
1 Development of coordinated research efforts

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[Introduction](#)

Introduction

Vertisols account for 12.7 million hectares in Ethiopia of which 7.6 million hectares are in the Ethiopian highlands. Vertisols are generally hard when dry and sticky when wet and therefore present serious limitations to their use.

Poor internal drainage is a major problem associated with Vertisols in high rainfall as well as in irrigated areas. As a result of this, the roots of the crops are poorly aerated and nutrient uptake for growth and development impaired. Traditional farming has developed a wide range of drainage practices (construction of hand-made broadbed and furrows such as in Enewari plateaux, planting on ridges, soil burning etc) and the use of low yielding crop varieties and late planting practices to avoid waterlogging periods. Waterlogging of Vertisols is more severe in the Ethiopian highlands where rainfall is higher and evaporative demands are lower.

It has been recognised that, with the exception of the hand-made broadbeds and furrows, the technical efficiency of the traditionally applied surface drainage techniques is not sufficient to allow full use of the potentials of these soils (Mesfin Abebe, 1982; Getachew Asamenew et al, 1988; Jutzi et al, 1988). Cambered beds gave remarkable effects on crop growth and fertiliser efficiency (Mesfin Abebe, 1982). However, the economic viability of this technology in the smallholder subsistence sector proved to be questionable since no uptake by farmers was recorded.

The experience of ICRISAT with the use of Vertisols in semi-arid India (Burford, 1987; Kanwar and Virmani, 1987) indicates that the key to drastically improved productivity of Vertisols is the effective control of surface soil water which then enables rational use of the land for food and feed production. ILCA, therefore, developed and tested on-station and on-farm research in various highland Vertisol areas an animal-drawn implement for broadbed and furrow construction which was to combine technical efficiency of surface drainage construction with economic viability (Jutzi et al, 1987c). Substantial increments in grain and biomass outputs due to enhanced surface drainage were recorded along with convincing economic returns to the farm in the application of this technology.

History of the Project

The credit for the successful establishment of the improved Vertisol management project goes to Dr. Samuel Jutzi, a former staff of ILCA, who in 1984 prepared a project proposal entitled "Management of deep black clay soils (Vertisols) in sub-Saharan Africa". The project proposed the implementation of a research, training and outreach programme for improved Vertisol utilisation. The programme was envisaged to focus on Ethiopian Vertisols in the first phase, as a joint ICRISAT/ILCA initiative with the involvement of the Government of Ethiopia. The project proposal was submitted for comments to the Ethiopian Ministry of Agriculture, to the Institute of Agricultural Research (IAR) and to the International Crops Research Institute for the Semi-

Arid Tropics (ICRISAT). Discussions on the project Implementation for its outreach part were pursued with the Ministry of Agriculture (MOA) and the Central Planning and Programming Department of MOA during 1985. Two implementation documents, one for the research and one for the outreach parts of the Project, were prepared in November 1985 and submitted to MOA, IAR and Alemaya University of Agriculture (AUA).

Several informal discussions between ILCA, MOA, IAR and AUA professionals and heads of institutions were then held with the purpose of exchanging information and develop mutually useful intentions and interests. This led to the official formation of the Joint Vertisol Management Project (JVMP) composed of administratively independent cells that share the goals of the Project within their respective agencies to achieve these goals.

Project objectives

- The objective of the Joint Vertisol Project (JVP) has been to develop and verify improved on-farm animal-powered Vertisol management techniques in Ethiopian highland mixed farming systems. These were:
- To develop or adapt improved animal-based Vertisol management techniques in order to improve the overall utilisation of these soils in Ethiopia.
- To develop techniques for more effective use of the water resources of the Vertisol areas by appropriate animal-powered land-shaping and integrated watershed planning.
- To develop improved low-cost cropping systems for these physically eroded soils, with particular consideration given to the legume component in order to provide reasonable soil-N levels for sustained crop production and sufficient N for the supplementation of crop residues in animal feeding, Systems to be investigated will also include agro-forestry and silvopastoral sets.
- To design and test adapted technical means, e.g. animal-drawn implements for Vertisol cultivation and land-shaping.
- To implement necessary climatic data recording and handling systems to support improved land, water and crop management.
- To have effective means of inter-institutional coordination of Vertisol research activities.

