## Maintenance of Arsi Coffee Land race

**Back Ground and Justification**

Coffea, a member of the Rubiaceae family, has more than 70 species, but only two species, arabica (Coffea arabica L) and robusta ( Coffea canephora Pierre), have commercial value. C. *arabica* is originated from Ethiopia and was propagated and dispersed all over the world from a low number of plants, which in addition to its autogamous reproduction led to a narrow genetic basis within Arabica coffee cultivars (Steiger,*et al* 2002).

Coffee is the second most valuable commodity exported by developing countries after oil (Vega F, *et al*, 2002) which is produced in about 80 countries in the tropical regions (Musloi P,*et al*,2009) with an estimated 125 million people in Latin America, Africa and Asia depending on it for their livelihoods (Osorio N., *et al* 2002).The narrow genetic base of cultivated coffee (C. *arabica*), utilization of wild coffee genepool in future breeding programmers for crop improvement becomes imperative. With many wild species being lost due to habitat destruction, there is an urgent need for the conservation of these valuable genetic resources (Krishnan S.2011).Coffee seeds are recalcitrant or exhibit intermediate storage behaviour, making preservation of germplasm through seed banking problematic (Dulloo ME, *et al* 1998)

Ethiopia holds a unique position in the world as Coffea arabica L. has its primary center of diversity in the south-western highlands of the country. This fact is strongly substantiated by observations and publications of travelers and scientists (Vavilov 1935; Sylvain 1955; Meyer 1965) and, more recently, by several studies using DNA-based genetic markers (Lashermes et al. 1996; Anthony et al. 2002; Tesfaye et al. 2007).

Ethiopia is well known not only for being the home of arabica coffee, but also for its very fine quality coffee acclaimed for its unique aroma and flavor characteristics. The coffee types that are distinguished for such unique characteristics include Sidamo, Yirgachefe, Hararge, Ghimbi and Limu types (Workafes Woldetsadik and Kassu Kebede, 2000).

Since Ethiopia is the primary center of origin and genetic diversity for C. *arabica*, there is high genetic variability for yield and yield components, disease and pest resistance, and other traits (Sylvain, 1958; Meyer, 1968; Melaku Worede, 1982). The environmental conditions in the coffee producing areas show considerable variations between and within regions. The growth of coffee under such diverse environments is an indication for the presence of genetic variability. The development of new coffee cultivars by breeding programs depends on the existence of germplasm collections with signiﬁcant and accessible genetic variability. The others are wild species that, although without commercial value, represent an important source of genetic variability to characteristics like architecture, disease and pest resistance and various agronomic and industrial traits. Currently, the IAC Coffee Germplasm Collection is one of the most representative Coffea collections conserved ex situ. Once direct access to genetic resources from the center of origin of several Coffea species may be restricted, the availability of germplasm collections is crucial for coffee breeding programs. The efﬁcient use of genetic resources of a germplasm bank requires, besides the introduction, characterization and proper maintenance of its accessions. Coffee Germplasm Collection of IAC has been maintained and characterized by traditional methods such as analysis of morphological (plant height and fruits, leaves and seeds color and size) and agronomic characteristics (productivity, disease and pest resistance, cup quality) (Silvarolla *et al*. 1999; Gaspari-Pezzopane *et al*. 2004; Aguiar *et al*. 2005; Medina-Filho *et al*. 2007).

Given that the rate of genetic erosion is increasing, it has become necessary to develop a new collection and maintenance to ensure that the coffee genetic resources are safely conserved in the field gene bank. Therefor this activity developed, with main objectives: to collect and conserve diverse Germplasm in the field gene bank from Arsi coffee growing areas.

**Objectives**

To Collect, Characterize and Maintain Coffee Germplasm of Arsi coffee Landrace (including unaddressed waredas

**Materials and Methods**

Collection will be under taken in 2020/2021 cropping season. Multidiscipline professionals (researchers) will participate during collection and preliminary supervision. The collection will held following the definitions in genetic resources documentation of IPGRI (International Plant Genetic Resource Institute).It includes coffee plant descriptors from passport descriptors to morphological characterization.

Passport descriptors provide the basic information used for the general management of the accession (including the registration at the gene bank and other identification information) and describe parameters that should be observed when the accession is originally collected. It includes information such as, accession descriptors(accession number, donor name, donor number, scientific name of accession, cultivar name, *etc.*),collector descriptors(name of collecting institute, site number, collecting number, date of collection, country of collection and location of site, population size and isolation) .

Environment and site descriptors describe the environmental and site-specific parameters that are important when characterization and evaluation trials are held. They can be important for the interpretation of the results of the trials. Site descriptors for germplasm collecting such as, topography, landform, slope, vegetation surrounding, soil fertility and climatic condition of the site are also included here.

