instead of serving several neighbouring farms as intended, cut-off drains were mainly constructed on individual farms (further indication of the strong individualization of farmers in Runyenjes).

Important side-effects of the District policy prior to 1984, primarily according to interviewed farmers, were that jobs were created for landless people, and for school drop-outs during a time of the year when the demand for cash is high and other jobs are difficult to find. Incidentally, this seems to be a common argument used by many people in the local administration, to get the District to return to its former policy.

Regardless of what effects the structures paid for have had on combating erosion, the fact remains that the policy of paying casuals has created expectations primarily among farmers, but also among chiefs and sub-chiefs that conservation is Government responsibility to be paid for by Government money, and not by the farmers themselves. This opinion is strongly articulated among the farmers who identify conservation exclusively with the digging of structures. According to the TA´s interviewed, terraces and cut-off drains are the only conservation measures farmers ask for.

It cannot be excluded that cut-off drains were dug in numbers greater than strictly necessary, and in places where other measures would have been sufficient or more appropriate, just because they were provided free of charge by the Government (through the Programme). Nor can it be excluded that the overall notion of conservation as a digging activity has contributed to the fact that simpler and more labour-saving measures, which would be less costly and more applicable, considering for example the labour shortage experienced by most households, have been treated as less important.

4.6.2 Extension staff opinions

There are a few extension workers, who together with the Headquarter and Divisional staff, support the District change in Programme policy that conservation should be carried out by the farmers themselves. But they are notable exceptions.

The vast majority of the field extension staff does not support the present District policy on soil conservation. On the contrary, their opinion is that the District should once more use Programme funds to pay for casuals to do the work (whether they refer to the digging of cut-off drains only, as was the case before, or to any conservation work is unclear). Many of the field workers expressed their view on this in special comments and remarks when filling in the questionnaires. It is emphasized strongly. No bias such as age, sex, or Location can be traced in the statement. It appears to be a consistent viewpoint all over the Division regardless of other circumstances.

Moreover, out of the students or trainees (the next generation field workers) that filled in the forms, the majority does not only share the above opinion. They also stated that funds should be allocated directly to farmers to pay for soil conservation.

4.6.3 Conclusion

Consequently, there is a considerable discrepancy between the District interpretation of the Programme and how it is perceived by the extension staff, who are to implement that particular policy in their daily work.

The motives of the District´s withdrawing of funds to pay for the digging of cut-off drains have not been supported nor understood by the majority of those actively involved in carrying out the Programme. Now almost everyone talks about the problem of conservation as one that should be solved by Government funds. There is a need for increased training of the field workers and for information on the reasons for the present District policy of conservation.

The fact that both TA´s and farmers so strongly emphasize lack of labour and funds as constraints to conservation is of course also understandable from the point of view that soil conservation work (specifically the digging of cut-off drains) actually was paid for very recently. It is still fresh in the memory of farmers and field workers and naturally referred to frequently.

4.7 FARMERS´ PERCEPTIONS OF SOIL EROSION

4.7.1 Erosion vs soil fertility

The Divisional agricultural staff and the field workers state that sheet erosion is the most common type of erosion, but that it is normally not noticed by the farmers as long as they obtain expected yields from their shambas. Only when severe soil erosion is experienced, to an extent that crops or manure are washed away, or that gullies are forming on the farms, do they approach the staff for advice. The soil conservation measures in Runyenjes are to a very great extent curative rather than preventive!

With few exceptions, none of the farmers visited complained about decreasing yields in spite of obvious sheet and rill erosion on their farms. On the contrary, most of them reported rising yields due to increased use of fertilizers and manure as compared to five years ago. This was a consistent finding regardless of the state of soil erosion on the farms, except for a few cases where the erosion was too obvious to be disregarded.

The TA´s, however, told a slightly different story. They said that most of the farmers actually complain that their yields are decreasing, though the reasons the farmers give do not pertain to erosion, but to lack of manure and fertilizers, lack of certified seeds, to pests and diseases, etc.

Moreover, to judge from the farmers interviewed, the problem of erosion is not referred to as a serious one among the farmers themselves. Erosion is generally not everyday talk and does not seem to preoccupy people´s minds very much. When a particular farmer´s crops are washed away people will notice and he will be pitied by his neighbours. The event, however, will be seen as an isolated one. No action of conservation among his neighbours will follow and it is soon to be forgotten by the farmers in the vicinity.

4.7.2 Conclusions

For the farmers the question of land fertility more than anything else is a question of inputs such as fertilizers, at least until the erosion reaches a stage where it no longer can be ignored.

Considering the background of farmers´ perception of soil conservation as a digging enterprise, requiring either hard work or/and money, they do not see the benefits of digging in the form of higher or at least constant yields, when compared to the costs. They get at least constant and, above all, immediate returns by spending money on fertilizers, instead of paying casuals to dig terraces.

Then there is the question of convincing them and others of the long term advantages of soil conservation. Many farmers in Runyenjes seem hardly to be in the position, money- and labourwise, to plan their farming years ahead. For them planning is a matter of getting on from one season to thenext. One woman farmer stated:

> "If the yields as they say increase with conservation, why does the Government not lend us the money to pay casuals for digging? Then we could pay the loans back through our increased yields."

As can be seen, there is considerable discrepancy between the emphasis on mechanical soil conservation within the Programme and the ways in which farmers in Runyenjes perceive the actual situation of erosion. Farmers do not consider erosion to be a problem serious enough to be dealt with by digging structures, at least not so serious that they readily pay for it themselves.

Farmers´, staff´s and administrators´ expectations of conservation to be paid for and farmers not seeing erosion as a serious problem (lack of motivation) probably form the strongest general and short term reasons to why the Programme is facing difficulties in Runyenjes.

Considering farmers´ lack of motivation and incentives to conservation it is not certain that it would be wise for the District headquarters to once again pay for structures, either for cut-off drains on individual farms or for terraces dug on demonstration plots, in spite of the strong advice from the field workers, the farmers and, to some extent, from the administration to do so.

4.8 THE COMMUNAL WORK APPROACH TO CONSERVATION

4.8.1 The problem

It is generally very difficult to get people to attend harambee based communal soil conservation work on individual farms. The work is called for or announced by the local chief or sub-chief, and even then people turn up sometimes in very low numbers (a communal working day that the author of this report attended on June 6th only assembled about fifty farmers, in spite of it being announced in the entire Gikuuri South Location. The fact that it took place during a difficult time with regard to the harvesting of coffee can hardly be the only explanation of the poor response from the farmers).

Many extension workers and farmers consider the communal work to be forced labour, an opinion that especially in upper Runyenjes is very prominent. There have been a number of incidences where the chief has threatened the farmers with prosecution if they do not attend the communal work of digging terraces, and a few such cases have also been carried through to state examples.

"The administration must stop forcing farmers to do the communal digging", was one TAs statement as he filled in the questionnaire.

"We do it for the benefit of the chief and sub-chief", was the annoyed comment from a farmer.

Most of the communal digging takes place during a time of the year when the cash demand is very high among the farmers. January-February and August-September are the soil conservation periods, but also the time when the schools start and when the farmers´ need of money to pay school-fees becomes an urgent problem.

According to the extension workers, farmers´ unwillingness to participate in communal digging does not so much depend on their being busy elsewhere to look for money during this particular time (to raise school-fee money is a year around problem), as on their minds being so preoccupied with money at this period of the year. Many farmers see the communal digging as a potential source of income, most certainly fueled by the former Programme policy in the District of actually paying for such work (specifically for cut-off drains). In an interview one woman farmer stated:

"We have to sell off our land, our food-crops and animals to pay for the school-fees. Then why should we do that hard communal work for nothing?"

4.8.2 Reasons

Several factors seem to add to the presence of resistance against the harambee based communal digging, factors which confirm the trend of the resistance being stronger in the high potential areas of Runyenjes:

-a process of social differentiation that takes place in upper Runyenjes in conjunction with households´ market involvement through intensive cash-crop agriculture, outside employment, etc

-the relative lack of traditions of communal work and self-help groups (individualization of farmers).

-farmers being very preoccupied with agriculture (particularly in the tea zone).

-the low probability of reciprocity from participation in communal work. A particular farmer can hardly in his lifetime expect the digging to take place on his farm. That means he attends the chief´s digging for "nothing".

-farmers with flat land or structures already made may lack motivation to carry out conservation on other farms

-some farmers complained when interviewed that certain farms were being favoured in the selection of digging or demonstration sites. One farmer (who himself was very successful at conservation) commented that some farmers in his area had used their money and influence to bias the selection of digging sites in their own favour. The important point here is not whether such things actually take place or not, but the fact that farmers think so. In most cases the selection of demonstration sites seems to be done according to the principles set up by the involved authorities, though of course under the circumstances it is difficult to completely avoid the jealousy that the digging for a particular farmer creates among his neighbours.

-the low efficiency of communal work that leads to farmers being called several times to finish the same spot. "If we only had casuals to complete the work", was one comment from a TA on the communal work day, previously referred to.

-the extension staff share to a great extent the views of the farmers and do not support the present approach. There are, of course, also exceptions.

The resistance to communal digging, however, is not absolute. As pointed out by some TA´s, it is normally much easier to gather people for work on public land, or when everybody is expected to benefit from it. Then people know that no individual will be favoured. Such occasions may involve for example gully control from roads, rehabilitation of communal grazing land, afforestation projects, etc. It is also normally easier to gather people together in the lower parts of Runyenjes than in the high potential areas.

The majority of the farmers visited said they first learnt about soil conservation from a chief´s baraza[6], not from visiting a contact farmer[7] or otherwise from the agricultural staff as one might expect. The information forwarded on barazas, however, is only verbal. To gather people together to dig communally at selected sites, is intended as a futher step in the education of farmers through the practical demonstrations that such occasions involve.

