Ethiopia Drylands Development Programme

Final Draft

Planned Comparison Protocol

Comparison of tree seedlings management for better survival and growth performance in the DRYDEV programme intervention areas of Ethiopia

June 2016

1. Background and Justification

Tens of millions of people in Ethiopia rely on forests for a whole range of products and services (EFAP, 1994), although only about 11% of the original forest is now remaining (FAO, 2010). Fruit bearing trees and shrubs, and their products play a great role in economic development while improved agroforestry system can also provide food, fuel wood, charcoal, shade, construction materials, farming implements, fodder, and soil improvement and conservation. However, about 70% of the Ethiopian landmass is classified as dryland and faced with multiple production challenges. Due to these constraints, integration of high value trees such as fruit trees into the farming systems of these areas including the DRYDEV programme implementation watersheds has limited success. The major constraints raised during the Community Action Plan (CAP) process related to tree planting were moisture stress, pre and post management of planted tree seedlings which resulted in poor survival and growth performance of planted seedlings.

Promoting efficient water conserving methods such as mulching which could be adopted and practiced by farmers will increase planting of fruit and other multipurpose tree species. Even though, mulching is known as a moisture conservation technique, it is not well practiced and mainstreamed in most parts of Ethiopia including the DRYDEV programme sites. Moreover, farmers who exercised the mulching as practices are also considered as a onetime application which is commonly applied during planting time. However, use of mulching as a practice should be continuous phenomenon at list till the growth performance of the seedling is good and well-adapted. The technique is simple and the materials are easily available by any farmer be it poor, and better off at any time. In its simplest form, any locally available mulching material including grasses, crop residues, leftover hays, and dried broad leaves will put around the pit where the seedling planted and help the water not easily evaporate rather conserve the moisture. Thus, application of continuous mulching technique conserves the moisture and uses the water efficiently that improves the survival and growth performance of planted fruit and other multipurpose tree species compared to not applying mulching technique. Therefore, this planned comparison is designed to measure and evaluate mulching technique for better survival and growth of seedlings either in homestead or farm plots or both.

2. Planned comparison design

The planned comparison on fruit and multipurpose trees will be primarily designed to support farmers to select better moisture conserving practices that suit their condition and ensure tree survival and growth at an affordable cost. The study will be carried out in selected sub-catchments of four woredas of DRYDEV namely, *Tsaeda Emba*, *Saharti Samre*, *Boset* and *Gursum*. Farmer selection will be in consultation with the watershed committee members taking into account biophysical factors like access to water as well as socio economic factors that include household land sizes for tree promotion. Seven fruit and three multipurpose tree species are identified based on; earlier performance history, the result of the CAP process and follow up consultation with the watershed committee members. Based on this, the fruit tree species selected are; Mango *(Mangifera indica)* Apples (*Malus domestica),* Guava *(Psidium guajava),* Avocado *(Persea americana)),* Orange (*Cirus sinensis),* Sapote *(Casimiroa edulis,) and Papaya* (*Carica papaya) and multipurpose tree species;* Neem *(Azadiracta indica),* Ziziphus *(Ziziphus sps), Moringa (Moringa oliefera),* Shiferaw *(Moringa stenopetela*), *Melia /Chinaberry (Melia azendrach) and Apple ring Acacia (Faidherbia albida).*

In the event that local supplies are not adequate fruit tree seedlings will be bought from outside nurseries and the multipurpose tree seedlings could be collected from the Woreda office of agriculture and/or private nursery sites. As the performance of the species and options will vary from farmer to farmer the data collection will be done at the individual farm level. A summary of the design is presented in Table 1 below.

