

The Development,
Utilization & Transfer of
Vetiver Technology: The
Experience of Coffee
Plantation Development
Enterprise in Ethiopia

Introduction

- Vetiver grass (*Vetiveria zizanioides* L) is native to South and South Easter Asia, where it has been used for centuries to mark boundary lines, stabilize steep slope and rehabilitate degraded land.
- The grass has a wide adaptability range to soils and climatic conditions
- Consequently it can be established on very acid, alkaline or saline soils and in areas with annual rainfall greater than 200mm.

- **Due to its extensive root system It is tolerant to adverse conditions such as extreme heat (50°C) and frost (-10°C).**
- **Vetiver multiplication in CPDE started in early 1980s.**
- **The 1st planting material was introduced from Gera Agricultural Research station(GARS).**
- **During the last 3 decades of its cultivation substantial experiences were gained on its development and utilization.**
- **Furthermore, efforts were made to disseminate the technology.**
- **This presentation,therefore, summarizes the experience of CPDE about the development, utilization and transfer of the vetiver technology.**

1. **About coffee Plantation Development Enterprise**
 - **CPDE is re- established in 1993 and manages 3 plantations.**
 - **The plantations are located in 3 NRS**
 - **CPDE produces coffee & other related crops in its plantations.**
 - **The area covered by each crop is shown below.**

Coffee	20144.07 ha
Cereals	1267 ha
Fruits, Oil palm & spices	562 ha
Rubber plantation	587 ha
 - **The background information of the farms is presented on Table 1**

2. Vetiver Development

2.1 variety planted in CPDE

- Two types existed
 - a. A wild type that flowers regularly, set fertile seed which is known as a “ colonizer”
 - b. A domesticated type that is non flowering and non seeding which is propagated vegetatively

The vetiver planted in CPDE is the 2nd type(Fig 1)



Fig.1 Vetiver grass planted at CPDE.

2.2 Land Development

2.2.1 Site Selection

- **Vetiver has wide adaptability and is best grown under warm& humid condition**
- **Since the farms of CPDE are situated in warm& humid areas site selection is not an issue.**

2.2.2 Land clearing

- **Clearing is performed by labor force using machete**

2.2.3 Nursery Management

a. Source of planting material

- **The 1st planting material was obtained from GARS**
- **The matured vetiver from 1st planting has become the source for its expansion**

b. Nursery Establishment

- **Mature vetiver is obtained**
- **The leaves are pruned at 20 cm**
- **The clump is uprooted with the ball of soil**
- **The roots are pruned at 10 cm**
- **The slips are split up and planted directly on the ground as bare root**
- **Established nursery is shown on Figure 2.**



Fig. 2. Vetiver nursery at CPDE

2.3 Plantation Development

2.3.1 Land Preparation

- To eliminate the weed competition and ensure sound establishment, the planting site is cleared using machete.
- The land is marked out along the gradation with pegs
- Following marking small ditch 15-20cm deep is dug

2.3.2 Field Planting

a. Time of planting

- In the farms rain begins in mid March and Extended to late November.
- Best results are obtained from early planting in the rainy season
- Thus planting is carried out in the rainy season (April-August (September)

b. Transplanting

- Healthy vigorous mature vetiver grass is selected and the tops are cut back to 20cm length & is uprooted with the ball of soil.

- The clump is transported to planting site.
- It is broken up into slips of 3 to 4 tillers.
- Slips are planted into a furrow (ditch) at 10 to 15 cm spacing
- The roots are covered with soil and is firmly compacted.
- Planting of slips is performed within 2 days after uprooting.

To ensure accurate planting on the contour, levels are used.

- Usually losses of vetiver slips occur and infilling is carried out.
- Neither fertilizer nor mulch is applied contrary to the practice else where.

2.4 Vetiver Maintenance

Vetiver generally requires little management of which weeding and trimming are important.

2.4.1 Weed control

- Weeding is done regularly until plant establishment.

2.4.2 Trimming

- Topping to a height of 30-40cm will promote tillering.
- This is practiced 2 to 3 times per year

2.4.2 Fertilization

- No fertilizer is applied

3. Utilization of vetiver grass

3.1 Soil Erosion Control

- Runoff erosion causes degradation of soil physical characteristics and is also responsible for the decline in fertilizer use efficiency by increasing nutrient losses.

- To protect the soil loss various conservation practices are employed
- Soil erosion control strategies includes agronomic measure, mechanical methods and soil management.
- In CPDE agronomic measures are employed
- The Agronomic measures includes:
 - **High density Planting**
 - **Cover Cropping**
 - **Inter cropping**
 - **Shading**
 - **Mulching**
 - **Contour planting**
 - **Vegetative contour hedges (vetiver grass)**

- Using vetiver hedge, in India runoff and silt were reduced from 40% to 15% and 25 tons to 6 tons respectively.
- In Thailand, Howeler *et al* (2002) reported that vetiver grass was effective in reducing soil loss by erosion.
- Conservation measures evaluated by Gardner (1988) indicated that in Ethiopia grass treatment retained soil and catch sediment best among different treatments.

- **At CPDE to protect the soil from erosion vetiver grass was planted across the slope in coffee blocks as shown on Fig.3**





Fig. 3 Vetiver hedgerows designed to protect soil erosion by runoff in coffee plantations.

- Once established such hedges protect the land from erosion for years, as they build up natural terraces as shown on Figure 4.



Fig.4. Erosion sediment trapped by vetiver hedgerow in coffee plantations.

