



Norway's International  
Climate and Forest Initiative  
(NICFI)

# Technical seed centre procedures and use of equipment at CEE-FRC/TSC and the four regional tree seed centres in Ethiopia

May and October/November 2018

TECHNICAL



# **Technical seed centre procedures and use of equipment at CEE-FRC/TSC and the four regional tree seed centres in Ethiopia**

## **Consultancy Report**

**May and October/November 2018**



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## **Introduction**

This report presents the findings and recommendations of the consultant Poul Elgaard who visited Ethiopia the 8<sup>th</sup> - 26<sup>th</sup> of May and 23<sup>rd</sup> of October - 10<sup>th</sup> of November 2018 and assessed facilities at TSTC and four RSCs in accordance with the ToR of the consultancy.

The consultants visited the TSC under FRC in Addis Ababa and the four regional tree seed centres (RTSC) in Bahir; Dar, Mekele, Sebeta and Awassa, to assess the current situation regarding seed documentation related to tasks of the centers. After evaluating the present situation on seed documentation, recommendations were made for upgrading the seed documentation by presenting a flow chart and examples for different registration forms from planning of seed collection, seed processing, seed testing, seed storage to seed delivering note.

The consultants would like to express their sincere thanks to PATSPO and in particular Sime Mekdes, Samuel Hailu and Bekele Achame for all the operational and logistical support received during their stay in Ethiopia.

The findings and recommendations from the visits to the centres are presented on the following pages and in the appendices. *See Annex 1. ToR*

**May 14<sup>th</sup> – 17<sup>th</sup>. CEEFRC/TSC, Addis Ababa.** *See Annex 2.*

Meeting with the Director of CEEFRC/TSC and head of seed procurement explaining the objective of the consultancy and discussing the program for the following days.

An example of a flow chart of procedures for registration and documentation was presented. *See annex 4*

It was decided to meet with each section separately, starting with Seed collection/Seed processing, Seed testing, Seed storage and Customer Office.

**Planning of seed collection**

Each year representatives of CEEFRC/TSC prepare an annual plan based on assigned budget and demand. It covers a period between June and July the following year.

**Seed Collection**

At the present time there are three people responsible for the seed collection with experience in tree climbing. However, it was not clear, how much seed they actual are collecting on an annual basis as local farmer groups collect the majority of the seed.

For each specific collection a Seed Collection Advice Note and labels are handed over by the Seed Officer to the Collection Team Leader. A form called Seed Collection Monthly Report is made where it mentions the Name of Species, Collection Site, Collection Time, amount of Tree Seed collected, both mentioned as fruit, impure- and pure seed delivered to the Seed Centre.

**Processing**

Most of the seeds that are received have already been through a process of pre-cleaning or received as pure seed.

A Seed Extraction Record is filled in, mentioning the species, date of receiving, kg of fruit and finally kg of pure seed.

When the seed lot has been approved by the Seed Testing Lab for purity, and moisture content, a Tree Seed Delivery Form is filled in and the seed is delivered to the Seed Store

**Seed Testing**

Seed Moisture Book, Seed Purity Book and Seed Germination Book

All necessary information is available, but there is no unique number that links the different tests results to the specific seed lot. Each book only uses continuous numbers that don't match/refer to the same seed lot when it is tested over several times.

### **Seed Storage**

After the seeds have arrived at the Seed Store from the Seed Processing, a Tree Seed Stock Balance Control Sheet is filed in with the species' name, Container code No., place of collection, date of collection, Seed Zone, received date at store, received amount in kg., date of germination test carried out, Germination % and Purity %.

Moisture content is not mentioned, which is an error, as it is very important to have this data, for maintaining quality during storage. Furthermore, number of seeds per kg., viable seed/kg. and pre-sowing treatment is mentioned.

When the seed lot has finally been tested, the Seed Storage receives a Tree Seed Quality Data Form (Yellow) with the latest results from the Seed Testing Lab.

### **Seed Distribution Office**

The day when the Seed Storage receives the seeds from the seed processing and the final amount of kg has been determined, a copy of the Tree Seed Delivery Form is handed over to the Seed Distribution Office. Furthermore, they receive a Tree Seed Quality Data Form (Green) with the latest results from the Seed Testing Lab.

For issuing an order for the customer the following documents are filled out:

- Tree Seed Order Form mentioning species name, number of kg and price.
- Seed Distribution Order Form mainly describing the purpose for use of the seed example Agroforestry, Forestry, Fuelwood etc. and type of Customer /Organization.
- Invoice, mentioning customer name, species, number of kg and price etc. However, documentation of the origin of the seed lot is lacking. The person in charge of the seed store is using the Invoice as a packing list and no actual delivery form is issued.
- Lastly a form, a permit for the customer, is made to present at the gate, before being able to leave the compound, signed by three different people.

### **Labels**

There are two different types of Labels, one for internal and one for customer use.

The label for internal use is used from date of collection to seed processing. The most relevant information is mentioned on the label however, a Seed Lot Number is not being used.

The Customer label is used in the seed store to identify the different seed lots in the seed store and at the same time used for identifying the seed lots handed over to the customers. The person in charge of the seed store is filling out the labels for customer-use with information



identifying the seed lot and with the latest seed quality data including recommendation on pre-sowing treatment.

### **Comments**

The overall seed documentation at the CEEFRC/TSC is in place, however, it is recommended to make a more transparent and efficient system, that secures proper documentation of the seed origin and the correct access to the latest seed quality data. For this purpose, it is strongly recommended to introduce a Seed lot number system, a system that has previously been used, but for reasons unknown, haven't been used within the past years.

### **October 20<sup>th</sup> - 24<sup>th</sup>, Amara RTS, Bahir Dar.**

Meeting with the Director of Amhara RSC and head of seed procurement, explaining the objective of the consultancy and discussing the program for the following days. An example of a flow chart of procedures for registration and documentation was presented. *See annex 4.*

After having a brief meeting with the different heads of staff for each section it became evident that in order to being able to understand the present flow chart at the facility it was necessary to visit one of eight regional branches, that actually were doing the seed collection for the Amhara RSC. Therefore, a trip to Debretabor, South Gunda was arranged for the following day.