Table 1: summary of the study design

Question or objectives	How do fruit and other multipurpose tree seedlings survival and growth vary across practices and contexts?
Hypothesis	Planting seedlings using continuous application of mulching with watering improves tree survival and growth
Options to compare	Application of Mulching and Watering : Application of mulching and farmer method
Contexts to compare	Soil type: sandy loam, loam and clay soils Fruit tree species. (see section 3.2.2 for detail) Location: farm or homestead (based on the availability of land and location of water source).
Study unit	Tree
Responses to measure	Seedling survival: count of survived seedlings Seedling growth: height and collar diameter
Roles of farmers	Farmers - Planting the allocated seedlings according to the agreed protocol - Keeping record and experience sharing (If there is no person in the household who cannot do this, the program will arrange to support the data recording). - Keeping from livestock or other damage - Farmer perception of costs and benefits (labor etc.)
Roles of others	**ICRAF** - Lead in the preparation of the planned comparison protocol and roll out (Niguse Hagazi) - Provide technical backstopping in the delivery of the training of extension workers and farmers; - Lead the preparation of the data capture format, analysis and reporting **Implementation partners (WVE APs, REST & EOC-DICAC)** - Contribute to the design of the planned comparisons - Lead the organization and delivery of training of extension workers and farmers - Lead the identification of farmers who would like to fruit tree planting - Lead the identification of farmers who would like to be involved in the planned comparison - Organize exchange visits - Participate in the evaluation of the options; **Government development agents** in the respective *Kebeles* - In collaboration with the IPs identify farmers who would like to engage in planned comparison. - Participate in training of farmers; - Provide technical support whenever required; - Follow up the implementation of option and PC; data recording - Collect the filled data collection sheet and submit to IPS. Supervise the implementation and data recording.
Study design/experimental	See detail in the following section
Suggested timing (start & end)	Three years (2016, 2017 & 2018)
Data collection sheet	See annex 1, 2 and 3.

3. Approach

3.1 Treatment application and procedure

Mulching and Watering

Mulching will involve covering the area surrounding the tree and keeping that intact for the whole study period. Locally and readily available mulching materials including grass, crop residues or leftover hays, will be used by participating farmers. The size of the mulching around the planting pit will depend on the size of planting pit as it depends on the size of polyethylene tube and type of trees species. For example, if the size of the pit for fruit trees with a bigger polyethylene tube is 50cm * 50cm, at least about 2500 cm^2 area should be covered with mulch for the whole study period. This is believed to reduce evaporation, and stay the planting pit moist as well as decrease the amount of water needed for watering the trees. The treatments to be compared are presented below. Each participating farmer will apply all the proposed treatments but tree species selection will depend on his/her preference. However, field workers will also make sure those farmers to plant two or more tree species to encourage diversity of tree species per participating farmers. The frequency and amount of water applied will be recorded by the farmer while the application of watering will be directly pouring on the ground around the pit both for pits with mulching and without mulching. Usually, watering will be done either early in the morning or late afternoon every three and five days for fruit and other multipurpose tree species respectively.

Treatments for fruit trees
1. Mulching + 5 liter per 5 days
2. Mulching + 5 liter per 10 days
3. Without mulching + 5 liter per 5 days

Treatments for non-fruit trees
1. Mulching + 3 liter per 5 days
2. Mulching + 3 liter per 10 days
3. Without mulching + 3 liter per 5 days

Mulching frequency: Throughout the project period
Farmers involved in Tree Planting PC: 240 (60 per district)

1.2 Study design

The planned comparison will be carried out in all the DRYDEV programme woredas: *Tsaeda Emba* (in three sub-watersheds, *Seharti Samre* (in one sub watershed), *Boset* (in two sub-watersheds), and Gursum (in 3 sub-watersheds) woredas. The number of fruit and multipurpose tree seedlings that will be planted by participants will be determined by availability of seedlings. Seven fruit tree species (and three multipurpose tree species) were selected from the initial list proposed during the CAP process and others were additions by field staff. However, this will be finalized with farmers who will decide on the species and the specific sites they will be planted. Provision of seedlings will be according to the programme input modalities[1]. Therefore, based on what is planned in the DIP, the number of seedlings to be planted by each farmer will be between 4 to 6 (2 to 3 for each treatment). The detailed distribution of seedlings, treatment, sub-watershed and *woreda* is indicated in Table 2 and 3. This planned comparison will be conducted at least in 240 farmers (60 farmers per each Woreda).