Characterization descriptors enable an easy and quick discrimination between phenotypes. They are generally highly heritable, can be easily seen by our eyes and are equally expressed in all environments. We use coffee plant descriptors for vegetative description such as growth habit, plant height, branching habit, angle of insertion of primary branch, stipule shape, leaf color, leaf shape and leaf width and also for fruit and seed description we use fruit color, shape, length, width and pulp thickness and seed length, thickness, width, color and shape.

**Data Analysis**

Data collected will be subjected to R-statistical software for comparisons and characterization.

**Duration of the Activity:-**2020/21 to 2027

**Location:-**Mechara on station

**Expected output:-**There could be at least 100 accession with variable characters.

**Beneficiaries:-**small holder farmers, researchers, Investors, etc

**Initiator:-**Mohammed Jundi, Iyob Alemayehu & Addisu Wegari

**Expected year of completion: 2026/27**

**Action plan for 2020/21:**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **List of activities** | **1st Quarter** | | | **2nd Quarter** | | | **3rd Quarter** | | | **4th Quarter** | | |
| Jul | Aug | Sep | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun |
| Collection of Land race |  |  |  | X | X | X |  |  |  |  |  |  |
| Nursery management | X | X |  |  |  |  |  |  |  |  |  |  |
| Site selection | X |  |  |  |  |  |  |  |  |  |  |  |
| Land preparation | X |  |  |  |  |  |  |  |  |  |  |  |
| Lay outing and hole digging | X |  |  |  |  |  |  |  |  |  |  |  |
| Transplanting |  | X | X |  |  |  |  |  |  |  |  |  |
| Field management |  |  | X | X | X | X | X | X | X | X | X | X |

**Budget for 2020/21:** 144,205ETB

|  |  |  |
| --- | --- | --- |
| **Budget code** | **Description** | **Total budget (ETB)** |
| 6114 | wage | 36,124 |
| 6212 | Stationeries | 6,400 |
| 6213 | Publication | 5,500 |
| 6217 | Fuel and lubricant | 1,200 |
| 6219 | Farm tools | 8,500 |
| 6221 | Fertilizer (Input) | 1,200 |
| 6223 | Agricultural materials | 2,100 |
| 6231 | Perdiem | 46,231 |
| 6232 | Transport fee | 8,200 |
| 6241 | Vehicle maintenance | 6,200 |
| 6243 | Machinery maintenance | 6,300 |
| 6255 | Loading | 6,550 |
| 6271 | local trianing | 2,300 |
| 6313 | Permanent equipment | 7,400 |
| **Total** |  | **144,205** |

## Collections, Characterization, Evaluation and Maintenance of Harerghe Coffee Land race

**Back Ground and Justification**

Coffea, a member of the Rubiaceae family, has more than 70 species, but only two species, arabica (Coffea arabica L) and robusta ( Coffea canephora Pierre), have commercial value. C. *arabica* is originated from Ethiopia and was propagated and dispersed all over the world from a low number of plants, which in addition to its autogamous reproduction led to a narrow genetic basis within Arabica coffee cultivars (Steiger,*et al* 2002).

Coffee is the second most valuable commodity exported by developing countries after oil (Vega F, *et al*, 2002 ) which is produced in about 80 countries in the tropical regions (Musloi P,*et al*,2009) with an estimated 125 million people in Latin America, Africa and Asia depending on it for their livelihoods (Osorio N., *et al* 2002).The narrow genetic base of cultivated coffee (C. *arabica*), utilization of wild coffee genepool in future breeding programmers for crop improvement becomes imperative. With many wild species being lost due to habitat destruction, there is an urgent need for the conservation of these valuable genetic resources (Krishnan S.2011).Coffee seeds are recalcitrant or exhibit intermediate storage behaviour, making preservation of germplasm through seed banking problematic (Dulloo ME, *et al* 1998)

Ethiopia holds a unique position in the world as Coffea arabica L. has its primary center of diversity in the south-western highlands of the country. This fact is strongly substantiated by observations and publications of travelers and scientists (Vavilov 1935; Sylvain 1955; Meyer 1965) and, more recently, by several studies using DNA-based genetic markers (Lashermes et al. 1996; Anthony et al. 2002; Tesfaye et al. 2007).

Ethiopia is well known not only for being the home of arabica coffee, but also for its very fine quality coffee acclaimed for its unique aroma and flavor characteristics. The coffee types that are distinguished for such unique characteristics include Sidamo, Yirgachefe, Hararge, Ghimbi and Limu types (Workafes Woldetsadik and Kassu Kebede, 2000).