In each of the eight Regional Branches there is a person in charge of coordinating the seed collection, taking contact to different farmer groups that are responsible for the seed collection and also doing most of the seed processing.

This work is done in close coordination, with the Seed procurement Officer in the RSC in Bahir Dar, who is responsible for receiving and transportation of the seed to the RSC.

### **Planning of Seed Collection**

Each year representatives of Amhara RSC prepares an annual seed collection plan based on assigned budget and demand. It covers a period between June and July the following year.

### **Seed collection**

As mentioned earlier, the majority of seed collection is carried out by different farmer groups coordinated out from eight different Regional branches under the supervision of RSC.

### **Processing**

As the majority of the seed is processed and dried by the farmer groups, the seeds that arrives at the RSC needs only minor drying and cleaning before storage.

No seed processing forms was presented.

The sacks/ seed lots that arrived form the Regional Branches were not properly labelled and mostly identified by the physical look of the seed.

**Seed Testing**

When the seeds arrive from the Regional Branches a sample is taken out for analysing. The forms for the seed purity, moisture content and germination were not transparent and fully documented.

**Seed Storage**

The sacks and barrels of seeds had no proper labels on, and there was no specific identification system. Again, the seed lots were mostly identified by the physical look of the seed.

**Seed Distribution Office**

All customer relation is done through the Amhara Forest Enterprise Head Office in Bahir Dar, where to the customers has to apply in writing, which species they want to buy. Then this application has to be approved by the Head of the Amhara Forest Enterprise, before the actual process of buying the seeds can start.

The person in charge of the Seed store is using the Invoice as a packing list and filling out the Customer Label with data on species, origin and data on seed quality.

No actual seed-delivering note is prepared.

**Labels**

Internally, Labels was not systematically in use, therefore there is a considerably risk that mistakes concerning species and origin can occur.

**Comments**

The overall seed documentation at the Amhara RSC is not in place, and there is a considerable risk, that seeds from different seed sources can be mistaken for one and another.

It is recommended that a more transparent system is set into place that secure proper documentation by introducing labels with the necessary information on seed origin and correct documentation and access to the latest seed quality data.

## **Consultancy October 23<sup>rd</sup> – November 9<sup>th</sup>, 2018, See program annex 3**

### **Octubre 26. Dima RSC, Sebeta (OFWE)**

Meeting with the Director of and Head of Seed Oromia RSC together with leading staff members, explaining the objective of the consultancy and discussing the program for the day.

An example of a flow chart of procedures for registration and documentation was presented. See Annex 4.

#### **Planning of seed collection**

In June each year, the senior staff at RSC, Sebeta prepare a seed collection plan with attached budget for coming seed collection season, which runs from July 1<sup>st</sup> to June 30<sup>th</sup> the following year. The seed collection plan is based on present demand and what was actually sold the year before. After the plan has finally been approved on a higher level in the OFWE (Oromia Forest and Wildlife Enterprise) the plan can be implemented.

#### **Pre- collection**

First step, is to prepare a contract with different farmer groups that will do the actual seed collection, containing the following elements:

- Objective of the agreement
- Name of tree species to collect (often several species are collected by the same farmer group.
- Location of seed collection, locality, district and zone.
- Description of seed, in fruit, pure seed and quality etc.
- Organization of the farmer group with a list of names of the members of the tree seed collector group.
- How to maintain the seed quality of the collected seed.
- Terms of delivery, when and where to receive/deliver the seed
- Price and terms of payment.
- Responsibility and obligations
  - o Responsibility and obligations of the tree seed collector
  - o Responsibility and obligations of RSC
  - o Conflict management
- Duration of agreement
- The contract is signed by RSC and the representative seed collectors, plus three other departments of the organization

#### **Seed collection label (Yellow label)**

After finishing the seed collection, the Forester visit the farmer groups to inspect the quality of the seed that has been collected and hand over labels.

The label has the essential information to identify the seed lot such as scientific name, local name, provenance and seed zone, gross weight, altitude, collection period and date of receiving etc. However, on the present label, it is not mentioned any Seed source- or Seed lot number.

### **Seed processing**

As the farmer groups process the majority of seed, the seed arrives at the RSC as clean or semi clean seed. The person in charge of the seed processing fills out a registration form and issues a receipt when the seed arrives at the seed processing area. Next a sample is taken to the Seed-testing lab for further analyses. When the seed is ready for storage a form is filed out issued to the Seed Store

### **Laboratory seed test.**

At present time the lab at the RSC use a form called Tree Seed Laboratory Test Order divided into 3 sections, covering moisture content, purity and germination results.

The standard tests and calculations are purity, moisture content, seed per kg. 1000 seed weight, germination percentage and live seed per kg.

When the seed lot has been approved by the Seed Laboratory, the seed lot is transferred from the seed processing facility to the seed storage.

### **Seed storage and seed distribution label (Green label)**

The person in charge of the seed storage receives the seed lot and a standard store requisition form is filled out, and an inventory is made in the form Seed Stock and Disposals.

The green label has similar information as mentioned on the Yellow label, but beside this the Green label has data on moisture % content, purity %, germination %, number of seeds per kg and recommended pre- sowing treatment.

### **Invoice/delivery note**

Normal standard invoices are used, only mentioning species, unit/Kg. quantity, unit price and total price. In other words, there is no reference or connection on the invoice, to the exact seed lot, only name of species.

### **Cost price.**

If was mentioned by the Head of the RSC, that an exact cost price is calculated for each seed lot, including the cost for seed collection, transport, processing etc. However, no example was presented.

### **Comments**

The contract seems to be precise and with adequate and with relevant information, though only the headlines have been translated into English from the local language.

**Seed collection label (Yellow label)**

The yellow labels have sufficient information, as long as they are correctly filled out. It would be beneficial if they were reduced in size and could be easier managed by introducing Seed Source and Seed Lot Number onto the labels.

**Seed processing**

As most of the seed is processed by the farmer groups, there are only little activity at the seed processing area at the RSC.