Project rationale

1. Vertisols in high rainfall areas are agriculturally underutilised because of marked waterlogging during the growing period. They appear to be the soils with the largest gap between actual and potential production in the Ethiopian highlands.
2. Vertisols have very high waterholding capacity and high CEC due to their high clay content. They are, therefore, low-risk soils of high potential.
3. Impact of improved tillage quality on crop yields is higher on heavy clay soils than on light soils.
4. Animal power has comparative advantages over tractor power in tilling cracking clays in the wet phase. There seems to be opportunity for synergies between draught animal power (wet-soil tillage and planting) and tractor power (rough off-season ploughing).

5. Ethiopian highland agriculture has been animal-powered for centuries; animal traction knowledge is, therefore, available.
6. Acceptance of animal-powered land cultivation as an alternative to hand cultivation (human drudgery) is more likely to take place on heavy clays than on light soils.
7. Ethiopia's Vertisol area is considerable (13 in ha of which 7.6 in ha are in the highlands). Ethiopia has the largest Vertisol area in high rainfall regimes in sub-Saharan Africa.

Project strategies

The joint project adopted the following strategic positions for its programme development:

- Strict adjustment of external cost of technologies to capital/cash availabilities in target-farming systems. Since these systems are subsistence-oriented, a low external cost approach is adopted.
- Research, verification and extension of "element by element". No major effort to assemble comprehensive technological packages is undertaken.
- Bases of improved technologies are to be sought as much as possible in traditionally available elements.
- Involvement of target farmers for feedback generation and direction of the technology adoption from the start i.e. on-farm research.
- Inter-institutional task-sharing, vital for the assembling critical mass in all areas of project activity, would be practiced.

Project target areas

- (a) High rainfall areas
- (b) Mixed crop-livestock farming
- (c) Systems with viable draught-cattle population.

Project structure and organisation

The Joint Vertisol Management Project document proposed an advisory board to give guidance to the Project and a technical committee to supervise the day-to-day execution of the Project.

The Advisory Committee (AC)

The inaugural meeting of the Advisory Committee (AC) to the joint project was held on March 28, 1986 at ILCA headquarters. The composition of the Committee was endorsed as follows:

- Vice-Minister, Animal and Fishery Resources Development Main Department, Ministry of Agriculture, chairman
- General manager, Institute of Agricultural Research, member
- President, Alemaya University of Agriculture, member
- Research and Publications Officer (RPO), Addis Ababa University, member
- Director General ICRISAT, member
- Director General, ILCA, member.

The Committee's main task would be as follows:

- (a) to consider policy issues associated with the Project
- (b) to maintain a watching brief on its progress
- (c) to ensure adequate coordination of all agencies involved
- (d) to assign relative responsibilities for key actions
- (e) to supervise the work of the Technical Coordinating Committee responsible for project implementation
- (f) to develop and assess guidelines for resource acquisition and allocations.

Since its formation the AC met seven times and discussed a range of issues such as project emphasis, funding, membership etc. At its sixth meeting on January 27, 1991, the AC discussed the need to revise the membership list, and the following membership was approved:

- Vice-Minister, Ministry of Natural Resource Development and Environmental Protection, chairman
- ILCA Director General, member
- IAR General Manager, member
- RPO, Addis Ababa University, member
- President, Alemaya University of Agriculture, member
- Director General, ICRISAT, member
- Representative, Swiss Development Cooperation, member
- Chairman of the Technical Committee, Secretary.

