REPORT ON A SURVEY MISSION TO
KONSO SPECIAL WOREDA, ETHIOPIA

August 1998

FARM-Africa
9-10 Southampton Place
London WC1A 2EA
England

Vincent Gainey
Programme Officer
Survey Mission to Konso Special Woreda, Ethiopia.

Mission members:

Vincent Gaine
Programme Officer, FARM-Africa London
Engineer Bufekadu
WaterAction, Addis Ababa

Purpose:

The purpose of this one week mission was to visit sites prioritised by the Konso Development Association for water development, specifically the development of spate irrigation for crop production, and sand dams for the provision of domestic water supply. The field visits assessed the technical suitability at each site for the proposed development. The team also talked to farmers and land users to assess their need for such improvements and their willingness and ability to participate in and provide a substantial contribution to such a programme.

Soils in proposed field areas were examined by augering and basic measurements were made of long and cross stream profiles, particularly at proposed sand dam sites to calculate storage potential.

Overview of water harvesting and soil and water conservation in Konso.

The Konso people have a long history of indigenous soil and water conservation. Legend has it that they and the Boran people are one and the same, but the Boran chose to become livestock herders and the Konso farmers, The Boran stayed living on the plains with their cattle and the Konso took to the hills to farm. The hills are not very productive and in order to optimise their productivity the Konso developed a system of elaborate terracing and channelling of water to conserve soil and preserve the rainwater that fell and use it productively.

As a result the Konso highlands are all terraced where possible (and in some cases where it seems impossible), and seasonal streams have been diverted and the water led through elaborate systems of basins and spillways to water the land. This has been achieved without any formal technical training or support (though the approach that the Konso use is “technical” within their own parameters).

Systems have been developed by trial and error, and through a process of accretion and evolution. Although from a purely engineering perspective terraces are not always laid out “correctly” (i.e. they do not always follow the contour line) or channels built according to hydraulic laws, the systems do work, and have contributed to a form of land use that has sustained the Konso in otherwise inhospitable highlands for generations. In recent times though the system has started to fail due to population pressure in the highland zone of the Woreda.

In recent times the Konso have started to farm in the lowland zones of the Woreda. They had hitherto avoided these zones, largely because of the incidence of malaria. The terrain of these zones is very different from their highland home, but with typical Konso initiative and hard work, they have attempted to harness the water flowing in the seasonal rivers out of the hills, to use in the fertile alluvial plains adjacent to the river courses. The techniques they have used include building stone and brushwood spurs into the stream beds to divert a proportion of the stream flow, and then channelling it along long narrow hand dug canals and into field areas. Within the fields distribution is controlled by a system of basins and secondary canals. Water rights are determined by the communities and appear to grant fair and equitable distribution and usage rights to all participating farmers.

The farmers have essentially used the same technical approach in the lowlands as they used in the highlands. A common failing of the spate irrigation schemes built by Konso farmers in the lowlands is that they dig deep narrow canals. Water, when confined increases in velocity, and this is
reflected in rapid downward incision of the canal beds. In a short space of time canals are incised too deeply for water to reach adjacent field level. In some cases a substantial portion of river flow continues to flow along the canal widening and deepening it further and in at least one case we saw actually forming a new river channel. Canal redesign will involve a calculation of crop water requirements, cropping area and a redesigned canal that will be wide and shallow allowing a greater flow of water at a more gentle, non-scouring velocity.

**Notes on cropping and agricultural systems of Konso:**

Konso farmers occupy two distinct agro-climatic zones; the “Kolla” (lowlands) and “Wayne-Dega” (mid-altitude highlands). The main crops grown in both zones are maize and sorghum. Presently the varieties of sorghum grown (about 15 varieties in all) are long season varieties taking up to six months from planting to harvest.

Both cereal crops are planted from mid-February to the end of March after land clearing in January-February. Maize is ready for harvest by the end of June or mid-July. The expected average yield of maize is 12 quintals per ha.

Sorghum is allowed to raton and a second harvest from sorghum can be expected in Sept.-October. Sorghum yields vary widely but an average expectation is about 9 quintals/ha (excluding the raton crop).

The National Extension Programme (SG2000) is being implemented in Konso but with a low level of participation from farmers who are reluctant to participate due to the unreliability of the rainfall. The BoA is not pressing implementation at the moment for this reason. The FARM-Africa Farmers Research Project has been conducting participatory on-farm trials in Konso and are well regarded at the BoA.