The establishing of demonstration sites can of course also be seen as a way by which local officers are able to show outsiders that conservation activities in fact are taking place in their area. Demonstration sites are then seen as a positive feed-back to Programme Headquarters from the point of view of the local staff.

The negative attitude towards communal digging, however, seems locally to be so great that the disseminating effects of such an activity, especially in the north of the Division, probably are very low.

4.8.3 Conclusion

Farmers´ resistance to harambee communal digging in the high potential areas of Runyenjes (especially when carried out on individual farms), is a strong indication that a group approach of this kind to soil conservation might not be the best solution in certain parts of the Division. A focus solely on this activity as a way of educating farmers, may very well lead to a biased view of what conservation is really about, and create increasingly negative attitudes about the idea of conservation.

4.9 PROMOTING THE PROGRAMME - RECOMMENDATIONS BY STAFF

4.9.1 Training of the local administration

Increased training of particularly chiefs and sub-chiefs appears as a frequent response from the staff on the question of how to make the Programme successful. Quite a number of the extension workers complain about lack of interest and commitment on behalf of the administration. According to one TA:

> "If soil conservation is left only to the agricultural staff or to the Ministry we will never succeed. The administration has to be fully educated and participating."

4.9.2 Training of farmers

The majority of the field workers emphasize the need for increased training and education of farmers, though it must be added that they think farmers´ lack of labour and funds to be bigger constraints to conserving the soil, than lack of knowledge or education, an observation that hardly is surprising as it is the task of the staff to educate the farmers.

Quite a number of the TA´s also ask for funds and, in a few cases in the lower areas, tools for self-help groups. Tools to individual farmers, however, are very rarely considered to promote conservation.

4.9.3 Training of staff

Many of the extension workers state that their own knowledge of conservation needs renewing, though they do not specify in what respect. The technical part of this joint report will more specifically illustrate what is needed.

4.9.4 Nurseries

The demand for tree-seedlings in the Division is very high, and most farmers try to solve the problem by collecting seedlings from the bush or from their shambas. Very few of the farmers visited reported that they had got seedlings from a soil conservation or agricultural nursery. The most common suggestion by the staff to meet the demand, especially of fruit-trees, is to establish nurseries close to the farmers, preferably at Sublocational level. One TA suggests bulking plots for seedlings at primary schools and coffee factories to improve the distribution. A teacher at a 4K club asked for better support as regards material for running a nursery.

4.9.5 Soil Conservation Committees

The soil conservation committees are reported as dormant or non-existent. Several TAs want the committees to be active in helping to educate the farmers. In discussions with the extension staff and with the Divisional staff on the issue, there surfaced a wish that the committees should play a more active role in the Programme. One suggestion was that committee members should not as now be picked on the criteria of being influential people, but in consideration of how much conservation that had been done on their farms. They should constitute good examples for others. The committees were requested to more actively encourage the participation of local people in carrying out the Programme, e. g. in the selection of demonstration plots, in the identification of erosive areas, in the education of farmers, etc.

4.10. BIOLOGICAL CONSERVATION

4.10.1 Some preconditions

If one considers the money- and labour-shortage, and the lack of motivation on behalf of the farmers, an increase of biological measures in the execution of the Programme would be worth thinking about. What are the preconditions for simpler or biological conservation measures? Let us here just pick a few examples to briefly illustrate the complexity of the situation.

Traditionally, as reported by an elder TA, people used grass-strips and trash-lines for conservation. Today permanent trash-lines are rarely found. Crop residues are used as fodder for stall-fed livestock and for mixing with manure in the cowshed. The scarcity of fodder experienced by almost every household could be used, one would think, as an incentive to increase the planting of grass-strips along the contours. A problem is that some farmers consider grass planted as strips to interfere with their other crops. One of the extension workers reported that farmers think that grass planted in strips takes more of their land than when planted on the embankment of fanja-yuu terraces.

There is also the question of how to make good grass varieties available to farmers. Some TA´s from Gikuuri South Location reported that farmers there could not get fodder-grass seeds or/and cuttings when they wanted them. Better distribution was requested, or alternatively, nurseries closer to the farmers. Yet another problem is the implementation of agroforestry during the present situation of scarcity of tree seedlings.

The problem of ploughing up and down hill was previously referred to. A simular issue; the planting or cultivation along the contour (which is a biological conservation measure) encounters similar problems, originating from the cultural and socio-economic organization of the rural society. Women have a considerable workload already through child-rearing, cooking, fetching of water and firewood. They will definitely go for the most labour-saving farming practicies, and it is generally physically easier to dig and to plant up and down hill than to do it along the contour.

Very important when discussing biological conservation is how the message should be forwarded to the farmers to have them understand that conservation measures are part of the general agricultural work and farming practicies. This question will more closely be dealt with in the last chapter of the report in connection to T&V System experiences.

4.11 THE T & V SYSTEM AND THE PROGRAMME

4.11.1 General difficulties

The following are some reflections and opinions expressed by the extension staff on the present Training and Visit System and its relation to the soil conservation policy of the Programme. They involve some obvious contradictions, which rather than being overlooked, should serve as starting points for fruitful discussions of how to creatively involve the Programme in the T&V System.

Understandably, the advantages of the T&V System are in most cases advocated by the officers concerned and the headquarters. With the field workers on a fixed schedule, monitoring and follow-up of their progress have become considerably facilitated. For headquarters, planning is now much easier and agricultural campaigns can be launched with the message disseminated to the farmers within a very short time. When it comes to conservation, the general argument is that thanks to the T&V System it is now possible to integrate conservation in every agricultural instruction given to farmers, and to do this during every part of the year.

The field workers, however, have a different view on the matter. To start with how they perceive general problems, the disadvantages of the T&V System can be summarized as follows:

-the contact farmer is very often absent . The attendance of the follow farmers in the neighbourhood is poor and irregular.

This statement was very strikingly supported by the farmers themselves. Most farmers reported that they never or very rarely visited their contact farmers, and it was not uncommon to find farmers that did not know about or did not want to acknowledge the existence of contact farmers at all. Yet other farmers said they knew their contact farmers but were nevertheless unable to point them out at a direct request to do so. Most frequent reasons given not to visit the contact farmers were lack of time and lack of knowledge about their existence or who they were.

Contact farmers´ absense was a very common statement from both male and female TA´s when filling in the questionnaires. The TA´s interviewed on the subject, however, were all men. Their further comment was that it was very difficult to improve farming when only wives and children were to be met (at farms where husbands existed but were absent for employment or for other reasons). Very few contact farms, if any, are women headed households (widows or unmarried women).

One Locational Extension Officer (LEO) reported that women on farms where husbands are absent no longer were instructed by the staff, as their husbands in any case would not accept the new farming methods introduced by the wives and not by themselves. Also when the men are the ones instructed, he continued, their supervision of the wives and children, who do most of the practical agricultural work, is very poor and lacks commitment.

-farmers to be visited are too many, or extension workers too few (suggesting the area covered within the T&V route being to large) This is reported from every Sublocation, with an emphasis on the lower areas (Kyeni South and Gikuuri South).

-some TA´s in every Location state transport problems (or rather a lack of means of transport), (most frequently in Kagaari North).

-a large number of the field workers complain about farmers ignoring the advice they are given.

-the schedule of the T&V route is too tight. Too many subjects are introduced at the "same" time. A new subject comes up almost every fortnight, which will make follow-up of the previous one very difficult. Farmers not present at a given occasion will miss that particular piece of information entirely.

4.11.2 T&V and conservation - a contradictory issue

When it comes to soil conservation, the overall extension staff opinion is that the T&V System has interfered with the Soil Conservation Programme. The idea that soil conservation should be integrated in every agricultural issue, the staff agree, is no problem to be dealt with verbally. What the farmers are said to need, however, are practical instructions in the field. "The T&V is for teaching theory, it does not allow us practical demonstrations", was a frequent comment from interviewed field workers. Several farmers visited also complained that they were given only verbal information from the TA´s (also when it concerned agriculture in general).

The most important period for doing soil conservation is in August-September. This is the time when soil conservation is the main issue on the T&V route. To cover all farms along the route takes half of that period, according to the respondents, who also say that time allows them to verbally present conservation at every farm visited, but not to carry out practical excercises, e.g. to measure and to peg out terraces, etc. They say there is no time to measure all the terraces requested by the farmers, let alone to follow up those that have been previously measured to assure that they are constructed correctly.

The above statements involve some obvious contradictions. According to the District and Division Headquarters some 183,000 meters of cut-off drains were measured last year, but less than 5,000 of them had been constructed!

Do the above TA´s arguments of time constraints, when considering the impressive length of cut-off drains measured, suggest that even more cut-off drains would be measured, provided there was more time?

Why is it that a lot of time and resources during the conservation campaign in September is spent on having the extension staff measuring cut-off drains and other structures that are never completed? Are such structures measured without any follow-up of farmers´ ability in terms of labour and money, or motivation, to carry out the work?

Why do farmers ask for the measuring of structures they have no intention of digging? Unfortunately, time did not allow us to investigate these issues in detail.

4.11.3 The staff - farmer relation

A couple of farmers were encountered, who when experiencing soil erosion on their farms and after attending a chief´s baraza and a demonstration plot, asked the TA to come to their farms to measure terraces, but he never turned up. Another farmer stated that the TA was never to be met and that he expected farmers to pay him for the measuring. As these farmers were very motivated they eventually tried to dig terraces themselves.

The first example supports the extension worker´s own view of the workload they experience along their T&V route; the other one rather indicates the need for improved follow-up or monitoring of their whereabouts. Perhaps a comment should be made here. Naturally, the success of conservation, as the outcome of other agricultural instructions, will depend on the interest, knowledge and dedication of the fieldworkers. Thereby not indicating that the extension workers concern of the T&V System should not be a genuine one.