3.2 Moisture conservation

- As stated by Carey (2006), the stiff stems of the hedges slow the movement of runoff water and spreads it out; trapping silt behind the hedge.
- This allows more water to be absorbed into the soil.

- In the mean time deep roots (2 or 3m) open up the ground and more of the rain water penetrates into the ground where rain water is harvested (Report on Rainwater Harvesting with vetiver)
- This helps to enrich the moisture status of the soil
- Although measures are not taken in the level of retaining natural moisture in the soil at CPDE it is anticipated that the vetiver system helps in moisture conservation.
- The structure is shown on Figure 5



Fig.5. Vetiver used to conserve moisture there by increase groundwater recharge

3.3 Stabilizing Farm Infrastructures

- Vetiver planted in CPDE is also used to stabilize farm infrastructure such as in farm road verges and the slopes at coffee pulping stations.
- Figure 6 shows how vetiver can be used to stabilize the road verges in coffee states.
- The road verges could be worn out by the action of water in the absence of this vegetative cover.



Fig. 6. Vetiver used to stabilize

- On the other hand, Fig 7 depicts the role that vetiver could play to stabilize the steep slopes at coffee pulping station.
- The soil on the space between the reception of red coffee cherries and ground level is sometimes imported or cut from the slope side.
- To secure this soil from loss the slope is planted with vetiver hedges.
- When runoff/rain reaches the vegetative hedges, it slows down, spread out, oozes through hedges and large portion is anticipated to infiltrate into the ground along the way.
- Thus neither soil nor water is lost through the concentration of runoff in specific areas



Fig. 7. Vetiver hedge rows used to stabilize the fill up/ cut soil at pulping stations in CPDE.

3.4 Mulching

- In its natural environment coffee grows in a bed of forest, litter and its root is adapted to function efficiently under such condition.
- This condition is stimulated in commercial plantations by keeping the bare soil covered with a layer of organic mulch material.
- It is applied near the end of the rain and/or at planting.
- Substantial benefits are obtained from application of mulch.

- The benefits obtained from mulch includes
 - Suppressing weeds
 - Conserving moisture
 - Improving the fertility of the soil
 - Protecting erosion
 - Regulating the soil temperature
- Recognizing these benefits it is exercised in CPDE as shown on Figure 8



Fig. 8 Vetiver grass used as mulch material for young coffee trees in CPDE

3.5 Thatched roof

- The predominant roof thatching material in use in Ethiopia is long straw & combed cereal straw
- Currently constructing thatched roof is in a decline in towns due to shortage of thatching material
- But in rural areas it is still extensively used.
- Manarang (1994) and Booth *et al.* (2006) reported the use of vetiver grass as roof thatching material in the Phillipense and Indonesia respectively.

- Like wise in CPDE the vetiver material is used for thatching as shown on Figure 9 (shelter) and Figure 10 (shed) respectively.



Fig. 9. Thatched shelter using vetiver grass



Fig. 10. Thatched shed using vetiver grass

3.6 Coffee effluent discharge

- Red coffee cherry arriving the pulper is pulped where skin is removed leaving behind the parchment coffee
- The parchment is covered with mucilage(sugary material) which is removed by fermentation and /or mechanical mucilage remover (Demucilager) and washing.

- The water from the 1st washings of the fermented coffee (effluent) is polluted to be used
- The use of vetiver grass as pollution mitigation from effluent disposal areas was reported by Loch(2006).
- Invariably CPDE is also exercising it.
- Here the effluent is spread over the vetiver system, it slows down, drops the effluent and clean water oozes.
- Figure 11 shows the use of the vetiver system for effluent treatment



Fig. 11 Vetiver system used to treat the effluent discharged from coffee pulper.

4. Transfer of vetiver Technology

- Diverse systems were exploited by many authors to transfer the vetiver technology to farming community and other users
- Booth *et al.*(2006) in Indonesia reported that the dissemination of the vetiver information was made possible through introducing, holding conference, training, newsletters, use of local media and email communications.

- Farmers participatory research approach was also used as tool to transfer the vetiver technology in Thailand as explained by Howeler *et al.* (2002).
- In CPDE the technique employed to promote the vetiver technology is by acting as demonstration field and basically through sales of the clumps upon request.

- Accordingly It was disseminated to the following organizations:
 1. **Finch a sugar factory**
 2. **Green Coffee Agro Industry**
 3. **Beta Woreda agricultural office**
 4. **Guraferda Woreda Agricultural Office**
 5. **SNNP Agriculture Bureau (Wolayeta Zone)**
 6. **Gemadero Coffee Plantation**
 7. **Menschen für Menschne**
 8. **Elubabor Betel Sinodose**
 9. **Yalewgeta Farm**

5 Conclusion

- CPDE manages three coffee states distributed in different agro-ecology of tropical rainforest eco-type where vetiver grass is successfully multiplied
- The grass was introduced from GRS
- Slips usually ripped off the main clump are used as propagates and planted like seedlings
- Once roots are established the plant develop quickly and found to require little management (weeding & trimming)

Social, Environmental and Agricultural importance of vetiver grass in CPDE

- Protection of coffee fields against erosion
- Stabilization of in farm road verges and slopes at pulping station
- Serve as mulching material for coffee trees
- Conserve water by harvesting the rainwater
- Provide thatching material for roof of shelters & sheds
- Pollution mitigation

In an endeavor to enhance the dissemination of the vetiver grass technology the enterprise has been and still act as strong extension partner to governmental, non-governmental and private organizations in the country.

**Thank
You**