There is limited utilisation of draught animal power in Konso and few animals owned.

Some other basic cropping statistics:

- **Seed requirements:**
  - Maize: 25kg/ha
  - Sorghum: 10 kg/ha

Current local selling price of maize is 120 Birr/Quintal

Average labour costs are 6 Birr a day

Little utilisation of fertilisers or pesticides outside the SG2000 programme due to high cost to farmers.

**Sites visited and recommendations at each site**

1. **Elbache (Yanda) River. (Spate irrigation)**

This site was given first priority by the Konso Development Association (KDA) in their list of preferred sites for spate irrigation. It is a new hitherto undeveloped site adjacent to an area of 500-750 ha of irrigable land. The soils are silty clays overlying clay with some silt.

Two sites were visited at the Elbache River. On our first visit (on August 9) we were taken to a site that was unsuitable for spate irrigation. The river was deeply incised to a depth of over three metres below the adjacent fields which the farmers wished to irrigate. Without water lifting devices it
would be impossible to raise the water to field level within the distance available from intake to field.

On a return visit to the site (on August 14) we were shown another potential intake site. Although depth of incision was probably close to the depth of the first site visited, the distance from the field area (about 500m) meant that there would be sufficient canal length to allow canal and ground level to come together at the field entry point. This will require a more detailed survey along the proposed canal line, using an engineers level to confirm.

The soils at the intake site are vertisols, otherwise known as Black cotton clays. The main characteristic of these soils is their swelling on wetting and shrinking on drying, due to the presence of montmorillonite clay minerals. They become very hard during the dry season and impossibly sticky in the wet season, and because of the extreme swelling and shrinking characteristics crack very deeply. The implications are that they can be difficult soils to work with for construction purposes, especially when we hope to produce a watertight canal to supply the fields from the river intake. The site engineer needs to be aware of these characteristics and must tailor his design accordingly. Stone lining of the canal for some of its length may be necessary.

We met local farmers who are very keen to develop this site. There are potentially 100-150 families wanting to farm this site, who would each have a land holding of 5ha. The crops that they wish to grow are sorghum, maize, pepper, banana and groundnuts.

Unlike some of the other sites described below an advantage of this site is the fact that it is so far undeveloped. It will be possible to design a scheme from scratch without having to superimpose it on a previously existing site already developed by Konso farmers.

**We recommend that this site be given priority by FARM/KDA/WaterAction to be one of the initial spate irrigation sites for development under the Konso Project.**

2. **Yanda River-Yel Arba (Spate Irrigation and Sand dam)**

This site on the upper Yanda River, north-east of Konso was identified by KDA as a potential spate irrigation site. Farmers have already dug a canal to irrigate an area of 27 ha but could not get sufficient command over the land, and water could not reach field level. The canal has since scoured more deeply making it impossible to raise water to field level.

On this stretch of the Yanda River the bedload is predominately sand. The river banks are rock lined for a substantial length. In many ways this is a very high potential sand dam site. We probed the sand bed of the river to ensure that rock formed a continuous barrier below the sand. We encountered rock at just over one metre depth in the sand bed. With these characteristics in mind we are proposing the following:

A sand dam is constructed across the bed of the Yanda River. This will serve to start harvesting water from seasonal flows to be used for domestic consumption. As with all sand dams, to function effectively it will need raising above stream bed level in incremental stages over a number of years. This will have the effect of increasing the storage capacity of the sand reservoir so providing a greater potential water supply to a settled population.

In the initial detailed engineering survey of the site, a profile needs to be surveyed back from the potential irrigated field area at Yel Arba ("the place of the elephant"), to the dam site. The intake level for the canal will determine the spillway level of the sand dam. The spillway will then supply water to the main canal for irrigating the field area. The main canal will have to be chiselled through weathered rock for a distance of about 30 metres. The Konso have experience of this kind of work.
A disadvantage will be that the irrigation intake will not be able to function as such until the sand dam is built up to a sufficient height to allow the offtake from the spillway. It is very important that the dam is NOT built to its full final height in the first year. Doing so will cause the river to drop all of its bed load behind the dam wall, including all the finer particles of clay and silt, which will have the effect of substantially reducing the storage capacity of the sand reservoir. Incremental height increases are absolutely necessary. Although the irrigation potential will not therefore be realised for three or four years, in the long run it will be a far more effective structure.