**Laboratory and seed testing.**

The present procedures and performance of the seed testing in the lab can be improved considerably.

- Identifying and labelling the germination boxes and petri-dishes is insufficient.
- There is an urgent need for training in understanding and carrying out seed-analysis
- New forms of documentation for seed-testing results has to be introduced so there is more transparency in the test results.
- There is need of training in use of the different equipment in the lab.
- Need of introducing a seed lot number.

**Seed storage and seed distribution label (Green label)**

The label has the essential information to identify the seed lot such as scientific name, local name, provenance and seed zone, gross weight, altitude, collection period and date of receiving etc.

On the present label there is no mentioning of any Seed Source or Seed Lot Number.

Information on seed quality should be removed from the present label and instead written on a delivery note, where there is more space to present the data on quality and recommendation on pre- sowing treatment

Furthermore, there should be a mentioning of Seed Order or Dispatch Number on the label.

**Cost price**

To have a cost price it is essential to have a commercially driven seed center. This includes things such as making a budget for coming seed collection to estimating to what amount of money you can invest in the seed collection to fix the sales price.

### **Invoice/delivery note**

It is recommended that the RSC make their own layout of an invoice where there is room for specific information besides information on customer address and order number such as: Seed Lot Number, Species, Provenance, Seed Source Number, Unit/Kg, Kg/Price and total amount.

Delivery note should aside from the standard information on the customer, as on the invoice, also include further information as mentioned below:

- Species
- Provenance
- Seed source number
- Seed crop year
- Seed lot number
- Latest test date
- Moisture content
- Purity %
- 1000-gram seed weight
- Number of seeds per kg
- Germination after certain number of days
- Total germination %
- Live seed pr. kg.
- Recommended pre-sowing treatment

To have sufficient space on a A4 sheet of paper it is recommendable to make the layout of the label in landscape form.

The overall impression of the procedures and documentation at the Dima RSC. Sebeta. OFWE is that the overall documentation procedures are in place, however, for the different activities, there is a lack of logical sequence in the flow chart of the documentation and there is a risk of losing or confusing data between the different seed lot.

### **October 29<sup>th</sup> – 30<sup>th</sup> RSC SNNPR, Hawassa.**

*(Southern Nations and Nationalities Peoples Republic.)*

Meeting with leading staff members to explain the objective of our visit and introducing the flow chart for the procedures for seed registration and documentation. *See annex 4.*

The RSC/ SNNPR Hawassa is a regional government institution and is therefore not necessarily managed as an enterprise.

This means that the seed collected is distributed free of charge to eight or nine different regions which thereafter distributes the seed to smaller zones within the region.

However, these differences or different objectives between a private enterprise and a governmental-driven facility does not change the need of having a complete operational system for seed documentation.

### **Annual budget and activity plan**

In June each year the senior staff at RSC prepare a seed collection plan with a budget for the coming season, which runs from July 1<sup>st</sup> to June 30<sup>th</sup> the following year. The demand is based on questionnaires that the forest representative brings with him when he visit the Zonal offices and nurseries and evaluate and follow-up on the present years delivery of seed.

This information from the zones is then included in next year's budget and activity plan and presented for approval at a higher level in the governmental system.

In 2018/2019 the RSC requested in the proposed budget was of BIR 6.000,000 but the RCS was only granted BIR 2.000,000

No actual seed collection plan is made, rather a list of priority species is made. After having had approved their annual budget and activity plan, staff from RSC take contact to different Cooperatives/ Farmer groups which then collect the seed of a specific species in their zone.

However, from the RTC, it is more a matter of buying in seed from a supplier that is able to offer the seed to the most favourable price than actually a more long term cooperation between the two parts.

### **Seed Lot register**

A seed lot register is available, but did not seem updated.

### **Support and supervision report.**

The main purpose of this report is for staff from the RSC to supervise the different zones and sub-zones (Vordeda) on which species and provenances to use and recommendation on seed handling at a nursery level.

### **Questionnaire to evaluate germination condition of the distribution of seed**

Evaluating and feedback from the recipient of the seed.

### **Quality and demand control**

It was not quite clear the purpose of this document.

### **Registration and receive format**

Seed source- and Seed lot number

This form was not updated and furthermore is in need of more space for description of location.

#### **Collection and extraction guidelines.**

Certainly adequate and useful.

#### **Seed extraction/ processing form**

Mentioning extraction method, number of kg. and volume of fruit and amount of pure seed.

#### **Balance Sheet for seed store**

This form was not complete – but is under preparation.

#### **Laboratory labels for seed testing**

Mentioning species, sowing date, number of seed and type of treatment.

The labels have sufficient information for Lab use if a Seed Lot Number is added on the label.

#### **Delivery note**

Normal standard invoices are used. They only mention species, unit/kg, quantity, unit price and total price. In other words, there is no reference or connection on the invoice to the exact seed lot, only name of species.

#### **Labels**

Seed lot label for internal use (Blue) and a label for customer use (Yellow). New labels will be printed with updated information as recommended.

#### **Comments.**

The overall impression of the procedures and documentation at the RSC Hawassa, SNNP is that there are not adequate seed documentation on hand, and there is a lack of logical sequence, that is systematic order in the flow chart in the existing documents and a considerable risk of losing or confusing data between the different seed lots.

### **November 5<sup>th</sup> – 7<sup>th</sup> RSC Mekele *See program. Annex 6***

On Monday 5<sup>th</sup> during the morning program, the representative of Minister of Agriculture from the Regional government in Tigray, officially handed over the equipment donated by the Japanese government donated in 2015 to a representative of the RSC. Each item from a list was checked and approved by both parts.

In the afternoon there was held an official opening ceremony for the RSC for all Staff members, and 4 representatives from PATSPO. Afterwards the installation of the equipment should start.

#### **Seed testing laboratory**

Furniture for the Laboratory, donated by PATSPO in June 2018 has been installed and has been done satisfactory, however, connecting the water tabs and drainage from the sinks (that is,



plumbing work) was still not in place as well of missing plugs/outlets for electricity. The RSC will the following week from our stay, forward a price offer, covering the expenses to solve this problem.