"There is a gap of communication between the TAs and the farmers", one elderly TA pointed out. The gap was said to be twofold. "On the one hand the contact farmer is absent and the follow farmers are not attending; on the other one, those farmers who really wish the help of the TAs have great difficulties in getting that assistance as the latter are very much tied up on their routes".

4.11.4 Staff suggestions

The suggestions made by the staff to solve these problems are geared towards two measures:

- to increase the number of field workers within the present T&V system.
- to employ a special staff member to deal with soil conservation only in every Location or Sublocation.

4.11.5 Conclusions and comments

As indicated by the above suggestions by the extension workers, their complaints are not so much a questioning of the T&V System itself, but should rather be seen as a genuine concern about their working situation and of how soil conservation, as they see it, should be implemented in their daily work. Obviously, the T&V System has some limitations when it comes to soil conservation.

The problems facing the T&V system as they have been presented here, however, most likely and to a great extent appears to depend on the current bias towards mechanical conservation that characterizes the Programme in Runyenjes. The idea behind the T&V System seems to be considered a good one, and with some modifications it can be probably be further improved. It should not be too difficult to integrate simpler or biological conservation measures in the T&V route, as such information can be passed on verbally to the farmer, thus requiring less time by the staff.

To comment further on this issue and on the staff´s suggestions of employing extra personnel to deal with conservation, one can say that an alternative measure worth trying would be to emphasize biological conservation also in the education and training of the present staff. The majority ofthe field workers failed to see conservation as being an integrated part of general agricultural practices. Instead it was looked upon as one subject among others, each of them claiming attention during particular times of the year. By giving less attention to mechanical soil conservation in the Programme, the frustrations the staff now is experiencing along their routes could be decreased. The possibility of involving soil conservation committees to alleviate the workload of the staff, as suggested by many TA´s, is also worth investigating as an alternative to employing extra staff members.

The problem of contact farmers´ absence and follow farmers not attending could possibly be partly overcome by regular changes of contact farmers. The disseminating effects should most likely increase by such a measure, and when necessary, it would be possible to concentrate on particular categories of farmers that are in need of special attention, e.g. women headed households.

4.12 INDEX

1. The Field Extension Staff is employed by the Ministry of Agriculture and Livestock Development for the purpose of training the farmers on issues launched by the Ministry. The field workers are attached to the Divisional Headquarters of the Ministry and carry out their duties at a Sublocational level. The Staff consists of LEO´s (Locational Extension Officers), TA´s (Technical Assistants), and JTA´s (Junior Technical Assistants).

2. Harambee is a gathering of people to work communally on a volounteer basis, or to raise money for specific projects, for example building of schools or churches. The communal digging of soil conservation structures on individual farms as well as on common land is carried out as harambee.

3. The T & V System (The Training & Visit System). The field workers daily move along a predetermined route visiting contact farmers who are instructed and trained in agricultural practices, including soil conservation. Each field worker visits six farmers daily. Once a fortnight the entire staff assembles at the Divisional Headquarters for information on what´s on during the coming period, and for their ongoing education.

4. Zero-grazing is the technical term for having stall-fed cows, the most common way of organizing animal husbandry in Runyenjes Division.

5. Soil Conservation Committees. These committees were introduced by the Programme and the Ministry for the purpose of involving the local people in conservation, and to take advantage of farmers´ knowledge of constraints, areas of erosion, and so on. The committee chairmen are the chiefs and subchiefs, and some of the field workers act as secretaries. It is the task of the chiefs to convene meetings of the committees. The farmers are also represented in the committees selected on the criteria of being influential on the local community. The majority of these committees, however, are reported by the staff and farmers to be inactive or non-existent.

6. A Baraza is a meeting called by the chief whereby important information is passed on to the people. During barazas the extension workers can sometimes take the opportunity to inform farmers about soil conservation.

7. The Contact Farmers are the ones visited by the staff along the routes of the Training and Visit System. The farmers in the vicinity of a contact farmer, called "follow-farmers", are supposed to visit the contact farmer when the staff comes to instruct on agriculture. The contact farm is conceived of as being an instructive example for other farmers to follow.

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APPENDIX 1

Farm size, slope and land use

Tab. 1. Areas (mean values, in acres)

Total area of visited plots	3.7	
Of which a) farmyard	0.25	
b) cultivated land	3.1	
- cash crop	1.1	
- food crop	1.8	
- napier grass	0.4	(mean for 25 farmers)
c) uncultivated land	1.2	(mean for 23 farmers)
Area of other plots belonging to the same farmer	3.3	(mean for 14 farmers)

Tab. 2. Crops

Number of farmers growing	a) maize and beans	68
	b) Irish potatoes	62
	c) coffee	64
	d) tea	3
	e) other cash crop (cotton or tobacco)	3
Mean number of subsidiary crops		15

Tab. 3. Slope/land use - how the farmers utilize their land in relation to slope (figures show numbers of farms on each class of slope gradient)

	<6%	6-12%	12-20%	20-35%	35-55%	>55%	Tot.
Coffee	10	15	17	11	9	2	64
Food crops	10	16	21	12	5	4	68
Napier grass	1	4	3	3	8	6	25
Uncultivated	3	3	4	2	5	6	23

Tab. 4. Slope/degree of erosion in food crops (figures show numbers of farms)

	<6%	6-12%	12-20%	20-35%	35-55%	>55%	Tot.
Slight sheet erosion (SSE)	8	3	2				13
SSE + small rills		2	2				4
Visible sheet erosion (VSE)	2	2	1				5
VSE + small rills		8	9	5			22
VSE + medium rills		1	5	4	3	1	14
VSE + large rills			2	3	2	3	10
	10	16	21	12	5	4	68

Tab. 5. Facts about cattle

Number of animals:	a) cows	3 (mean of 59 farmers)	
	b) goats	3 (mean of 42 farmers)	
Type of grazing (number of farms)	a) zero-grazing		59
	b) grazing in farm-yard etc		19
	c) on own uncultivated land		8
	d) on public land		2
Signs of erosion due to over-grazing:	No signs		68 (farms)

Biological erosion control measures

Tab. 6. General practises (figures give number of farms)

Contourplanting:	where beans are grown	8
	totally	48
Crop rotation:	with maize, beans and Irish potatoes	56
	other	4
	totally	60
Intercropping:	maize and beans	52
	coffee and food crops	8
	other	9
	totally	64
Stripcropping:		3
Ridging:	Irish potatoes	62
	other	2
	totally	64
Fallowing:	with a plot of napier grass (3yr on average)	11
	totally	19
Agroforestry:		11

Tab. 7. Manuring and mulching (figures give number of farms)

Mulching:	on coffee	31
	on Irish potatoes	19
	on maize	10
	totally	35
	laid out as trash-lines	12
Manuring:	on coffee	46
	on Irish potatoes	47
	on maize	40
	totally	47

Tab. 8. Fertilizers

	On total no. of farms	Amount/farm/season	Amount/yr/acre	Type N	Type NP	Times/yr 1	Times/yr 2
Coffee	64	50 kg	75 kg	58	6	4	60
Food crops	49	75-100 kg	100-150 kg	11	38	17	32

Tab. 9. Trees and treeplanting (figures give number of farms)

a) How much, how often and what species

Leaving old trees in the fields:		47
Totally planting trees:		63
Species:	Grevillea robusta	59
	Eucalyptus sp	20
	Indigenous species	31
	Fruit trees	43
Frequency of planting:	Seasonally	22
	Yearly	22
	Occassionally	19

b) Source and siting

		Fruit trees	Forest trees
Source:	own collection	42	50
	Kangaru tree nursery	5	
	Ishiara tree nursery	2	
	Forest dep. nursery	11	8
	bought at market	2	
Siting:	farm boundary	8	50
	in the shamba	14	14
	woodlot	1	6
	around farmyard	25	12

Mechanical measures

Tab. 10. Excavated bench terraces (BT) in coffee fields
(figures give number of farms)

a) General facts

Total number of farms with coffee		64
Number of farms with BT		58
BT on slope:	- <6%	8
	- 6-12%	11
	- 12-20%	16
	- 20-35%	12
	- 35-55%	9
	- >55%	2
Farms having coffee fields without BT on slope:	- <6%	2
	- 6-12%	4
Age of BT (note: eight farmers had both old and new excavated bench terraces)		
	- <2yr	4
	- 2-5yr	17
	- 5-23yr	26
	- >23yr (from colonial times)	19
Laid out by:	- farmer	13
	- agr. officer	45

b) Measurements

Slope of benches:	- reverse	5
	- level	11
	- 1-6%	38
	- 6-12%	4
Gradient of benches:	- level	27
	- 1-5%	13
	- >5%	3
	- variable/ondulating	15
Vegetation cover on risers:		
	- napier grass	6
	- other fodder grass	11
	- weeds	4
	- bare	20
	- fodder grass/bare	4
	- fodder grass/weeds	1
	- napier grass/weeds	2
	- bare/weeds	7
	- napier grass/food crops	3
Runoff crossing terrace risers:	- yes	47
	- no	6
	- not ascertened	5

c) Impressions

Impression: - very good	2
- good	4
- fair	24
- poor	19
- very poor	9
Reasons for terraces being inadequate:	
- No/poor cover on terrace risers	42
- HI ≥ 2 x HI recommended	2
- alignment	18
- lack of maintenance	33