At present there is no settled local population close to the proposed site. It is a central part of the KDA strategy for development of the Woreda that opportunities are made in the lowlands to ease the pressure on the overcrowded highland zones of Konso. The provision of drinking water will ease one critical problem and the realisation of the agricultural potential of the land through stream flow diversion will ease another.

It is recommended that a start is made on this scheme in this phase of the project, by the construction of a sand dam up to stream bed level with provision made for incremental height increases to the dam to bring it up to a sufficient height to divert water for irrigation.

3. Taho River (Spate Irrigation)

This site is one at which there already exists canal diversions from the Taho wadi into field areas where crops, in particular maize and sorghum are already grown. Soils are fertile and easily workable silty clays with some vertisol development close to the river bank and some stone and gravel deposits at a depth of about 1.5 metres in the alluvial material of the river banks.

On investigation it was found that there already exists a sophisticated system of physical water distribution in-field and of social water management by the farmers. The project must respect these indigenous systems without attempting to superimpose new and possibly inferior systems on them. It is estimated that there are 100-150 farming families using this scheme, with a land holding per family of approximately 1-1.5 ha. This makes a total potential irrigable area of 225 ha.
On a technical level therefore the main requirement, as at other sites is improvement at the river intake and to the main supply canal.

The very seasonality of these rivers makes them unpredictable. In particular they are subject to great variations in their course and can change course dramatically within one season cutting new channels and causing banks and levees to collapse. For this reason it is not recommended that intake structures are built as permanent structures as there is a great danger of water erosion cutting around them and isolating them in the stream bed. Konso farmers build temporary diversion structures made of stone and brushwood, and under prevailing conditions these structures are appropriate and adequate for the job required of them. Local farmers report that the peak flow of the river, sufficient to reach the intake only occurs for two to three days when the river is in flood.

Canal design can be improved as previously detailed, widening the canal sufficiently to carry a calculated design flow, and ensuring that the gradient of the canal is gentle enough to avoid scouring and overdeepening.

It is recommended that work on improving the intakes and canals along the Taho River commences this season.

4. Orgaliso River (Sand Dam)

There were two sites at this location identified by the KDA as suitable for sand dam construction. On investigation we identified one high potential site along the Orgaliso River which cuts the Jinka Road about 25 km west of Konso.

We identified a suitable dam site in the sand river at a walking distance of 15 minutes from Maderya, the nearest settlement. Presently women have a two and a half hour round trip to collect water. There is a broken Mono (deep well) handpump on a borehole about 40 minutes walk from Maderya village. The pump was installed when there was a larger rural community settled around the pump location under the programme of the previous government of forced villagisation. Since that policy was abandoned the people have moved back to their previous locations and on enquiry we found that rehabilitation of that particular pump would not be a useful exercise as there would not be a sufficiently motivated local community available to maintain it.

 Provision of domestic water by a sand dam would therefore seem justified at this location. The width of the sand river at the most suitable point is relatively narrow, no more than 10 metres. The capacity of a single dam will therefore be initially small. There is the potential though along this river to build a series of sand dams at intervals which will provide a much more satisfactory water supply. In the first year a single dam should be built and when the community has shown that they can contribute willingly to both initial construction, and to incremental construction in future years, then the decision can be made to construct more dams.

It is recommended that one sand dam is built at this site in the first year of this phase, with a view to constructing a series of sand dams along the river in future years.

5. Yandafero (Spate irrigation)

The Yandafero scheme is a very extensive existing irrigation scheme consisting of a series of 20 canals from the Yanda River irrigating an area estimated to be about potentially 4,000 ha and farmed by nearly 4,000 families. The local NGO MekaneYesus did conduct a survey of this site
about three years ago, but took no further action on developing or improving the scheme despite stating that this was their intention. The KDA are losing patience with MY and are hoping that someone else will take on the development of this site.

The amount of work necessary to develop this site is huge. The process of community consultation and making basic decisions on prioritisation of canals and distributions systems for development, on its own would be very lengthy. We do not feel that in its first phase the project is equipped to take on this task. After we have gained some experience on smaller sites we may feel experienced enough to tackle a project of the magnitude of Yandafero.