The laboratory is operational in carrying out basic germination tests, however a basic training and understanding in seed technology and testing is necessary before it can be functional.

Equipment purchased by PATSPO, but not yet delivered are: One Grading mill, one Growth cabinet and other minor equipment for seed testing purpose that are expected to arrive early 2019. When installed, the lab facilities will be fully equipped and a more through training of the staff can begin.

### **Seed processing**

Seed cleaning equipment from BCC in Sweden was unpacked, unfortunately, a section of the equipment was missing, and it was not possible to assemble the machine. RSC Staff will contact the regional Agriculture burro and ask if the section of the equipment might be misplaced.

### **Seed Storage and packing**

The two cold stores are in place, but the cooling system and installations are not complete. It has been arranged by PATSPO that a company from Addis Ababa, soon will arrive at the RSC and carry out the final installation.

It is recommended that PATSPO furthermore finance installation of shelves and the purchase of plastic barrels for seed storage. The RSC was asked to forward a price offer, covering the two pieces of equipment and present it for PATSPO/ Addis.

Equipment for dispatch of seed for the customers is in place with packing materials, balance ect.

It is strongly recommended that the RSC soon make a layout for seed labels, one for seed collection and internal use. Another for customer use. Example was discussed and a soft copy has been sent to Head of the seed center.

### **Main recommendations.**

As the Seed Center is in the starting-up phase, there is a considerable need of capacity building from seed source description, seed- collection, processing, testing and storage, and management of the seed center in general. For all staff members the Flow Chart was presented. *See annex 4.*

The staff showed great will to learn, and with the facilities in place and a demand for seed, there is good potential for a well-functioning seed center.

### **Over all comments of Consultancy May and October/November 2018**

The overall impression of the procedures and documentation at the CEEFRC/TSC Addis Ababa and the four RTC is that there is documentation on hand, but on different levels. This means, there is a lack of logical and systematic sequence of work in the flow chart of the documentation,

and therefor there is a risk of losing or confusing data. In other words, adequate information concerning provenances and seed quality data is not necessary passed on in a complete form to the end consumer.

Therefore, it would improve the documentation considerably if a unique seed lot number was introduced to FRC Addis Ababa and the four RSC, and included on labels from the beginning at the day of collection throughout the flow chart of documentation until the seed is handed to the costumer.

*An example of creating a seed lot number (Seed Lot No.) could be as followed:*

1. July 2010 (Ethiopian calendar). First 3 numbers, refers to numbers of seed lots received. Maximum 999 seed lots. Two last numbers refer to seed collection year/season. A seed collection year/season runs from July 1<sup>st</sup> - 30<sup>th</sup> June the following year.

Example Seed Lot No. 00110 and the following season/year L. No. 00111. The year always refers to the first half, of the seed collection season.

Beside the Seed Lot No. it is recommended to introduce a Seed Source No. as soon as the seed source has been described. This will give more accurate information on the exact origin of the seed lot and reduce any mistakes of the origin of seeds on the long term.

Using adequate forms and labels and introducing Seed source- and Seed lot numbers will reduce the risk of errors. Introducing and getting accustomed to these procedures are essential before it is possible to introduce an electronic version for seed documentation.

**Annex 1.**

**Provision of Adequate Tree Seed Portfolios (PATSPO) Ethiopia, 2017-2020**

**TERMS OF REFERENCE**

**Consultancy on technical seed centre procedures and use of equipment at CEEFRC/TSC and the four RTSCs**

**(May & October – November 2018)**

**1. BACKGROUND**

Provision of Adequate Tree Seed Portfolios (PATSPO) to enhance productivity and resilience of Forest Landscape Restoration in Ethiopia is a project supported by a grant from the Government of Norway through the Norwegian International Climate and Forest Initiative (NICFI). The project is implemented by the World Agroforestry Centre (the International Centre for Research in Agroforestry - ICRAF) in close collaboration with the Ethiopia Environment and Forest Research Institute (EEFRI) under the Ministry of Environment, Forest and Climate Change (MEFCC), and other institutions working in the tree seed sector in Ethiopia. PATSPO is a four-year project 2017 – 2020 based on an agreement between the Royal Norwegian Embassy in Ethiopia (RNE) and ICRAF.

PATSPO is designed to support Ethiopia in its ambitious programmes of forest landscape restoration with a commitment to restore more than 20 million ha of degraded forest landscapes within the next 20 years.

A major challenge of forest landscape restoration work is that it generally requires the use of planting material in large quantities of a broad spectrum of genetically diverse, healthy and productive tree species.

PATSPO addresses this major challenge by providing a multiple tree species programme able to provide:

1. organizational setup of the tree seed sector, including stakeholder identification and roles and responsibilities, based on a sector analysis;
2. species specific knowledge for most priority tree species;

3. a built up of the tree genetic resources for the future, comprising exploration, mobilisation, conservation, establishment, management and improvement; and
4. capacity to monitor and deliver quality seed and seedlings of multiple species required for large scale restoration.

The capacity-building component of PATSPO includes support to physical upgrading the Tree Seed Centre under CEEFRC and the four Regional Tree Seed Centres (RSCs), as well as 'on the job training' on all technical procedures and use of equipment related to tasks and functions of tree seed centres. These procedures include seed collection, seed processing, seed testing (seed laboratory), seed store management, seed packing/dispatch and seed documentation from collection in the field to dispatch of seed from the seed centres.

This consultancy supports delivery in output area number four mentioned above.

Further background information is available in the Project Document and references therein which should be consulted.

## 2. OBJECTIVE

The objective of the consultancy is:

Technical procedures and tasks and functions, from collection to dispatch of seed, at the TSC/CEEFRC and one or two of the RTSCs described and upgraded through 'on the job training' of the staff working at the tree seed centres.