Tab. 11. Terraces on food crop fields (Fanya juu = FJ: Grass strips = GS: Stone terraces = ST: permanent Trash lines = TL)

a) Number of terraceworks

Farms with terraceworks: - FJ only	13
- GS only	20
- TL only	1
- FJ + GS	4
- FJ + ST	1
- GS + ST	1
- totally	40
Number of terraceworks, total number of farms with: - FJ	18
- GS	25
- ST	2
- TL	1
Total number of terraceworks:	46

b) General facts (figures give number of farms)

	Tot.	FJ	GS	ST	TL
On slope: - < 6%	5	1	4		
- 6-12%	9	4	5		
- 12-20%	15	6	7	2	
- 20-35%	13	6	7		
- 35-55%	1		1		
- > 55%	3	1	1		1
Age of terrace: - < 2yr	16	6	10		
- 2-5yr	16	4	10	1	1
- 5-23yr	9	5	4	1	
- > 23yr	4	3	1		
Laid out by: - farmer		7	19	2	1
- agr. officer		11	6		

c) Measurements (figures give number of farms)

	Tot.	FJ	GS	ST	TL
Gradient: -level	28	9	17	2	
- < 1%	1	1			
- 1-5%	11	6	4		1
- > 5%	4	2	2		
-variable	2		2		
Vegetation cover on risers:					
- napier grass	37	12	24	1	
- other fodder grasses	4	3	1		
- bare	1				1
- napier/bare	1	1			
- napier/weeds	1	1			
- napier/food crops	1	1			
Runoff crossing terrace risers:					
- yes	39	14	22	2	1
- no	3	1	2		
- not ascertened	4	3	1		
Width of grass-strip:					
- < 0.5m			4		
- 0.5-1m			13		
- > 1m			8		
d) Impressions					
Impression: - very good	1		1		
- good	4	2	2		
- fair	15	5	9	1	
- poor	19	7	11	1	
- very poor	7	4	2		1
Reasons for terraces being inadequate:					
- no/poor cover on terrace risers	25	8	17		
- HI ≥ 2 x HI recommended	17	5	10	1	1
- alignment	6	2	4		
- lack of maintenance	9	5	4		
- slope too steep for chosen type	4	1	2		1
- not completed	5	4		1	

Tab. 12. Cut-off drains (figures give number of COD:s)

a) General facts

Total number of cut-off drains (COD): 36

Number of farms with COD:s: 24

Type and slope (%) of catchment area:

	<6	6-12	12-20	20-35	35-55	>55	Tot.
-Own land, cultivated, terraced		4	2	3	6		15
-Own land, cultivated, nonterraced	1	3	4	5	2	2	17
-Road		1					1
-Farmyard	1	1					2
-Uncultivated land of other farmer		1					1
	2	10	6	8	8	2	36

Type and slope of diversion area

	<6	6-12	12-20	20-35	35-55	>55	Tot.
-Footpath/farm boundary				5	2	2	9
-Artificial waterway		3					3
-Road							2
-None = closed-ended COD							22
							36

Overflow: - from closed-ended COD:s	12
- from open-ended COD:s	3
Age of COD:s: - < 2yr	10
- 2-5yr	22
- 5-10yr	3
- 10-23yr	0
- > 23yr	1
	36
Laid out by: - farmer	14
- agr. officer	22

Maintained by:	sev. times/yr	seasonally	yearly	occ.
-Farmer	4	8	1	4
-Casuals			1	
-Both		3	1	1
	4	11	3	5

b) Measurements (figures give number of COD:s)

Gradient (%):	level	0.25-0.5	0.5-1	1-3	3-5	> 5	variable
	6	0	6	6	4	3	11

Average depth (m):	0-0.1	0.1-0.2	0.2-0.3	0.3-0.5	>0.5
	10	5	9	8	4

Average width (m):	0.5	0.5-0.75	0.75-1	1-1.5	>1.5
	5	8	6	11	6

c) Impressions (figures give number of COD:s)

Impression:	- very good	0
	- good	2
	- fair	7
	- poor	21
	- very poor	6
Reasons for COD:s being inadequate:		
	- embankments too low	24
	- embankments poorly/not grassed	17
	- alignment	18
	- located at wrong place	20
	- erosion at outlet	9
	- channel silted up	7
	- weedy channel	2
	- wrong measure taken	12

Tab. 13. Artificial waterways

See 4.2.3.3 and tab. 12 a about diversion areas, above.

Tab. 14. Gullies (figures give number of gullies)

Total number of gullies found on the investigated farms:		20
Of which:	- on farm boundaries	13
	- still growing	17
Cause of gully:	- runoff from cultivated land	17
	- runoff from road	10
	- culvert outlet	2
	- COD outlet	9
	- overflow from COD	4

(note: in most cases there were several factors causing the gully)

Age of gully:	- < 5yr	4
	- 5-15yr	7
	- >15yr	9
Size of catchment area (acres):	- < 5	3
	- 5-10	11
	- 10-25	5
	- > 25	1
Measures taken:	- none	16
	- planted vegetation (grass)	4

Appendix 2.

SOIL ANALYSIS

Methods

On 20 different farms altogether 39 soil samples were taken - 19 in fields grown with maize and 20 in fields grown with coffee. Slope in the maize fields varied between 0 and 12%, and in the coffee fields only between 0 and 5% (due to terracing).

The samples were taken in the top soil, at a depth of 10 cm. In the coffe they were taken in the middle of the terrace, between two coffee bushes. In the maize fields they were taken between two planted rows.

The samples were analyzed regarding texture, pH and nutrient composition at the National Agricultural Laboratories, Nairobi.

Results

	Sand	Silt	Clay
Textural Analysis (39 samples)	17,2 ± 3,0	12,9 ± 3,8	69,9 ± 5,0

pH: maize (19 samples) 5,8 ± 0,4
coffee (20 samples) 5,8 ± 0,6

	C %	N %	P ppm	K me %
Maize	1,58 ± 0,29	0,31 ± 0,11	27,8 ± 26	0,87 ± 0,26
Coffee	1,7 ± 0,47	0,31 ± 0,11	25,2 ± 28	0,74 ± 0,31

Figures denote mean values and standard error.

Comments

The tests confirm that soils in Runyenjes have a high clay content (70%).

There were no differences in pH, % carbon, or nitrogen, phosphorous and potassium content between maize fields and coffee fields in spite of the later being more fertilized.

Appendix 3.

QUESTIONNAIRE FOR TECHNICAL EVALUATION OF SOIL CONSERVATION MEASURES ON SMALL SCALE FARMS IN KENYA

Date of visit .....

District .....

Division .....

Location .....

Sub-location .....

Plot-number .....

1. *Land use*

(1.1) Areas

Total area of visited plot (acres) .....

Of which farmyard (acres) .....

" cultivated land (acres) .....

" grass land area (acres) .....

" woodlot or bush (acres) .....

Area of other plots belonging to the same farmer (acres) .....

(1.2) Crops

Major foodcrops:.....

Subsidaiary food crops:.....

Cash crops:.....

State of crops development (judgement)

Crop/State	Very good	Good	Fair	Poor	Very poor

1.3 Relation slope/land use

Slope	Major land use (state crop, grass trees)
< 12%	
12-35%	
35-55%	
> 55%	

Profile sketch of land use sectors:
(One or two representatives profiles)

1.4 Erosion

Signs of erosion on annually or semi-permanently cultivated land

No signs ☐

Slight sheet erosion ☐

Visible sheet erosion ☐

Small rills ☐

Large rills ☐

Gullies ☐

1.5 Signs of erosion on grazing areas

Yes ☐

No ☐

Only slightly ☐

1. *Biological erosion control measures*

2.1 Plowing and sowing along contours — practised ☐ / not practised ☐

2.2 Crop rotation system — practised ☐ / not practised ☐

Normal crop rotation .....

2.3 Intercropping (</m between rows of different crops) — practised ☐ / not practised ☐

Mixed crops: a) .....

b) .....

c) .....

2.4 Agroforestry system — practised ☐ / not practised ☐

Mixed agricultural crops and woody perennials:

a).....

b).....

c).....

2.5 Stripcropping (>/m between rows of different crops) — practised ☐ / not practised ☐

Crops a).....

b).....

c).....

2.6 Ridging — practised ☐ / not practised ☐

Crops a).....

b).....

c).....

2.7 Fallowing — practised ☐ / not practised ☐

Normal lenght of fallow period:.....

2.8 Mulching

practised ☐

not practised ☐

Crops a).....

b).....

c).....

2.9 Use of artificial fertilizers

Frequency of usage and estimated amount

Major food crops ☐ .....

Subsidiary food crops ☐ .....

Cash crops ☐ .....

2.10 Use of natural manure

Major food crops ☐ .....

Subsidiary food crops ☐ .....

Cash crops ☐ .....

3. *Terrace works*

3.1 Terrace types Landuse and ≈ groundslope

a) Bench terraces (BT)

with forward slope ☐ .....

with reverse slope ☐ .....

level ☐ .....

b) Developed bench terraces (DBT)

Fanya Juu type ☐ .....

trash line type ☐ .....

grass strip type ☐ .....

c) Channel terraces (CT)

narrow based ☐ .....

broad based ☐ .....

d) Stone terraces (ST) ☐ .....

e) Other types (OT) ☐ .....

Describe .....

.....