It was also emphasised that other institutions such as the Relief and Rehabilitation Commission (RRC) and IBSRAM should periodically be informed about Project developments.

The Technical Committee (TC)

The AC, as its first task, appointed the Technical Committee (TC) to the Project with the following institutional composition: AUA, IAR, MOA, ICRISAT, ILCA. The Technical Committee had its first meeting on May 12, 1986. It appointed Dr. Mesfin Abebe as chairman and Dr. Samuel Jutzi as secretary and agreed on its functions as follows:

- (a) to preview and review research protocols of the Project
- (b) to implement the Project activity jointly, thereby assuring inter-institutional flow of information and avoid duplication of efforts
- (c) to assign responsibilities for specific protocols to participating agencies (supported by Project funds where feasible)
- (d) to prepare complementary bases for Project activities and to generate proposals for their funding and implementation

(e) to propose mechanisms for strengthening relevant activities in national institutions

At the time of going to press, the TC had met about 30 times. The TC's division of responsibilities among the various institutions are listed in Table 1.

Table 1. Division of responsibilities between participating institutions.

Institution	Research area
IAR	- Soil fertility N and related micro-nutrients including BNF
	- Crop physiology/cropping systems for all crops with special emphasis on those crops on which IAR is running improvement programmes
	- Standardisation of animal-drawn implement testing
AUA	- Soil fertility P and related micro-nutrients including mycorrhiza
	- Crop physiology/cropping systems for all cop with special emphasis on those crops on which AUA is running improvement programmes (crop types different from IAR)
LUPRD	- Vertisol characterisation
ICRISAT	- Resource assessment and utilisation (agro climatology)
	- Land and water management (watershed-based land-use planning)
ILCA	- Traction animal (physiology, feeding uses)
	- Implements for soil, water and crop management and water harvesting
	- Crop-livestock interactions, crop residue utilisation
	- On-farm technology evaluation.
AUA	Alemaya University of Agriculture
IAR	Institute of Agricultural Research
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
ILCA	International Livestock Centre for Africa
LUPRD	Land Use Planning and Regulatory Department, Ministry of Agriculture.

In April 1987, the terms of reference of the TC were revised by the TC itself at its 4th meeting in order to address more responsibilities. This was approved by the AC in September 1987.

Terms of reference for the Technical Committee (revised)

The revised terms of reference of the Technical Committee were as follows:

1. To implement the Project as a joint activity thereby assuring inter-institutional flow of information to avoid duplication of effort
2. To propose mechanisms for strengthening relevant activities in national institutions by suggesting activities where these are inadequate or not well covered; further, to make efforts to acquire funds for the same where necessary
3. To advise on the nature, location and extent of outreach activities in the context of the Project
4. To organise information exchange and briefing sessions of staff of participating agencies to increase general awareness and commitment
5. To keep a comprehensive inventory of research protocols and development-oriented activities of participating agencies

6. To meet for follow-up and assessment at least three times per year (before season, mid-season, post-harvest)
7. To report annually to the Advisory Committee on Project progress and any other functions assigned by the Advisory Committee
8. To perform any other functions assigned by the Advisory Committee.

In 1987, the TC produced the synopsis of institutional involvement (both current and intended) in the Ethiopian project, with the understanding that no single institution can claim to have the disciplinary specialists, infrastructure and resources that are required to address the necessary study on Vertisols.

The rationale for an inter-institutional approach to research on and development of Vertisols was based on the fact that:

- Some elements of improved Vertisol technology can be rapidly brought into the extension phase. This is the primary responsibility of the Agricultural Extension Services in the Ministry of Agriculture (MOA)
- Multi-disciplinary inputs in technology research and development are required in any resource management change. Institutions with complementary mandates, therefore, preferably collaborate in these efforts
- The coordination of efforts between institutions allows:
 - a) assembling of critical mass, and
 - b) judicious use of scarce available funds (especially for research)
- The innovative potential of IARCs (International Agricultural Research Centres) can best be deployed if their activities are formally inserted in a national system of research and extension
- To avoid duplication of efforts
- To benefit from exchange of information, experiences and expertise input
- To achieve quick technological break-throughs.