## 3. METHOD OF WORK

The consultant and a PATSPO resource person (regional tree seed centre coordinator/seed procurement officer) will work as a team following the TOR and guidance from the PMT. The consultants will work at the PATSPO Office, the TSC/CEEFRC and likely at the RTSC in Bahir Dar or Sebeta. The consultancy team will work closely with the management and the technical staff at the tree seed centres.

A briefing meeting will be held with the PATSPO staff in the beginning of the consultancy, where the TOR will be further discussed and the itinerary for the consultancy finally decided upon. A debriefing meeting will be arranged at the end for the consultancy to present their preliminary findings and conclusions for comments by the PATSPO staff.

## 4. OUTPUTS

The consultants will deliver the following outputs:

A consultancy report including the following:

- a) a short and concise description of the procedures and specific tasks in each of the technical functions of a tree seed centre: seed collection, processing/cleaning, testing, seed store management, seed packing/dispatch and seed documentation from collection in the field to dispatch of seed from the seed centres;
- b) an assessment of the existing data management system for all procedures/tasks undertaken at the centres leading to recommendations and specific measures to be taken for upgrading the data handling and safety, - including possible use of electronic data handling/management;
- c) a prioritized and specified list of data handling equipment and -programmes recommended for procurement and use at the tree seed centres.

## 5. ACTIVITIES

The activities of the consultants will include, but not necessary be limited to:

- a) describe the procedures and specific tasks in each of the technical functions of a tree seed centre;
- b) assess the existing technical procedures at the seed centres and provide 'on the job training' to improve the procedures as required;
- c) assess the existing data handling methodologies and – equipment and make recommendations for improvement as required, - including possible use of electronic equipment;
- d) prepare a list of equipment needed to ensure safe and efficient data handling at the seed centres;

## 6. STAFFING AND QUALITICATIONS

The team will consist of an expert on all technical – and managerial aspect of tree seed centre operation and a PATSPO staff member (regional seed centre coordinator or seed procurement officer). The combined team includes the following expertise:

- Applied tree seed centre and seed bank management
- Seed technology and seed physiology
- Seed processing and handling
- Tree seed laboratory operations and management

The consultant from UCPH will be Mr. Poul Elgaard, who has a forestry background and substantial experience and knowledge on the particular topic of operating and maintaining tree seed producing facilities in Central America as well as in Denmark, including seed research laboratories.

The resource person from PATSPO to be identified.

#### 7. TIMING AND DURATION OF THE ASSIGNMENT

The duration and timing of the consultancy will be of one month 1 - 31 May 2018. Approximately three weeks will be spent in Ethiopia (5 - 25 May) and 10 days in Denmark for preparation and reporting.

#### 8. REPORTING

The consultant will prepare a consolidated report with the contents as mentioned under point 4.

The consultant will present and discuss the contents of the report with the PATSPO PMT before departure from Ethiopia, and a draft report submitted to PATSPO 10 days later. PATSPO will provide comments to the report one week after receiving the draft and the consultant will submit the final report one week later.

A note on general requirements (including quality) and guidelines for travel and consultancy reports to PATSPO is provided under separate cover in appendix 1.

PATSPO will arrange for the design of the report before publishing.

#### 9. SUPPORT FROM PATSPO

PATSPO will support the consultants and the resource person in organizing itinerary and meeting plan, as well as booking hotels and domestic flights. Relevant background information will be made available.

When in Addis Ababa the consultant will work from the ICRAF Office at the ILRI Compound.

**Annex 2 Program May 7<sup>th</sup> - 24<sup>th</sup>, 2018**

<b>Date</b>	<b>Tasks to be preform</b>	<b>Participants</b>
Mon. May. 7 <sup>th</sup> – Sun 13 <sup>th</sup> .	ILRI. Preparing flow charge and forms for procedures/activities	
Mon. May. 14 <sup>th</sup> .	<b>Meeting at FRC introducing week program</b>	KM + PE
Tus. May 15 <sup>th</sup> .	FRC Meeting with tree climber and heads of seed division	
	FRC Meeting with staff in Seed Processing.	
	FRC Meeting with staff from Seed Storage and Distribution	
Wed. May 16 <sup>th</sup> .	FRC Meeting with staff Seed Lab. ILRI Office	
Ths. May 17 <sup>th</sup> .	FRC Seed processing and Storage.	
Fri. 18 <sup>th</sup> .	PATSPo office / ILRI compound	
Sat. 19 <sup>th</sup> .	Presentation of Flow Chart for Seed Documentation	
Sun. 20 <sup>th</sup> .	Departure to Amhara Bahir Dar.	

Mon. May 21 <sup>st</sup> .	Presentation at RSC of Flow Charge for Seed Documentation for Head of Seed Centre.	KM +PE
Tus. May 22 <sup>nd</sup> .	Field trip to Debreabor, South Gunda	KM + PE
Wed. May 23 <sup>th</sup> .	Bahir Dar. Lab,. Procedures + Moisture contents.	
Thu. May 24 <sup>th</sup> .	Bahir Dar Lab. Activities. + Debriefing head of RSC before departure.	
Fri. May 25.	ILRI Compound. Following and debriefing meeting before departure to Denmark	

### Annex 3.

Program October 23<sup>rd</sup> – November 9<sup>th</sup> 2018

Main activity. Description of existing and- recommendations for procedures to secure seed documentation. Furthermore, install seed processing and testing equipment in RSC Mekele.