3.2 Profile sketch of terrace development

a) Bench terraces

b) Developed bench terraces

c) Channel terraces

d) Stone terraces

e) Other types

3.3 Construction and maintenance

a) Year of construction

b) Laid out by

farmer

agrcicultural officer

c) Maintained by

farmer

casual labour

both

d) Maintenance routines

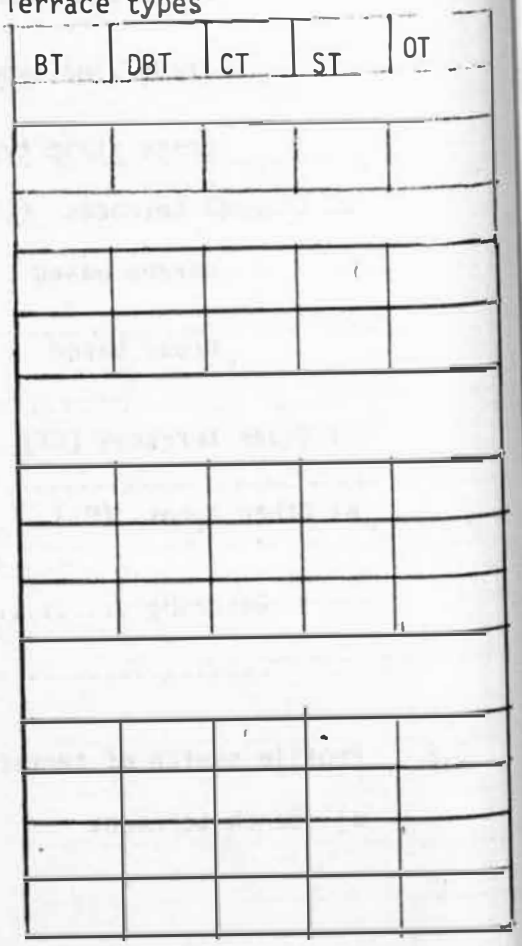
several times a year

once every year

occasionally

never

Terrace types



3.4 Terrace risers and embankments

Terrace types

	BT	DBT	CT	ST	OT
a) Vegetation cover:					
bare					
foodcrops					
selfsawn grass weeds					
Napier grass					
Bana grass					
other grasses					
woody perennials					
b) Width of grass strip (cm)					
c) Has runoff been crossing terrace risers?					
Yes					
No					
Not ascertained					

3.5 Measuring of the terraces (On each plot an average representative terrace of each type should be chosen and described and measured)

a) Terrace spacing (m)					
Vertical interval (measured)					
" (calculated)					
Horizontal interval (measured)					
" (calculated					
b) Slope of terrace (%) forward or backward)					
c) Gradient along the terrace (%)					

Formulas:

1) slope < 20%: $VI = \frac{\% \text{ slope} + 8}{12}$ (meter)

slope > 20% $VI = \frac{\% \text{ slope} + 8}{6}$ (meter)

2) $HI = \frac{VI \times 100}{\% \text{ slope}}$ (meter)

3.6 General impression of terrace work

a) Impression

very good

good

fair

poor

very poor

b) If terraces are inadequate it is due to:

poor/no bankcover

HI > 2 x HI calculated

lack of maintenance

wrong main terrace

slope too steep for chosen type

Terrace type

BT	DBT	CT	ST	OT

c) Other comments .....

.....

.....

.....

4. *Cutoff drains*

4.1 Number and types of cutoff drains

closed ended .....

open ended .....

total .....

4.2 Type and slope of catchment area above cutoff drain

cultivated area; terraced ☐

cultivated area; nonterraced ☐

grazing area ☐

perennial crops, dense cover ☐

building area ☐

road ☐

other ..... ☐

4.3 Diversion area of open ended cutoff drains

natural grass ☐

bare/nearly bare earth ☐

cultivated land ☐

cattle track/foot path ☐

streambed ☐

artificial waterway ☐

other ..... ☐

4.4 Measuring of cutoff drains

	No 1	No 2	No 3
average depth (m)	.....	.....	.....
average width (cm)	.....	.....	.....
gradient (%)	.....	.....	.....

4.5 Profile sketch of the development of the cutoff drains

1)

2)

3)

4.6 Construction and maintenance

	No 1	No 2	No 3
a. Year of construction	☐	☐	☐
b. Laid out by			
farmer	☐	☐	☐
agriculture officer	☐	☐	☐
c. Maintained by			
farmer	☐	☐	☐
casual labour	☐	☐	☐
both	☐	☐	☐

	No 1	No 2	No 3
d. Maintenance routines			
several times a year	☐	☐	☐
once every year	☐	☐	☐
occasionally	☐	☐	☐
never	☐	☐	☐
e. Signs of overflow of closed cutoff drains?			
Yes	☐	☐	☐
No	☐	☐	☐

4.7 General impression of cutoff drains

a. Impression

very good	☐
good	☐
fair	☐
poor	☐
very poor	☐

b. If a cutoff drain is inadequate it is mainly due to:

embankment too low/broken	☐
embankment poorly/not grassed	☐
channel silted up	☐
channel overgrown with weeds	☐

b. If a cutoff drain is inadequate it is mainly due to:

unsatisfactory alignment ☐

erosion at outlet ☐

other ..... ☐

5. *Waterways*

5.1 Type and slope of waterway	Occur	Slope %
Stream/old gully bed	☐	.....
Cattle track/foot path	☐	.....
Natural vegetation	☐	.....
Artificial waterway	☐	.....
Other	☐	.....

Artificial waterway

5.2 Year of construction .....

5.3 Lining

grass	☐
weeds/vegetation	☐
stones/rocks	☐
other	☐
none	☐

5.4 Profile sketch of the development of waterways

5.5 General impression of waterways

a. Impression

very good ☐

good ☐

fair ☐

poor ☐

very poor ☐

b. If a waterway is inadequate it is mainly due to:

waterway not properly located ☐

discharge not properly located ☐

waterway not properly lined ☐

erosion on the channel ☐

channel silted up ☐

c. Additional remarks on waterways.....

.....

.....

6. *Summarized impression of soil conservation activities on the farm*

6.1 How big areas of the farm which need soil conservation are covered by biological or mechanical soil conservation measures?

all areas needed ☐

about half of area needed ☐

almost no area ☐

6.2 General impression of soil conservation on the farm

very good ☐

good ☐

fair ☐

poor ☐

very poor ☐

6.3 Possible reasons for lack of or inadequate soil conservation activities and constructions

lack of labour ☐

lack of capital ☐

lack of technical advise ☐

wrong technical advice ☐

unclear ownership of land ☐

lack of interest of farmer ☐

other ..... ☐

6.4 Extension

Frequency of visits by Agriculture Extension Officers.

> 6 times/year ☐

3-5 times/year ☐

1-2 times/year ☐

Every other year ☐

Never ☐

6.5 Additional remarks .....

.....

.....

.....

7 Gully control and gully erosion.

7.1 Number of gullies

1 on cultivated land _____

2 on grazing land _____

3 crossing both _____

(7.2) Ownership around the gully other than the farmer interviewed

None ☐ Private ☐ Public ☐

Comments _____

_____

7.3 The land use in the above ownership is

Cultivation ☐ Grazing/fallow ☐ Other _____

7.4 The size of the catchment area is ---- acres.

(7.5) Major sources of runoff and causes of the gully are

Road drainage	☐	Cultivated land	☐
Culvert	☐	Building and excavation	☐
Deforestration	☐	overgrazed land	☐
One or a few heavy rains	☐	Other	_____

(7.6) What is the age of the gully?

----- years ---- monthes.

7.7 the gully is

still growing ☐ has stabilised ☐

Comments _____

_____

7.8 Size of the gully

Width	at the narrowest place	_____
	at the widest place	_____
depth	at theshallowest place	_____
	at the deepest place	_____

Length _____ Slope _____

7.9 Measures

a) diversion ditch ☐

b) gully head
- stone materials ☐
- wooden materials ☐
- gabions ☐

c) floor of the gully
- vegetative strips ☐
- checkdams of stones, wood or gabions ☐

d) walls and gully bends
- vegetaion ☐
- wooden materials ☐
- gabions ☐

7.10 Are themeasures satisfactory ?

Yes ☐ No ☐

If no what are the reasons ?

- lack of maintainance ☐
- incorrect dimenssions ☐
- others _____

7.11 comments _____

_____

_____

_____

7.12 profile sketch of development of the gully

8 Grazing land

8.1 Available grazing land in hectars

the farmar _____ on public land _____ private _____

Comments _____

_____

8.2 Type of grazing

stallfeeding ☐ rotational grazing on fallow land ☐

permanent paddlock ☐ on public land ☐

Comments _____

_____

8.3 Form of production

Animal	Subsidiary	Commercial	If commercial for what purpose	
			Milk	Meat
_____	☐	☐	☐	☐
_____	☐	☐	☐	☐
_____	☐	☐	☐	☐
_____	☐	☐	☐	☐

8.4 Erosion

None ☐

Slight sheet erosion ☐

visible sheet erosion ☐

Top soil entirely washed away ☐

small rills ☐

Large rills ☐

Small gullies ☐

Severe gully erosion ☐

8.5 Measures taken (i.e. Destocking, planting of fodder trees etc)

_____

_____

_____

_____

8.6 Comments

_____

_____

9 Tree planting

9.1 Are there trees left on cultivated land ?

Yes ☐ No ☐

If yes what are the species ? _____

9.2 Planted trees

Species	Frequency	Site	Year	Condition	Survival

9.3 Sources of trees planted _____

9.4 Comments _____

Appendix 4.