As a follow-up of the recommendation made by the External Review Panel of the Joint Project, and the decision reached by the TC, it was necessary to limit the TC membership to active participants from the collaborating institutions. A new TC composition was suggested and later endorsed by the AC at its sixth meeting on 27/01/91. The new TC membership now had the following membership:

- AUA Vertisol Project leader
- IAR Vertisol Project leader
- ILCA Vertisol Project leader
- ICRISAT Representative
- MOA Vertisol Project leader.

Among the other recommendations made by the TC, AC, the Review Panel and the donors were that the TC operation should be raised to a level of opening a coordination office and a secretariat so that a more efficient coordination role may take place. Although a one-year budget (1992) was approved for the coordination office by SDC, it was not possible to employ

a coordinator due to uncertainties of funding beyond 1992.

The Project phases and funding

The Joint Vertisol Project has passed through three project phases. The first phase was between 1986-1988 while the second phase was between 1989-1991. The last phase is 1992 which is considered as an intermediate phase, in order to continue and complete the on-going activities. During the first phase, local institutions participated in the Project although without direct funding. However, ILCA responded to some of the necessities (such as vehicle, research supplies, labour expenses etc) expressed by the NARSs (mainly IAR, AUA and MOA).

Beginning in 1989, IAR and AUA received funding assistance from SDC (based on the funding application prepared by the Technical Committee and endorsed both by IAR and AUA management). Tables 2 and 3 indicate the level of funding received by ILCA, IAR and AUA during the project phases.

Assistance by ICRISAT and IBSRAM

ICRISAT has been assisting the Joint Vertisol Project by providing expert advice in agro-climatology, soil physics, soil fertility and land/water management. ICRISAT scientists also attended regular TC meetings and together with this could interact with JVP scientists. Prior to receipt of funding by IAR and AUA, ICRISAT financed the training of some technicians at Hyderabad, India. In addition, visits by senior scientists and short-term training opportunities were arranged jointly by ICRISAT and the JVP.

Beginning in September 1990, ICRISAT seconded Mr K L Srivastava land/water engineer, to the JVP on a longer term basis (two years). He has been working closely with ILCA, AUA and IAR scientists.

IBSRAM assisted the JVP through its network: Management of Vertisols under Semi-Arid Conditions (MOVUSAC) and sponsoring participants (upto 1991) from IAR and AUA for attendance in regional Vertisol management conferences. The former coordinator of MOVUSAC, Prof. P M Ahn, visited JVP project sites and interacted with JVP scientists.

Table 2. ILCA's Vertisol management project source of funding from 1986 to 1992 (US Dollars).

Period	Donors	Amount	Total
1986	OXFAM	76000	889186
	CARITAS	62766	
	Norway	150000	
	Switzerland	600420	
1987	OXFAM	113280	1327501
	CARITAS	95080	
	Norway	300000	
	Finland	148000	
	Switzerland	671141	
1988	OXFAM	117194	
	CARITAS	198542	

	Norway	299991	
	Finland	135000	
	Switzerland	653595	
			1404322
1989	Norway	200000	
	Finland	140000	
	Switzerland	407102	
			747102
1990	Norway	150000	
	Finland	41101	
	Switzerland	498043	
			689144
1991	Switzerland	329442	
	Norway	100000	
			429442
1992	Switzerland	237000	
	OXFAM	60770	
			297770

Table 3. SDC grant for IAR and AUA (US\$).

	IAR	AUA
1989	101875	70733
1990	124635	86536
1991	115271	80034
1992	115000*	63000

* Of this amount, \$61 000 was allotted for the coordination office.

AUA = Alemaya University of Agriculture.

IAR = Institute of Agricultural Research.