Date	Tasks to be preform	Participants
Thu. Oct. 23	Arrival at ILRI compound	
Wed. Oct. 24	Introduction and planning of program, at PATSPO office	



Thu. Oct. 25.	Prepare material for visit to Sebeta. Meeting with ILRI office at 15:00	
Fri. Oct. 26	RSC Sebeta Oromia Leaving at 06:15	GE + PE+ KM + AH + TS
Sat. Oct. 27	Office	
Sun. Oct. 28	Office	
Mon. Oct. 29 – Tus. 30.	RSC Hawassa, SNNP 2 days	KM +PE
Wed. Okt. 31	Planning PATSPO meeting	KM + PE
Ths. Nov 1.	PATSPO information and collaboration meeting, ILRI, Campus, Addis Abba	
Fri. Nov. 2.	Meeting with Head of RSC Sabeta	KM + PE+ KM + AH + TS
Sat. Nov. 3.	Office	
Sun. Nov. 4.	Office	
Mon. 5. - Wed. Nov. 7.	RSC. Mekele, Trigray, seed documentation and Install equipment 3 days.	KM + CTN + PE
Thu. Nov. 8	Report...	
Fri. Nov. 9	Report and debriefing in the after noon	
Fri. Nov. 9.	Returning to Denmark at 23:45	

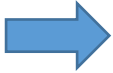
**Annex 4.**

**Flow chart of procedures/activities and related data and registrations forms at a tree seed center**

**PATSP0 May 2018**

**Flow chart of procedures/activities**                      **Related data registrations forms at a tree seed center.**  
**related data**

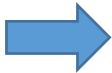
<p><b><u>Pre- Collection</u></b></p> <p><b>A. Purchase order or upstart of seed collection.</b> It is important that careful planning precede seed collection and all the processes that follow. Since planning is related to future activities, is not only required knowledge of the biological basis, but also of succeeding activities like collection, processing, storage and germination.</p>	<p>a. Seed collection plan. b. Seed Lot logbook. c. Seed collection label</p>	<p>Form A/1 Form A/2 Form A/3</p>
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<p><b><u>Post- collection</u></b></p> <p><b>B. Seed processing (cleaning and drying)</b> The objective of fruit or seed processing is to achieve clean, pure seed of high physiological quality (germination capacity) which can be stored and easily handled during succeeding processes, such as pretreatment, transport and sowing.</p>	<p>a. Seed extraction record</p>	<p>Form B/1</p>
<p><b>C. Seed testing</b></p> <p>Seed testing is used for control of quality parameters during seed handling, and test results are submitted to customers as documentation on seed quality. Standard parameters such as seed weight, purity and germination or viability enter as factors in the calculation of seed demand and calculation on sowing density in the Nursery. Moisture content in seed is particularly</p>	<p>a. Seed sample received from the Seed processing with Seed Lot No. b. Seed testing record c. Standards for seed testing and storage d. Laboratory ledger sheet</p>	<p>Form C/1 Form C/2 Form C/3 Form C/4</p>



important for successful storage. Furthermore a routine testing of seed in stock, has to be carried out on an annual basis, depending on the species.		
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<p><b>D. Seed storage</b></p> <p>The main purpose of seed storage is to secure the supply of good quality seed for nurseries and finally good plant material for the planting programs whenever needed. Furthermore, many species produce seed (or good seed crops) at long intervals, ranging from a few years to many years. To secure seed supply during the period between two good seed crops, a seed stock should be established. Even when fruiting is regular and abundant every year, it may be more cost efficient to collect surplus seed to cover several years, rather than undertake collection every year.</p>	<p>a. Seed storage label b. Register of seed stock and disposals c. Recommended storage temperature</p>	<p>Form D/1 Form D/2 Form D/3</p>
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<p><b>E. Seed dispatch</b></p> <p>The main purpose, dispatch of seed, whether it is for sale or part of the operational system within the forestry sector or nursery industry, involves measures to ensure that the seed reaches its destination safely. It is important that the seed transfer is arranged so that the seed is protected as much as possible during shipment, and that delay is minimized by effective pre- arrangement. Furthermore, to avoid any delay, in ports, costumer control or for domestically use, that the attached documents are accurate and correct.</p>	<p>a. Seed Order b. Seed delivery note</p>	<p>Form E/1 Form E/2</p>
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**F. Seed Documentation**

For tree seed of high physiological and genetic quality good records and documentation is very important from collection in the field over processing, testing, storing and disbursement at the seed center. From a silvicultural point of view, seed without information on its origin, history and potential performance poses a risk and may be of almost no value.

The major objective of correct seed documentation is to ensure transparency and relevant statistics like central records that ensure information on crop years, amount of seed collected and to whom it has been distributed, so the customer receive reliable information to the benefit of the nurseries and the forestry sector in general.

# Form A/1 Seed Collection Plan

## Seed Collection Plan RSC/CEEFR 2018

Date for printing: 13-05-2018

Need to collect as stock is lower than expected demand.  
Needs to collect, if there is a very good crop, to a low-cost price.

SS No. = Seed source No.

Example.

Current	Stock	To collect	Normal kg of	Need of	Sales price	Cost price	Blank	No seed collection	Time of collection	Evaluate	Contact person	TSC/CEE FRC	Budget
stock	provenance & seed source no.	kg. Seed	fruit / to 1. kg of seed	kg fruit fresh waight	dry seed ETB/kg.	per. Kg fresh fruit			collecti on	fruit setting	(Collector) add. local tif. No.	Person responsi bel	ETB
	Acacia abyssinica												
150	Dabena Seed SS No. XXX	200	2,5	125	850	75			nov	apr/may			9.375,00
	Dembi		2,5	0					nov				
				0									
	Acacia saligna												
25	Chefe donsa	75	3,5	175	3500	150			sep	apr/may			26.250,00
		0	3,5										
		0											
		0											











Form A/2 Seed Log book

Seed Lot logbook

Lot No.	Date	Species	Provenance	No. of Kg.	Name of supplier

Place one label in the sack and attach the other outside

<u>Sack Collection Label</u>	
<u>From Collector:-</u>	.....
<u>Species:-</u>	.....
<u>Provenance:-</u>	.....
<u>Seed source No.:-</u>	.....
<u>Date Collected:-</u>	.....
<u>Sack No.:-</u>	..... of total No. of ..... sacks
<u>Seed Lot No.:-</u>	.....

Form B/1 Seed extraction record

SEED EXTRACTION RECORDS

Date: .....; Month: .....; Year: 20xx

Species:	Provenance:	Seed Source No.:
Seed Lot No,	Crop Year:	

Date Received	Quantity of Fruits Received (sacks)	Fresh Wt. Received kg.	Dry Wt. of Processed Seeds kg.	Yield per Wt of Fruit gm/kg	Date of Transfer to Seed Store	Notes (method of drying, weather conditions etc.)