QUESTIONNAIRE FOR TECHNICAL EVALUATION OF SOIL CONSERVATION MEASURES ON SMALL SCALE FARMS IN KENYA

Date of visit _____

District _____

Division _____

Location _____

Sub-location _____

Number of identification (i e plot number) _____

1. LANDUSE

1.1 General

1.1.1 Areas (acres)

Total area of visited plot _____

Of which a) farmyard _____

b) cultivated land _____

- cash crop _____
- food crop _____
- napier grass _____

c) uncultivated land _____

Areas of other plots belonging to the same farmer _____

1.1.2 Relation slope/landuse

slope	Major land use (state food crop, cashcrop..
<6%	
6-12	
12-20	
20-35	
35-55	
>55%	

1.1.3 Profile sketch (or map) of land use sectors:

1.2 Cultivated land

1.2.1 Crops

Major food crops _____

Subsidiary food crops _____

Cash crop _____

1.2.2 State of crops development (cash crop and major food crop)

Crop	Very good	Good	Fair	Poor	Very poor

1.2.3 Signs of erosion on cultivated land

No signs ☐

Slight sheet erosion ☐

Visible sheet erosion ☐

Small rills ☐

Large rills ☐

Gullies ☐

1.3 Grazing land

1.3.1 Type of grazing

		Area
Stallfeeding	☐	
Permanent paddock	☐	_____
Own uncultivated land	☐	_____
Public land	☐	_____
Other (state)		_____

1.3.2 Number of animals

Cows _____

Goats _____

Other (state) _____

1.3.3 Signs of erosion on grazing land

- No signs ☐
- Slight sheet erosion ☐
- Visible sheet erosion ☐
- Top soil entirely washed away ☐
- Rills ☐
- Small gullies ☐
- Severe gully erosion ☐

2. BIOLOGICAL EROSION CONTROL MEASURES

2.1 General

2.1.1 Fallowing practised ☐

not practised ☐

Normal length of fallow period _____

2.1.2 Treeplanting

Species	Source of trees planted	Frequency of planting			Site of planting
		yearly	seasonally	occassionally	

Comments _____

_____

_____

2.1.3 Agroforestry practised ■

not practised ☐

State agricultural crops, woody perennials (and animals) _____

_____

_____

_____

2.2 Cultivated land

2.2.1 Plowing and sowing along contour

practised ☐

not practised ☐

Partly practised ☐

2.2.2 Crop rotation

practised ☐

not practised ☐

Normal crop rotation _____

2.2.3 Intercropping

practised ☐

not practised ☐

Mixed crops _____

_____

_____

2.2.4 Stripcropping

practised ☐

not practised ☐

Crops _____

_____

_____

2.2.5 Ridging

practised ☐

not practised ☐

Crops _____

_____

_____

2.2.6 Mulching

practsied ☐

not practised ☐

2.2.7 Use of fertilizers — Frequency of usage, type and amounts

Major food crops _____

_____

Cash crop _____

_____

Other (state) _____

_____

2.2.8 Use of manure

Major food crops _____

Cash crop _____

Other _____

2.3 Grazing land

2.3.1 Measures taken (i e destocking etc....)

_____

_____

_____

_____

2.4 General impression of biological measures

Satisfactory ☐

Unsatisfactory ☐

Comments _____

_____

_____

_____

_____

_____

3. MECHANICAL MEASURES

3.1 Terraceworks

3.1.1 Type[+], land use and slope

a) type

b) land use

c) slope

3.1.2 Construction and maintenance

a) year of construction

b) Laid out by

farmer

Agr. off.

c) Maintained by

farmer

casuals

both

d) Maintenance routines

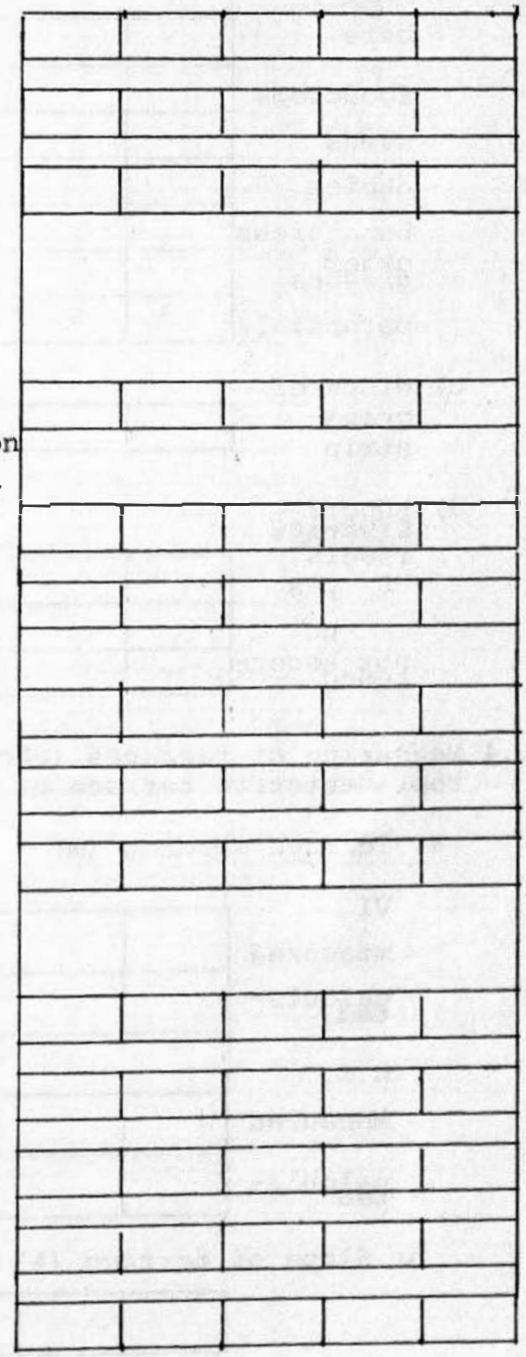
sev. times/ year

seasonally

yearly

occassional

never



[+] Fanya juu - FJ: Grass strip - GS: Trash line - TL: Excavated bench terrace - BT: Channel terrace - CT: Stone terrace -. ST

3.1.3 Terrace risers and embankments

a) type

b) Vegetation cover

bare

foodcrops

weeds

napier

bana grass

other grasses

perennials

c) Width of grass-strip

d) Runoff crossing terrace risers

yes

no

not ascertened

3.1.4 Measuring of terraces (chose an average representative terrace of each type)

a) Terrace spacing (m)

VI

measured

calculated

H.I.

Measured

calculated

b) Slope of terrace (%)

c) Gradient of terrace (%)

3.1.5 General impression of terrace works

a) type

b) impression

very good					
good					
fair					
poor					
very poor					

c) inadequate due to

poor/no bank cover					
HI 2xHI calculated					
lack of maintenance					
alignment					
wrong main terrace					
slope too steep for chosen type					

3.1.6 Profile sketches of development of terraces

3.1.7 Areas covered by terraces

	of land with foodcrops	cashcrops
None		
None - 1/4		
1/4 - 1/2		
1/2 - 3/4		
3/4 - all		

3.1.8 Comments _____

_____

_____

_____

_____

_____

_____

3.2 Cut-off drains

3.2.1 Number of cut-off drains _____

3.2.2 Construction, maintenance and overflow

	No 1	No 2	No 3	No 4	No 5
a) Year of construction					
b) Laid out by					
farmer					
agr. officer					
c) Maintained by					
farmer					
casuals					
both					
d) Maintenance routines					
sev. times/yr					
seasonally					
yearly					
occassionally					
never					
e) Openended?					
yes					
no					
f) Signs of overflow?					
yes					
no					

3.2.3 Catchment area above cut-off drain (state type and slope !!)

	No 1	No 2	No 3	No 4	No 5
cultivated area terraced					
cultivated area nonterraced					
grazing land					
perennial crops, dense cover					
building area					
road					
other (state)					

3.2.4 Diversion area of open-ended cut-off drains (state type, and slope)

natural vegetation					
bare/nearly bare earth					
cultivated land					
cattle track/ foot path					
stream/old stabilized gully					
artificial waterway					

3.2.5 Measuring of cut-off drains

average depth					
average width					
gradient (%)					

3.2.6 Profile sketches of developments of cut-off drains

3.2.7 Impression of cut-off drains

a) General impression

very good	
good	
fair	
poor	
very poor	

b) Inadequate due to

	No 1	No 2	No 3	No 4	No 5
channel silted up					
embankment broken					
embankment poorly/not grassed					
unsatisfactory alignment					
erosion at outlet					
not properly located					
other (state)					

3.2.8 Comments _____

_____

_____

_____

_____

3.3 Artificial waterways

3.3.1 Year of construction _____

3.3.2 Slope _____

3.3.3 Lining

- grass ☐
- weeds/vegetation ☐
- stones/rocks ☐
- other (state) _____ ☐
- none ☐

3.3.4 Profile sketch of development of waterway

3.3.5 General impression of waterway

a) Impression

- very good ☐
- good ☐
- fair ☐
- poor ☐
- very poor ☐

b) If inadequate it is mainly due to

- not properly located ☐
- discharge not taken care of ☐
- not properly lined ☐
- erosion in channel ☐
- channel silted up ☐

4. GENERAL IMPPESSION OF SOIL CONSERVATION ACTIVITIES ON THE FARM

4.1 General impression

Very good ☐

Good ☐

Fair ☐

Poor ☐

Very poor ☐

4.2 Extension

Contact farmer ☐

Never ☐

Other (state if possible) ☐

4.3 Additional remarks _____

Appendix 5

Interviewing farmers

Thirty-seven farmers (from a wide range of households with respect to acreage, agro-ecological settings, number of household members, income, sex distribution etc.) were interviewed about their socio-economic situation. The purpose of the interviews was to get at their attitudes towards conservation, and to supplement and cross-check the information that came out of the questionnaires distributed to the TAs in the area. In several cases, the information obtained from farmers was significantly different from or even contradictory to the one given by TAs, for example, concerning their experiences of erosion or of the T&V system.

Each interview lasted between one and three hours. For the interviews, two women interpreters independent of the Ministry were contacted. When starting the interviews, a great deal of effort was put into having the farmers understand that they were free to express their opinions on any matter related to the subject. Their answers were given anonymously. Though the interviews were unstructured, the same type of information was gathered at all farms, such as land and family size, experiences of erosion and conservation, availability of labor and monetary income, percentage of crops and animals sold at markets, visits by TAs on the farm, attitudes to and expectations from the conservation programme, etc.