Since Ethiopia is the primary center of origin and genetic diversity for C. *arabica*, there is high genetic variability for yield and yield components, disease and pest resistance, and other traits (Sylvain, 1958; Meyer, 1968; Melaku Worede, 1982). The environmental conditions in the coffee producing areas show considerable variations between and within regions. The growth of coffee under such diverse environments is an indication for the presence of genetic variability. The development of new coffee cultivars by breeding programs depends on the existence of germplasm collections with signiﬁcant and accessible genetic variability. The others are wild species that, although without commercial value, represent an important source of genetic variability to characteristics like architecture, disease and pest resistance and various agronomic and industrial traits. Currently, the IAC Coffee Germplasm Collection is one of the most representative Coffee collections conserved ex situ. Once direct access to genetic resources from the center of origin of several Coffea species may be restricted, the availability of germplasm collections is crucial for coffee breeding programs. The efﬁcient use of genetic resources of a germplasm bank requires, besides the introduction, characterization and proper maintenance of its accessions. Coffee Germplasm Collection of IAC has been maintained and characterized by traditional methods such as analysis of morphological (plant height and fruits, leaves and seeds color and size) and agronomic characteristics (productivity, disease and pest resistance, cup quality) (Silvarolla *et al*. 1999; Gaspari-Pezzopane *et al*. 2004; Aguiar *et al*. 2005; Medina-Filho *et al*. 2007).

Given that the rate of genetic erosion is increasing, it has become necessary to develop a new collection and maintenance to ensure that the coffee genetic resources are safely conserved in the field gene bank. Therefor this activity developed, with main objectives: to collect and conserve diverse Germplasm in the field gene bank from Harerghe coffee growing areas.

**Objectives**

To Collect, Characterize and Maintain Coffee Germplasm of Harerghe coffee Landrace (including unaddressed waredas)

**Materials and Methods**

Collection will be under taken in 2020/2021 cropping season. Multidiscipline professionals (researchers) will participate during collection and preliminary supervision. The collection will held following the definitions in genetic resources documentation of IPGRI (International Plant Genetic Resource Institute).It includes coffee plant descriptors from passport descriptors to morphological characterization.

Passport descriptors provide the basic information used for the general management of the accession (including the registration at the gene bank and other identification information) and describe parameters that should be observed when the accession is originally collected. It includes information such as, accession descriptors(accession number, donor name, donor number, scientific name of accession, cultivar name, *etc.*),collector descriptors(name of collecting institute, site number, collecting number, date of collection, country of collection and location of site, population size and isolation) .

Environment and site descriptors describe the environmental and site-specific parameters that are important when characterization and evaluation trials are held. They can be important for the interpretation of the results of the trials. Site descriptors for germplasm collecting such as, topography, landform, slope, vegetation surrounding, soil fertility and climatic condition of the site are also included here.

Characterization descriptors enable an easy and quick discrimination between phenotypes. They are generally highly heritable, can be easily seen by our eyes and are equally expressed in all environments. We use coffee plant descriptors for vegetative description such as growth habit, plant height, branching habit, angle of insertion of primary branch, stipule shape, leaf color, leaf shape and leaf width and also for fruit and seed description we use fruit color, shape, length, width and pulp thickness and seed length, thickness, width, color and shape.

**Data Analysis**

Data collected will be subjected to R-statistical software for comparisons and characterization.

**Duration of the Activity:-**2020/21 to 2027

**Location:-**Mechara on station

**Expected output:-**There could be at least 120 accession with variable characters.

**Beneficiaries:-**small holder farmers, researchers, Investors, etc

**Initiator:-**Mohammed Jundi, Iyob Alemayehu & Adisu Wegari

**Expected year of completion: 2026/27**

**Action plan for 2020/21:**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **List of activities** | **1st Quarter** | | | **2nd Quarter** | | | **3rd Quarter** | | | **4th Quarter** | | |
| Jul | Aug | Sep | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun |
| Collection of Land race |  |  |  | X | X | X |  |  |  |  |  |  |
| Nursery management | X | X |  |  |  |  |  |  |  |  |  |  |
| Site selection | X |  |  |  |  |  |  |  |  |  |  |  |
| Land preparation | X |  |  |  |  |  |  |  |  |  |  |  |
| Lay outing and hole digging | X |  |  |  |  |  |  |  |  |  |  |  |
| Transplanting |  | X | X |  |  |  |  |  |  |  |  |  |
| Field management |  |  | X | X | X | X | X | X | X | X | X | X |