Form C/1 Seed test (Germination test sheet)

Seed lot no.: ..... Species:- .....

Provenance:- .....

Source no:- ..... Date of complete germination analysis:- .....

Summary	Purity%	1000 seed Wgt (gr)	No. of seed pr. Kg.	Moisture content (%)	Germ. Cap. (%)	Rate of Germ. (%)
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Replica	Normal germination after days.		Total norm. germ. (a)	Fresh not germ. (b)	Abnormal germ. (c)	Seed empty (d)	Dead seed full (e)	Total (a- e)	Rotten seed	Insect damage seed
A										
B										
C										
D										
Total										
Av. %										

Germination table:- ..... Pre-treatment method:- .....

Germination substrate:- ..... Time:- .....

Germination temp °C :- ..... Temperature °C .....

Form C/2 Laboratory germination

LABORATORY GERMINATION TEST FORM

Test No	Date	Purity %	Germ. %	No. of pure seeds per kg	No. of viable seeds per kg	Empty Seeds %	Moisture Content %	Remarks



<u>Sample for Moisture, Purity and Germination Testing:</u>	
From    Seed Store/processing	To    Testing Laboratory
Species:.....	
Seed Lot No.....	
Sample No..... of ..... Weighing ..... gm and representing ..... kg of seed in ..... storage containers.	
Date of sampling .....	
Sampled by .....	
Sampled by .....	

## Sample Test Ledger Sheet

[illegible]

**Storage Label**

Species:- .....

Provenance:- .....

Seed source No.:- .....

Crop Year:- .....

Date of arrival:- .....

.....

Seed Lot No.:- .....

All containers or sacks needs to have a label on the inside and on the outside, clearly mentioning the species, provenance No. of Kg. and seed Lot No.



**Recommended storage temperature.**

Short term storage.

- From a matter of a few days to perhaps 6 – 9 months

Medium term storage:

- Typically, from 1 to 5 years, mainly to avoid seed shortage after poor seed production years

Long term storage:

- Typically for 10 years or more. Principally for genetic resources conservation.

Seed Storage behaviour:

- 1. Orthodox seed (O)
- 2. Intermediate seed (I)
- 3. Recalcitrant seed (R)

Orthodox seed must be stored in hermetic closed containers, whereas recalcitrant seed should normally be stored at high humidity and low temperature

Species name	Recommended Moisture Content %	Seed storage behaviour	Storage at room temperature °C Kg.	Stored in a refrigerated room at +10° C Kg.	Storage Cold store at +2 - +5°C Kg.	Durability for storage in months
<i>Acacia abyssinica</i>	?	?				?
<i>Acacia saligna</i>	4,5 - 9	O	X			>24
<i>Acacia senegal</i>	4,5 - 9	O	X			>24
<i>Acacia seyal</i>	4,5 - 9	O		X		>24
<i>Acacia tortolis</i>	4,5 - 9	O		X		>24
<i>Albizia lebbeck</i>	4,5 - 9	O	X			>24
<i>Albizia schimperiana</i>		(O)	?			?
<i>Casuarina equisetifolia</i>	4,5 - 9	O			X	>24
<i>Cordia africana</i>	6 - 8	O			X	>12
<i>Cupressus lusitanica</i>	6 - 10	O			X	>24
<i>Eucalyptus saligna</i>	6 - 10	O			X	>24
<i>Faidherbia albida</i>	6 - 10				X	>24
<i>Jacaranda mimosifolia</i>	7 - 8	O			X	?
<i>Leucaena leucocephala</i>	6 - 10	O				?
<i>Leucaena leucocephala</i>	5 - 8	O	X			>48
<i>Maerua aethiopica</i>	?	?				?
<i>Milletia ferruginea</i>	?	(O)				?
<i>Melia azedarach</i>	11 - 15	O	X			>24
<i>Moringa stenopetala</i>	?	?				?
<i>Pterolobium stellatum</i>	6 - 10	O	X			>24
<i>Schinus molle</i>	9 - 12	O		X		>24
<i>Sesbania sesban</i>	6 - 10	O	X			>24
<b>Total</b>						

### **Seed order**

Consist of several element, depending on type of customer, is it a professional who knows what he/ she wants so it is more a discussion on provenance, quality, volume, price and delivery time. Whereas the more unexperienced customer needs qualified advice concerning which species to use, provenance and amount of seed needed for production of a certain amount of seed.

### **Seed Lot No.**

The Seed Lot No. is a unique number that identifies and secure transparency of a specific seed collection during one year of collection.

The purpose is to document the specific seed lot from time of seed collection, processing, seed testing, storage, until the seed is dispatched to the Nursery.

The number can exist of five digits. First three digits refer to the number of seed slot collected the present year. That means you can collect from 1 to 999 seed lots in one season. Last two digits represent the seed-collecting season. Example start with 00118 and can end up with 99918.

The collecting season can start from July 1<sup>st</sup>, 2018 and end June 30<sup>th</sup>. The most important is that the seed lot number covers a whole seed collecting season.

## Form E/2 Seed delivery note

**Seed delivery note**

Name and address of customer:- .....

Customer no.:- .....

Delivery address:- .....

Time of delivery:- ..... No. Kg.: .....

Seed lot no.:- ..... Provenance:- ..... Seed source no.:- .....

**Seed quality data:**

Germination ( Total %) ..... Germination ( % after 3 weeks ) ..... Cutting test (%) ..... TZ test (%) .....

1000 seed weight (gr.)..... Purity (%) ..... Moisture (%).....

Pre-treatment:- .....

Date of finished test: Date: .....; Month: .....; Year: 20xx

Test carried out by:- .....