The majority of the farmers (who were selected randomly, the only criteria being "smallholders") were also visited by the technical co-investigator, biologist Maria Berlekom, thereby allowing direct and fruitful comparisons between the situation of erosion and agricultural practices on the one hand, and socio-economic conditions and farmers attitudes to conservation on the other.

Appendix 6

EXTENSION STAFF QUESTIONNAIRE FOR SOIL CONSERVATION PROFILE

A. FACTS ON THE RESPONDENT

1. Where are you posted? Sublocation.....
   Location.....
   Division.....
   District.....

2. Your designation? Technical Assistant ☐
   Junior technical ass. ☐
   Other..... ☐

3. Your age? ..... years

4. Your sex? ☐ male ☐ female

5. For how long have you been working in the location where you are now posted?
   .....years

6. For how long have you been working as a TA or JTA as a whole?
   .....years

7. What is your training in agriculture?
   Diploma 2 years ☐
   Certificate 2 yrs ☐
   Other..... ☐

8. Please, specify name, length and time of the soil conservation courses you have attended.

   1. Name.....

      Length.....When?.....

   2. Name.....

      Length.....When?.....

9. Do you have good command of the language spoken in your location?

   yes ☐

   no ☐

10. What is your native or first language?

B. SOIL CONSERVATION SITUATION

11. Is soil erosion common in your location?

On almost all farms ☐
On about half of the farms ☐
On only a few farms ☐
On public land ☐
Not common on public land ☐

12. Which are the most important causes of soil erosion?

	important	not important
1. Cultivation on steep slopes	☐	☐
2. Clearing of forests	☐	☐
3. Overgrazing	☐	☐
4. Erodible soils	☐	☐
5. Poor farm management	☐	☐
6. Roads on slopes	☐	☐
7. Road culverts	☐	☐
8. Other (state)	☐	☐
9.	☐	☐

13. Have you experienced any differences in the success of soil conservation due to different cultural/tribal origins of the farmers?

yes ☐ no ☐

If yes, please explain.

.....

.....

.....

.....

14. What soil conservation measures are practiced in your location?

On cultivated land	yes	no	very common	sometimes
a) Biological measures				
1. Contour ploughing	☐	☐	☐	☐
2. Mulching	☐	☐	☐	☐
3. Intercropping	☐	☐	☐	☐
4. Strip cropping	☐	☐	☐	☐
5. Fallowing	☐	☐	☐	☐
6. Fertilizers	☐	☐	☐	☐
7. Manure	☐	☐	☐	☐
8. Agroforestry	☐	☐	☐	☐
9. Other (state)	☐	☐	☐	☐
b) Mechanical measures				
1. Fanya juu terraces	☐	☐	☐	☐
2. Bench terraces	☐	☐	☐	☐
3. Cut-off drains	☐	☐	☐	☐
4. Grass covered waterways	☐	☐	☐	☐
5. Other waterways	☐	☐	☐	☐
6. Closed water ditches	☐	☐	☐	☐
7. Other (state)	☐	☐	☐	☐

What soil conservation measures are practised?

On grazing land

	yes	no	very common	some-times
1. De-stocking				
2. O-grazing (stall feeding)				
3. Closing some areas for grazing / rotational grazing				
4. Planting of trees / fodder trees				
5. Re-seeding of grass				
6. Other (state)				

15. Are gullies common in your area?

yes ☐ no ☐

If yes, on what kind of land?

cultivated land ☐

grazing land ☐

other (state) ☐

.....

Is gully control practised?

yes ☐ no ☐

16. What do you think are the main reasons why some farmers do not practise soil conservation, or fail to maintain their structures?

	Important reason	Reason in some cases	Not the reason
1. Farmers not aware	☐	☐	☐
2. Farmers ignorant, do not care	☐	☐	☐
3. Not needed on his or her farm	☐	☐	☐
4. Female headed household (no male labourer)	☐	☐	☐
5. Lack of time to do the work	☐	☐	☐
6. Lack of labour	☐	☐	☐
7. Lack of funds	☐	☐	☐
8. Lack of information how to do it	☐	☐	☐
9. Too few extension personnel	☐	☐	☐
10. Lack of tree nurseries	☐	☐	☐
11. Lack of tools	☐	☐	☐
12. Lack of transport for extension staff	☐	☐	☐
13. Lack of manure, fertilizers	☐	☐	☐
14. Others(state)	☐	☐	☐
15. Others(state).	☐	☐	☐

17. How many farmers complain that their yield/acre is going down on cultivated land?

Most of them ☐
At least half of them ☐
Only a few ☐
None of them ☐

what causes have they given?

1.....
2.....
3.....

Do farmers complain over difficulties in finding enough or good grazing for their animals?

Most of them ☐
At least half of them ☐
Only a few ☐
None of them ☐

what causes have they given?

1.....
2.....
3.....

18. Is there a soil conservation committee in your location?

yes ☐ no ☐

If yes, how many are in the committee?

men..... women ..... total .....

Please list the activities of the committee in order of importance.

1.....

2.....

3.....

4.....

19. At how many public barazas did you have the opportunity to address people on soil conservation issues during the last year.

Approximate number: .....

20. List non-governmental organizations (Missions, Red Cross or other) in your location, which are working with soil conservation and if you cooperate with them or not.

Organization	We cooperate yes	no
1.....	☐	☐
2.....	☐	☐
3.....	☐	☐
4.....	☐	☐

21. How many self-help groups are there in your location? (Not only those working with soil conservation)

State number: .....

22. Please give information on the most important self-help group.

1. Name .....

2. Consists of men ☐ women ☐ mixed ☐

3. In what kind of activity do they help each other?

.....

23. From where do farmers in your location get their tree-seedlings?

Mostly from:

1. Forest department nursery ☐
2. Soil conservation/agricultural nursery ☐
3. Chief's nursery ☐
4. Own nursery ☐
5. Commercial, private nursery ☐
6. Neighbours, friends ☐
7. Other (state)..... ☐

Can the farmers easily get all the seedlings they want?

yes ☐ no ☐

If the answer is no, what kind of trees do they ask for?

foresttrees ☐ foddertrees ☐ fruittrees ☐

How do you think the distribution of seedlings in your area can be improved to meet the demand?

.....

.....

24. Are handtools distributed in your area? yes ☐ no ☐

If yes, to whom and how are they distributed?

		handtools are a gift	handtools are a free loan
To individual farmers	☐	☐	☐
To self-help groups	☐	☐	☐
To casuals doing soil-conservation	☐	☐	☐
To others (state).....	☐	☐	☐

Are handtools provided by others than the agricultural staff?

yes ☐ no ☐

If yes, by which organization? .....

25. Who on a farm is doing most of the mechanical soil conservation work? (terraces, cut-off drains, etc.)

	Most common	Some-times	Never
1. Male farmer	☐	☐	☐
2. Farmer's wife	☐	☐	☐
3. Female farmer	☐	☐	☐
4. Employed labourers	☐	☐	☐

26. Which government inputs do you find to be the most important when it comes to soil conservation in your area?

	Very Important	Not Important
1. Training of agric. staff	☐	☐
2. Training of farmers	☐	☐
3. Training of chiefs	☐	☐
4. Training of others (state)	☐	☐
.....		
5. Hand tools to farmers	☐	☐
6. Hand tools to self-help groups	☐	☐
7. Hand tools to casuals	☐	☐
8. Funds for casual labourers	☐	☐
9. Funds to individual farmers	☐	☐
10. Nurseries for trees and grass	☐	☐
11. More extension personnel	☐	☐
12. Other (state)	☐	☐

C AGRICULTURAL SITUATION / LABOUR SITUATION

27. How many farms in your area are you expected to visit?

.....

Do you experience any difficulties in visiting all your farmers?

yes ☐ no ☐

If yes, what is the major problem?

.....

.....

28. Is the land in your area registered, and if so when?

yes ☐ no ☐ 19.....

29. On how many farms in your area is the husband dead, absent or not existing (woman-headed households)?

1. More than 3/4 ☐
2. On 1/2 ☐
3. On 1/4 ☐
4. None ☐

30. What is the most common reason behind woman-headed households?

1. Husband absent, working ☐
2. Husband dead ☐
3. Woman not married ☐
4. Other (state)..... ☐

31. Apart from the woman, who would constitute the most important labour-force on farms where the husband is absent during all or part of the year?

1. Children ☐
2. Other relatives (extended family) ☐
3. Friends, others ☐
4. No one (the woman is alone) ☐

32. Are the farms where the husband is absent smaller or larger, compared to the farms where the husband is present during the whole year?

1. Larger ☐
2. Smaller ☐
3. No difference ☐

33. Are there landless people in your area?

Yes ☐ No ☐

34. Does any lease of land occur in your area?

Yes ☐ No ☐

If yes, what is the land used for?

1. Cash crops ☐
2. Food crops ☐
3. Grazing ☐
4. Other (State) ☐

.....

35. Is communal land common in your location?

yes ☐ no ☐

If yes, what is the land used for?

1. Cultivation ☐
2. Grazing ☐
3. Collection of fuelwood ☐
4. Other (state) ☐

.....