**Budget for 2020/21:** 200000ETB

|  |  |  |
| --- | --- | --- |
| **Budget code** | **Description** | **Total budget (ETB)** |
| 6114 | wage | 32000 |
| 6212 | Stationeries | 1100 |
| 6213 | Fuel and lubricant | 4550 |
| 6217 | Farm tools | 15400 |
| 6218 | Fertilizer (Input) | 2200 |
| 6219 | Agricultural materials | 8800 |
| 6221 | Perdiem | 4400 |
| 6223 | Transport fee | 6400 |
| 6231 | Vehicle maintenance | 64000 |
| 6232 | Machinery maintenance | 14950 |
| 6241 | Loading | 23200 |
| 6243 | Machinery maintenance | 2200 |
| 6244 | local training | 8600 |
| 6251 | Permanent equipment | 1500 |
| 6255 | Loading | 2200 |
| 6256 | Service fee | 2200 |
| 6313 | Permanent equipment | 6300 |
| Total |  | 200000 |

## 

**Coordinated Variety Verification Trial of Arsi Coffee Land race**

**Background and justification**

Ethiopia is characterized by diverse agro ecological composition and coffees .The narrow genetic base of cultivated coffee (C. Arabica), utilization of wild coffee gene pool in future breeding programmers for crop improvement becomes imperative. Many wild species are being lost due to habitat destruction, there is an urgent need for the conservation of these valuable genetic resources (Krishnan S.2011).This generally confirms the need for continuous and strategically designed research approach to develop new coffee varieties

**Objective**

To develop high yielder, disease resistant and of good quality for Arsi coffee growing areas

**Materials and Methods**

A total of 15 (fifteen) promising selections of Arsi coffee landraces and two released coffee varieties (standard checks; Arusa and Machara-1) listed in the table below will be used. The study will be conducted using a RCBD with 3 replications, 10 trees per plot and a spacing of 2m x 2m between Block and plot. All field management Practices will be done as per the recommendation.

|  |  |  |  |
| --- | --- | --- | --- |
| Ar70/11 | Ar05/11 | Ar03/11 | Ar08/11 |
| Ar34/11 | Ar46/11 | Ar62/11 | Ar76/11 |
| Ar63/11 | Ar15/11 | Ar72/11 | Ar64/11 |
| Ar78/11 | Ar56/11 | Ar09/11 |  |

**Data to be collected**

Stem girth (cm), Height up to first primary branch (cm), Plant height (cm), Number of nodes on the main stem (No.), Number of primary branches (No.), Number of secondary branches (No.), Length of longest primary (cm), of Nodes on the longest primary (No.), Internodes length on longest primary (cm),Inter node length on the main stem (cm), Canopy diameter (cm), Yield (Qh1), Diseases and Insectsdata will be recorded .

**Data analysis**

Collected Data will be subjected to R-computer software program for comparison

**Duration of the Activity:-**2020/21 to 2027

**Location:-**Mechara on station Gololcha and Chole Districts.

**Expected output:-** at least 3 Variety will be recommended for Arsi Coffee Growing areas.

**Beneficiaries:-**small holder farmers, researchers, Investors, etc.

**Initiator:-**Mohammed Jundi, Iyob Alemayehu & Adisu Wegari

**Expected year of completion: 2026/27**

**Action plan for 2020/21:**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **List of activities** | **1st Quarter** | | | **2nd Quarter** | | | **3rd Quarter** | | | **4th Quarter** | | |
| Jul | Aug | Sep | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun |
| Nursery management | X | X |  |  |  |  |  |  |  |  |  |  |
| Site selection | X |  |  |  |  |  |  |  |  |  |  |  |
| Land preparation | X |  |  |  |  |  |  |  |  |  |  |  |
| Lay outing and hole digging | X |  |  |  |  |  |  |  |  |  |  |  |
| Transplanting |  | X | X |  |  |  |  |  |  |  |  |  |
| Field management |  |  | X | X | X | X | X | X | X | X | X | X |

**Budget for 2020/21: 180000**ETB

|  |  |  |
| --- | --- | --- |
| **Budget code** | **Description** | **Total budget (ETB)** |
| 6114 | wage | 68000 |
| 6212 | Stationeries | 2200 |
| 6213 | Fuel and lubricant | 2200 |
| 6217 | Farm tools | 10400 |
| 6218 | Fertilizer (Input) | 2200 |
| 6219 | Agricultural materials | 10800 |
| 6221 | Perdiem | 4400 |
| 6223 | Transport fee | 4400 |
| 6231 | Vehicle maintenance | 34000 |
| 6232 | Machinery maintenance | 14950 |
| 6241 | Loading | 1200 |
| 6243 | Machinery maintenance | 2200 |
| 6244 | local training | 6600 |
| 6255 | Loading | 2200 |
| 6256 | Service fee | 2200 |
| 6271 | local training | 8450 |
| 6313 | Permanent equipment | 3600 |
| **Total** |  | **180000** |