3.3. Planting arrangements and spacing of tree seedlings

The exact arrangement of the design will vary based on the size and orientation of the land of each participating farmer. Treatments will be randomly assigned as per the aspect and orientation of the land to ensure they are in the same biophysical local context. The arrangement of the treatments can either in a scattered way around the homestead or line based within the boundaries of the farm around the homestead, or in nearby farm lands. Farmers will be used as replication.

To promote diversity of species within the DryDev programme, participating farmers will be encouraged to plant both fruit and other multipurpose tree species either in a combined or in separate plots around their homestead or nearby farmlands. Fruit seedlings including *Avocado,*

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[1]Ethiopia PIP section 4.8
Inputs such as improved crop seeds/seedlings and tree seedlings and other new technologies that are required in small amount and for demonstration purposes will be provided to target farmers for free, given that the cost will be insignificant and recollection might not be cost-effective for the programme

Mango, Orange and *Guava* will be planted with a spacing of 6 meter and then other multipurpose trees can be planted within or between two seedlings of fruit trees to save space. However, when the multipurpose trees are going to plant in their own plot, a 2 meter spacing will be employed.

Table 2. Name of sub-watersheds, minimum number of participating farmers per Woreda and possible number of seedlings to be planted by participating farmers for the planned comparison

No.	Woreda	Sub – watershed	Minimum No. of participants per Woreda	No. of seedlings per participant		Total seedlings per participant
				Minimum fruit tree seedlings per participant	Minimum multipurpose tree seedlings per participant	
1	Boset	Osole	30			
		Doni	30			
		Sub-total	60	3 (3 per treatment)	3 (3 per treatment)	18
2	Gursum	Ijagobensa	20			
		Dolis	20			
		Oda Oromiya	20			
		Sub-total	60	3 (3 per treatment)	3(3 per treatment)	18
3	Tseda Emba	*Takot*	20			
		Dimello	20			
		May-Hantso	20			
		Sub-total	60	3 (3 per treatment)	3 (3 per treatment)	18
4	Saharti Samre	Dekera	60			
		Sub-total	**60**	**3 (3 per treatment)**	**3 (3 per treatment)**	**18**
		Grand total	**240**	**TBF**	**TBF**	**TBF***

N.B. Tree seedlings preference both for fruit and multiple purpose trees per each Woreda, sub-watershed and participating farmers will depend based on the context of each site, availability of seedlings and size of planting plots.

* TBF= To be filled after Woreda training

3.4. Roll-out activities

In order to smoothly implement the PC the following preparatory activities have done and still continuing the discussion and updating:

1. Discussions with implementation partners to agree on sites, species combination, study design, time for the different activities and responsibilities.

2. Training of DAs and *woreda* experts (ToT) on various tree planting practices for diverse contexts including the implementation of PC. This will be carried out by IPs and ICRAF.

3. Discuss and agree with implementation partners' criteria and process of farmer selection

4. Selection PC of participants by DAs and *woreda* experts

5. Training of PC participating farmers on the design and record keeping by DAs and *woreda* experts

6. Follow up on land and layout preparation with participating farmers.

7. Continued monitoring, data collection and experience sharing

3.5. Monitoring and data collection

During the farmer selection process, it should be made clear regarding getting farmers' willingness to participate in the PC and clarification of their responsibilities and benefits. In addition to implementing and managing the PCs as will be indicated in the farmers' training, farmers will be asked to keep record on the tree planting practices using a simple data collection sheet. Moreover, framers will be encouraged and advised to protect planted new seedling from fire and animal damage. Thus, during the training a robust ways to protect the new seedlings from damaged should be given and monitored. The data collection sheet is included under Annex 1, 2 and 3. The type of data to be collected, timing and responsibility is indicated in Table 3 and 4. Table 5 is the summary of the associated costs of PC in addition to what the programme is already covering.

Enumerators will be hired on short term contact basis to undertake farmer profiling mainly to understand the contextual variables of the farming system and farmer household characteristics and to collect the first round of tree planting survival and performance. For example, collecting data related to growth performance of planted seedlings under the different treatments mainly to monitor the success of the PCs. The electronic data collection forms for both the farmer profiling and the tree planting measurements are available on the ona ODK website for comment by IPs. Farmers perception on the PCs will be captured through reflection meetings/workshops to understand farmers perspectives on the PCs, expectation, performance, criteria and other similar information.