36. How many farmers in your area has opened up new land for cultivation during the last year?

1. No one ☐
2. 1/4 ☐
3. 1/2 ☐
4. 3/4 ☐
5. All ☐

37. How many households have more than one plot, being at least 1 km away, to cultivate?

1. More than 3/4 of the households ☐
2. 1/2 of the households ☐
3. Less than 1/4 ☐
4. No households ☐

38. How many farmers in your area practise shifting cultivation?

1. More than 3/4 of the farmers ☐
2. 1/2 of the farmers ☐
3. Less than 1/4 of the farmers ☐
4. Not practised ☐

39. Which crops are grown in your location?

	Yes	No	Very Common	Some cases
1. Maize	☐	☐	☐	☐
2. Beans	☐	☐	☐	☐
3. English potatoes	☐	☐	☐	☐
4. Sweet potatoes	☐	☐	☐	☐
5. Sorghum	☐	☐	☐	☐
6. Millet	☐	☐	☐	☐
7. Cassava	☐	☐	☐	☐
8. Pigeon peas	☐	☐	☐	☐
9. Cow peas	☐	☐	☐	☐
10. Cabbage	☐	☐	☐	☐
11. Tomatoes	☐	☐	☐	☐
12. Other vegetables	☐	☐	☐	☐
13. Pyrethrum	☐	☐	☐	☐
14. Tea	☐	☐	☐	☐

continued...

	Yes	No	Very common	Some cases
15. Coffee	☐	☐	☐	☐
16. Cotton	☐	☐	☐	☐
17. Citrus fruits	☐	☐	☐	☐
18. Bananas	☐	☐	☐	☐
19. Mangoes	☐	☐	☐	☐
20. Tobacco	☐	☐	☐	☐
21.	☐	☐	☐	☐
22.	☐	☐	☐	☐
23.	☐	☐	☐	☐
24.	☐	☐	☐	☐

40. Has there been any change (in the last 5 years), in what kind of crops that are being cultivated?

yes ☐ no ☐

If yes,

More common.....

.....

Less common.....

.....

What do you consider to be the most important reason for the change?

.....

.....

41. Which are the animals most common in the households in your area?

	Yes	No	Very common	Some cases
1. Cattle	☐	☐	☐	☐
2. Sheep	☐	☐	☐	☐
3. Goats	☐	☐	☐	☐
4. Camels	☐	☐	☐	☐
5. Other (state)	☐	☐	☐	☐

.....

42. Has there been any change (in the last 5 years) in the number of animals kept by the households?

yes ☐ no ☐

If yes, which animals have become more common.....

.....

Less common.....

What do you consider to be the most important reason for the change?

.....

.....

43. Is there less land available for grazing now, than 5 years ago?

Yes ☐ No ☐

Which land is most common for grazing?

Private land ☐ Communal land ☐

COMMENTS.....

.....

Is there any communal grazing on private land, in your area?

Yes ☐ No ☐

If yes, please explain how it is organised.

.....

.....

44. How are animals being fed and watered in your location, during the dry season ?

	Yes	No	Very common.	Some-times
1. O-grazing (stall feeding)	☐	☐	☐	☐
2. Stall feeding combined with grazing	☐	☐	☐	☐
3. Controlled grazing	☐	☐	☐	☐
4. Grazing on fields after harvest	☐	☐	☐	☐
5. Grazing on common land	☐	☐	☐	☐
6. Grazing in forest	☐	☐	☐	☐
7. Other (state)	☐	☐	☐	☐
8. Watered at home	☐	☐	☐	☐
9. Taken to water once a day	☐	☐	☐	☐
10. Taken to water every second day	☐	☐	☐	☐
11. Other (state)	☐	☐	☐	☐

45. In the case of overgrazing, do you think the farmers would accept to decrease the number of animals (de-stocking)?

yes ☐ no ☐

If yes, on what conditions? .....

.....

What do you consider to be the main reason why farmers keep too many animals on the limited amount of land? Please give some comments.

.....

.....

.....

46. How many households need to buy their staple food (maize, beans, potatoes, etc.) during 1 to 2 months before they can harvest their own crops?

1. All households ☐
2. More than 3/4 of the households ☐
3. 1/2 of the households ☐
4. 1/4 of the households ☐
5. None ☐

What would you consider to be the main reasons for these households producing too little staple food?

.....

.....

.....

47. In a household with both husband and wife, (none employed outside), who is doing most of the practical agricultural work?

1. Most of the work done by wife ☐
2. Husband and wife do equal work ☐
3. Most of the work done by husband ☐

48. On how many farms is the husband absent for more than 9 months of the year?

1. More than 3/4 of the farms ☐
2. On 1/2 of the farms ☐
3. On 1/4 of the farms ☐
4. On no farms ☐

On how many farms is the husband absent for 3 - 8 months of the year?

1. More than 3/4 of the farms ☐
2. On 1/2 of the farms ☐
3. On 1/4 of the farms ☐
4. On no farms ☐

On how many farms is the husband absent for 1 - 2 months of the year?

1. More than 3/4 of the farms ☐
2. On 1/2 of the farms ☐
3. On 1/4 of the farms ☐
4. On no farms ☐

49. How many farmers employ casual labourers to do agricultural work, including soil conservation work?

1. More than 3/4 of the farmers ☐
2. 1/2 of the farmers ☐
3. 1/4 of the farmers ☐
4. No farmers ☐

50. Of what sex are the employed casual labourers?

1. Mostly male ☐
2. Mixed male/female labourers ☐
3. Mostly female ☐

51. Is there any particular season of the year, when people otherwise living outside the land, who have no relatives in the location, come to do work on the farms?

Yes ☐
No ☐

Months.....

Type of work.....

.....

52. Can the government find casual labourers for soil conservation work, e.g. cut-off drains?

		Men	Women
1. Easily	☐	☐	☐
2. With difficulty	☐	☐	☐

53. What is the most common source of water in your location <u>during the dry season</u> ?

	Yes	No	Very common	Some-times
1. Tapped water	☐	☐	☐	☐
2. Well or pond close to house	☐	☐	☐	☐
3. Well or pond more than 500m away	☐	☐	☐	☐
4. River, close	☐	☐	☐	☐
5. River more than 500m away	☐	☐	☐	☐
6. Other (state)	☐	☐	☐	☐

54. How much time is needed every day, in <u>the dry season</u> to collect water (for the average household)?

1. Less than 1 hour/ day ☐
2. 1 - 2 hours/ day ☐
3. More than 2 hours/ day ☐

Who in the household collects water?

1. Men ☐
2. Women ☐
3. Children ☐

Comment: .....

.....

55. What is the most common source of fuel?

	yes	no	very common	sometimes
1. Wood from own farm	☐	☐	☐	☐
2. Wood bought from neighbours	☐	☐	☐	☐
3. Wood bought from Government	☐	☐	☐	☐
4. Wood collected free, on common land	☐	☐	☐	☐
5. Teabushes	☐	☐	☐	☐
6. Cotton stalks	☐	☐	☐	☐
7. Charcoal	☐	☐	☐	☐
8. Grain stalks	☐	☐	☐	☐
9. Dried cowdung	☐	☐	☐	☐
10. Other (state).....	☐	☐	☐	☐

56. How much time is needed for the average household to collect fuel-wood?

1. Every day, less than 1 hour ☐
2. Every day, 1 - 3 hours ☐
3. Every day, more than 3 hours ☐
4. Other (state) ..... ☐

57. Who in the household collects fuel?

Men ☐
Women ☐
Children ☐

Comments: .....
.....
.....

58. How much do the average farmer in your area sell of his harvest of food crops?

Crop:	Part sold: none	1/4	1/2	3/4	all
1. Maize	☐	☐	☐	☐	☐
2. Peas & beans	☐	☐	☐	☐	☐
3. Root crops	☐	☐	☐	☐	☐
4. Sorghum/millet	☐	☐	☐	☐	☐
5. Vegetables	☐	☐	☐	☐	☐
6. Fruits & nuts	☐	☐	☐	☐	☐
7. Other (state).....	☐	☐	☐	☐	☐

59. From where do the households in your area get their cash income and who controls the money?

	how many households all	3/4	1/2	1/4	none	controls money husband	wife
1. Selling cash-crops	☐	☐	☐	☐	☐	☐	☐
2. Selling food-crops	☐	☐	☐	☐	☐	☐	☐
3. Employment/ money from outside	☐	☐	☐	☐	☐	☐	☐
4. Selling animals	☐	☐	☐	☐	☐	☐	☐
5. Selling fruits	☐	☐	☐	☐	☐	☐	☐
6. Selling beer	☐	☐	☐	☐	☐	☐	☐
7. Selling bricks	☐	☐	☐	☐	☐	☐	☐

/continued.....

continued....

	How many of the households					money controll by	
	all	3/4	1/2	1/4	none	husband	wife
8. Selling charcoal	☐	☐	☐	☐	☐	☐	☐
9. Selling food	☐	☐	☐	☐	☐	☐	☐
10. Petty trade	☐	☐	☐	☐	☐	☐	☐
11. Handicraft	☐	☐	☐	☐	☐	☐	☐
12. Other (state)	☐	☐	☐	☐	☐	☐	☐

60. For how many households are the following expenditures considerable?

	Part of households:				
	all	3/4	1/2	1/4	none
1. Schoolfees	☐	☐	☐	☐	☐
2. Food & food-crops	☐	☐	☐	☐	☐
4. Animals	☐	☐	☐	☐	☐
5. Harambee	☐	☐	☐	☐	☐
6. Medicine	☐	☐	☐	☐	☐
7. Clothes	☐	☐	☐	☐	☐
8. Housebuilding/ maintainance	☐	☐	☐	☐	☐
9. Transport	☐	☐	☐	☐	☐
10. Soil con-servation	☐	☐	☐	☐	☐
11. Fertilizers	☐	☐	☐	☐	☐
12. Manure	☐	☐	☐	☐	☐
14. Farm labour	☐	☐	☐	☐	☐
15. Beer	☐	☐	☐	☐	☐
16. Other (state)	☐	☐	☐	☐	☐

FINAL QUESTION

61. What changes in the soil conservation programme would you like to see to make soil conservation very successful in your location?

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