ANNEX 5. RSC OFWE Sebeta November 2018	Species name	Recommended Moisture Content %	Seed storage behavior	Seed storage requirement PATSPO	Stored in a refrigerated room at +16 - +18° C	Storage Cold store at +3 – +5°C	Durability for storage in month
	<i>Acacia abyssinica</i>						
	<i>Acacia saligna</i>	4,5 - 9	O	X			>24
	<i>Acacia decurrens</i>						
	<i>Acacia melanoxylon</i>	4,5 - 9	O	X			>24
	<i>Acacia nilotica</i>						
	<i>Acasia polyacantha</i>						
	<i>Acacia saligna</i>						
	<i>Acacia senegal</i>	4,5 – 9	O	X			>24
	<i>Acacia seyal</i>	4,5 – 9	O		X		>24
	<i>Acacia tortilis</i>	4,5 – 9	O		X		>24
	<i>Albizia gummifera</i>	4,5 - 9	O		X		>24
	<i>Albizia lebbeck</i>	4,5 – 9	O	X			>24
	<i>Albizia schimperiana</i>						
	<i>Balanites argyptiaca</i>	4,5 - 9	O	x			>24
	<i>Casuarina equisetifolia</i>	4,5 - 9	O			X	>24
	<i>Boswellia papyrifera</i>	4,5 - 5	O			X	>24
	<i>Boswellia pirrotea</i>						
	<i>Cajanus cajan</i>	4,5 - 9	O	X			>24
	<i>Casuarina equisetifolia</i>	4,5 - 9	O			X	>24

<i>Cordia africana</i>	6 - 8	O				X	>12
<i>Chamaecytisus palmensis</i>	4,5 - 9	O				X	>24
<i>Chamaecytisus prolifer</i>							
<i>Combretum mollie/woyba</i>	4,5 - 9	O	X				
<i>Croton macrostachya</i>							
<i>Cupressus lusitanica</i>	6 - 10	O				X	>24
<i>Delonix regia</i>	4,5 - 9	O	X				>24
<i>Dovyalis caffra</i>	6 - 10	R				X	>24
<i>Eucalyptus camaldulensis</i>	6 - 10	O			X		>24
<i>Eucalyptus citriodora</i>	6 - 10	O				X	>24
<i>Eucalyptus globulus</i>	6 - 10	O				X	>24
<i>Eucalyptus grandis</i>	6 - 10	O				X	>24
<i>Eucalyptus saligna</i>	6 - 10	O				X	>24
<i>Eucalyptus viminalis</i>							
<i>Ekebergia capensis</i>							
<i>Faidherbia albida</i>	6 - 10					X	>24
<i>Gravilia robusta</i>	4,5 - 9	O				X	>12
<i>Hagenia abyssinica</i>	4,5 - 9	O				X	>24
<i>Jacaranda mimosifolia</i>	7 - 8	O				X	?
<i>Juniperus procera</i>	7 - 8	O				X	>24
<i>Leucaena leucocephala</i>	5 - 8	O	X				>48
<i>Maerua aethiopica</i>		?					?
<i>Milletia ferruginea</i>	?	(O)					?
<i>Melia azedarach</i>	11 - 15	O	X				>24
<i>Moringa stenopetala</i>	?	?					?
<i>Moringa olifera</i>							
<i>Olea africana</i>	6 - 10	O				X	>24
<i>Olea europea</i>	6 - 10	O				X	>24
<i>Oxythenantha abyssinica/ Yekola</i>	10-12	?			O		>6
<i>Persia americana</i>		R					
<i>Pinus patula</i>	4,5 . 9	O				X	>48

<i>Pinus radiata</i>	4,5 - 9	O			X	>48
<i>Podocarpus falcatus</i>	6 - 8	O			X	>48
<i>Prunus africana</i>						
<i>Pterolobium stellatum</i>	6 – 10	O	X			>24
<i>Schinus molle</i>	9 – 12	O		X		>24
<i>Sesbania sesban</i>	6 – 10	O	X			>24
<i>Sesbania aculeata</i>	18 - 20	O			X	>12
<i>Rhamnuss prionoides</i>	4,5 - 9	O			X	>24
<i>Tamarandus indica</i>	7 - 15	O		X		>24
<i>Terminalia brownii/abole</i>	10 -12	O			X	>24
<i>Ziziphus spina - chrisii</i>	4,5 - 9	O		X		

Remarks:

- Orthodox Seed should be stored in air- tight containers or polystyrene bags to maintain constant moisture content and protect against insects and other pests.
- Rule of thumb: For each 5° C the Temperature is lower the viability of the seed that is stored, increase length of possible storage by factor 2.

**Annex 6.****Program for field trip to Mekele, Tregrey****November 5<sup>th</sup> – 7<sup>th</sup>.****2018**

Departure Bole Airport at 7:00 AM

Pick up at ILRI Compound 05:00 AM

Participants,

KM.: Kedra Muhamed, CTN.: Carsten T. Noergaard, PE.: Poul Elgaard

A.H. Ali Hadus RTSC, H.T. Haile Tilahun PATSPO/Mekele

Plus staff attached to the RSC

		Description
Monday 5 <sup>th</sup> .	Arrival at Mekele at 08:10	Go to Hotel and check- in and have Breakfast
	10:00	Leave for RSC
	10:30	Meeting with senior staff at RSC presenting the objective for our visit
	12:00	Lunch
Tuesday 6 <sup>th</sup> .	13:00 – 17:00	Installing equipment in the Lab. And Seed processing
	18:30	Dinner
	07:00	Breakfast
	08:30	Departure for RSC
	09:00	Installing and testing equipment
	12:00	Lunch
Wednesday 7 <sup>th</sup> .	13:00 – 17:00	Training in use and handling of installed equipment
	18:30	Dinner
	07:00	Breakfast
	08:30	Departure for RSC
	09:00	Flow Chart for seed documentation
	12:00	Lunch
	13:00	Closing minutes
	15:00	Arrival at Alula Aba Nega Airport
	16:30	Departure with expected arrival at Addis at 05:55 PM

PATSPO

Friday 2<sup>nd</sup>. 2018









PATSPPO/ICRAF Office  
c/o ILRI Campus, Gurd  
Shola, P.O. Box 5689,  
Addis Ababa, Ethiopia

Phone: 251-116172000  
ext. 2491  
Email: K.Hadgu@cgiar.org

Website: <https://www.worldagroforestry.org/project/provision-adequate-tree-seed-portfolio-ethiopia>