A problem though is that the existing canals are so poorly designed and constructed (from an engineering viewpoint) that it is inevitable that they will experience greater erosion and deeper incision in each season that passes. This will make most of them unusable within two seasons at the most. It is possible perhaps to include some Yandafero farmers as trainees at the Taho River site to learn some of the basic techniques of improved canal and intake design and construction so that they will have the basic skills to improve their system and avoid the potentially massive deterioration that appears inevitable.

<table>
<thead>
<tr>
<th>Development of the Yandafero site is not recommended in this phase but should be regarded as pipeline project, when project staff have gained some experience in less complex sites. Yandafero farmers can though benefit by attending training in improved canal design at other sites, such as along the Taho river.</th>
</tr>
</thead>
</table>

6. **Segan River (Spate Irrigation)**

We investigated two sites along the Segen River which is a semi-permanent water course on the eastern boundary of Konso with Borana. The first site was unsatisfactory being too deeply incised to raise water to fall level.

At a second location though at a site adjacent to a bridge across the Segen River crossing into Borana, we found a far more promising site. Once again this site is already developed by the local people who are irrigating it already from a number of sources including the Segen and from ephemeral streams flowing out of the hills to the west. Presently farmers make a four hour return walk from their homes to work on this land. There is potentially up to 120 ha of irrigable land at this site being used by 150 farming families growing maize, sorghum, potato and soybeans. Soils here have quite a high clay content but not so as they would become seriously unworkable with hand tools or oxen. The most important intervention that the project could make would be in redesign and improvement of the intake and main canal.

There is also the potential for hand dug well construction adjacent to the river to supply safe drinking water. Presently water is extracted directly from the river for this purpose with the attendant health risks. Hand dug wells would also be able to access ground water during periods when the river was dry.

<table>
<thead>
<tr>
<th>Development of these high potential sites along the Segen River is recommended in future phases of the project, but is not priority for the first phase.</th>
</tr>
</thead>
</table>

**The issue of community contribution.**

Konso farmers are well known regionally and nationally for their initiative and hard work. All of their achievements to date have been as a result of this initiative and labour. We talked to many Konso farmers during our visit and they all expressed a great willingness to contribute labour, and
Summary of Recommendations:

We recommend that the Elbacha river site be given priority by FARM/KDA/WaterAction to be one of the initial spate irrigation sites for development under the Konso Project.

It is recommended that a start is made on the Yanda River/Yel-Arba scheme in this phase of the project, by the construction of a sand dam up to stream bed level with provision made for incremental height increases to the dam to bring it up to a sufficient height to divert water for irrigation.

It is recommended that work on improving the intakes and canals along the Taho River commences this season.

It is recommended that one sand dam is built at the Orgaliso River site in the first year of this phase, with a view to constructing a series of sand dams along the river in future years.

Development of the Yandafero site is not recommended in this phase but should be regarded as pipeline project, when project staff have gained some experience in less complex sites. Yandafero farmers can though benefit by attending training in improved canal design at other sites, such as along the Taho river.

Development of the high potential sites along the Segan River is recommended in future phases of the project, but is not priority for the first phase.
**Visit itinerary**

Saturday August 8
Arrived in Konso 1600

Sunday August 9
Start of field work in Konso special woreda investigating and surveying potential sand dam and spate irrigation sites. 
First visit to Elbache site.
Second visit to upper Yanda River/Yel-Arba

Monday August 10
Survey of sand dam/diversion site at upper Yanda River/Yel-Arba.

Tuesday August 11
Investigation of potential sand dam sites along the Orgaliso River.
Afternoon visited the Woreda Agriculture office.

Wednesday August 12
Field investigation of Yandafero irrigation scheme.

Thursday August 13
Field investigations along the Segan River.

Friday August 14
Field investigation at Elbache site.
p.m. departure from Konso to Arba Minch.

**Persons met**

Amare Mengiste
Co-ordinator Konso Capacity Building Project.

Michael Asefa
Training Officer, Konso Development Association.

**Konso Development Association (KDA)**

Ato Koshna
Chairman KDA

Ato Germu
Manager KDA

Ato Torito
Secretary KDA

Ato Ayano Kawidita
KDA member

Ato Kusiya
Member of Parliament for Konso

**Konso Woreda Agricultural Office**

Ato Kora Yyesito
Agriculture Department Head

Ato Taye Mamo
Agronomist and Crop production and protection expert.