Farmer profiling and growth performance of planted seedlings will be collected using the Open Data Kit (ODK) reliable mobile data collection system by the enumerators while farmers also record their data and observation in the provided data collection sheet. Farmers will fill-in the data collection sheet and also checked by the IPs and /or development agents.

Table 3 Data to be collected, method of collection, time and responsibility

Type of data	Method of collection	Timing	Responsibility
Survival rate	Record the dying, dead and survived trees	After 1, 3, 6 and 12 months.	Farmers
Water amount used	Measure the amount of water used for each plant	Recorded after each watering	Farmers
Tree height and collar diameter	Measure each plant	monthly	IPs and ICRAF
Farmer perception	Perception survey	At after 12 months	IPS and ICRAF

Table 4. Farmer and farm profile, the following data has to be collected as part of baseline and also whenever required.

No	Type of data	Responsibility
1.	GPS location of the farm	Community facilitator
2.	Type and number of options compared by the household	IPs field staff and Extension workers
3.	Soil characteristics	Community facilitator
4.	Pest and diseases	IPs field staff and Extension workers

5.	Rainfall condition (seasonal)	Farmers and extension workers

3.6. Data sharing and management

Data collected by farmers will be checked both by WVE and ICRAF at a certain interval while the IPs in collaboration with the local development agents conduct a routine follow-up, like providing data sheets when required and other related technical support and advise to the farmers. All participating organizations including WVE, REST, EOC, and ICRAF have equal share and responsibility to the data and thus have an open access to the data collected and results obtained. When the enumerator use the ODK to collect and share the data, every organization and/or person from the aforementioned organizations who have the password can access and made some quality control including editorial issues (when necessary) by log in to the "*ona.io*" system.

Note:

- Community facilitators will be hired for six month with monthly pay of 240 and 50 USD transport allowance. This fund is expected from ICRAF as additional money. WVE will communicate this money arrival to concerned IPs and APs as soon as WVE collect from ICRAF.
- 2017 budget will be negotiated while preparing 2017 DIP

References

Ethiopian Forestry Action Program (EFAP). 1994. *The Challenges for Development*. Final Report, Vol II, Ministry of Natural Resources Development and Environmental Protection, Addis Ababa, Ethiopia.

FAO, 2010. Global Forest Resources Assessment, Country report for Ethiopia. The Forest Resources Assessment programme. FRA 2010/065, Rome, 2010

Annex 1. Farmer data recording sheet

Woreda: ……………………………………………………………………………

Sub-watershed:………………………………………………………………….

Species name: ………………………………………………………………….

Name of farmer:……………………………………………………………….

Trees seedlings	Treatments	Watering Date	Amount of water (ml)	Tree number					
				1	2	3	4	5	6
Fruit trees	1								
	2								
	3								
Multipurpose tree 1	1								
	2								
	3								
Multipurpose tree 2	1								
	2								
	3								

Annex 2. Farmer data recording sheet

Woreda: …………………………………………………………………………

Sub-watershed…………………………………………………………………..

Name of farmer……………………………………………………………………

Tree number	Species	Treatment	Survival status			
			Survived -1/Dying -2/Dead-3			
			End Month 1	End Month 3	End Month 6	End Month 12
1						
2						
3						
4						
5						
6						

Annex 3. Scientific datasheet

Woreda: …………………………………………………………………………

Sub-watershed:……………………………………………………………………

Name of farmer……………………………………………………………………..

Soil type and texture:……………………………………………………………

Average slop of the planting plot: ………………………………………….

Farmer	Tree number	Species	Treatment	Tree height(cm)				Collar Diameter(mm)			
				Assessment end of month				Assessment end of month			
1	1			1	3	6	12	1	3	6	12
1	2										
1	3										
1	4										
1	5										
1	6										
2	1										
2	2										
2	3										
2	4										
2	5										
2	6										
3	1										
3	2										
3	3										
3	4										
3	5										
3	6										