Melkassa Agricultural Research Center

Available Agricultural Production Technology Packages for user

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Available Agricultural Technology Package For Users

Crop: Maize

Varieties: Melkasa-1
            Katumani
            ACV-3
            ACV-6

Adaptation zone/area:

Melkasa-1
- Rainfall: 460mm
- Altitude: <1600m.a.s.l
- AEZ: Rift valley, Kobo, Borena, Liben and Mieso

Katumani
- Rainfall: 500mm
- Altitude: <1600m.a.s.l
- AEZ: Rift valley areas

ACV-3
- Rainfall: 500mm
- Altitude: <1600m.a.s.l
- AEZ: Middle rift valley areas

ACV-6
- Rainfall: 500mm
- Altitude: <1600m.a.s.l
- AEZ: Middle rift valley areas, Mega and Yavello

Purpose for which the crop is grown: For food.

Sowing/planting date: Early June to mid-June (for all varieties)

Sowing/planting method: Row planting.

Seeding rate/ha: 25-30kg./ha (For all varieties)

Spacing:
- Between rows - 75 cm. (For all varieties)
- Between plants - 20 cm. (For Melkasa-1), 25 cm.
  (For Katumani, ACV-3 and ACV-6).

Time of cultivation and frequency of cultivation:
- Tillage: Once plowing just after harvest of the previous crop at October followed by once plowing in June.
- Tie-ridging at 6m interval by planting in furrow.
- 4-6 leaves stage shilshalo for weeding and moisture conservation.
- At knee height stage N-fertilizer side dressing

Fertilizer:

DAP - 100 kg./ha
Urea 50 kg./ha (at knee height stage)

Yield (q/ha), Maturity days and 50 % days to pollen shedding and Silking

<table>
<thead>
<tr>
<th>Name of varieties</th>
<th>Days to 50 %</th>
<th>Days to Maturity</th>
<th>Yield in q/ha</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pollen Shedding</td>
<td>Silking</td>
<td></td>
</tr>
<tr>
<td>Melkasa-1</td>
<td>46</td>
<td>48</td>
<td>90</td>
</tr>
<tr>
<td>Katumani</td>
<td>53</td>
<td>55</td>
<td>105</td>
</tr>
<tr>
<td>ACV-3</td>
<td>55</td>
<td>57</td>
<td>110</td>
</tr>
<tr>
<td>ACV-6</td>
<td>57</td>
<td>59</td>
<td>115</td>
</tr>
</tbody>
</table>
Crop: Sorghum

Varieties: Gubiye and Abshir

Adaptation zone/area: - Rainfall 500 - 600mm
- Altitude <1600 m.a.s.l.
- AEZ M2, SH2, SM2, SA2

Purpose for which the crop is grown for: - Food
- Raw material

Special features of the varieties: Striga and drought resistance and better seed quality

Sowing/Planting time: Mid June to early July

Sowing/Planting method: - Broadcasting
- Row planting

Seeding rate/ha: 8-10 Kg/ha to be adjusted 88,888 plants/ha after thinning. (Thinning to be carried out when seedlings reaches 5cm high)

Spacing: - Between rows 0.75m
- Between plants 0.15m

Time of cultivation and frequency of cultivation: 6 - 8 leaves stage

Fertilizer recommended (if any) - DAP 50 kg/ha
- Urea 50 kg/ha

Irrigation amount and rate (if any) - Rainfed production

Major disease, insect and weeds attacking the crop: smuts, stalkborers, shootfly sorghum chaffer, striga species

Plant protection measures
- For disease: Host resistance
- For insect: Host resistance except for sorghum chaffers. For stalk borers Chemicals like Karate 5% can be used at 16 g a.i./ha mixed with 400-1000 L. of water sprayed 45 - 50 days after crop emergence or endosulfan 35% EC, 0.05 - 10 % a.i./ha in 600 L. of water at 46 days after cropping.
- For weeds Use of resistant variety specially to striga and spraying 2-4D herbicide can also be used.
- IPM Cultural(hand pulling)+chemical(2-4D)+resistant varities
Yield Q/ha

Food quality results:

Storability

Maturity days

- From sowing to flowering 60-65
- From sowing to harvesting 90-110 depending on the rainfall
- On research center 20
- On farmers field 12-16

Good for injera making and local beverages

Good
Crop: Sorghum

Varieties: Birmash, IS 9302 and Baji

Adaptation zone/area: - Rainfall 900-1200mm
- Altitude 1600-1900
- AEZ H1, M1, SH2

Purpose for which the crop is grown for: - Food
- Row material

Special features of the variety: Higher yield and wide adaptation

Sowing/Planting time: 1-15 May

Sowing/Planting method: - Broadcasting
- Row planting

Seeding rate/ha: 10-20 Kg/ha for broadcasting
8-10 Kg/ha for row planting

Spacing: - Between rows 0.75m
- Between plants 0.15m

Time of cultivation and frequency of cultivation: 6-8 leaves stage

Fertilizer recommended (if any): - DAP 100 Kg/ha
- Urea 100 Kg/ha

Irrigation amount and rate (if any): Rainfed production

Major disease, insect and weeds attacking the crop: Grain mold, stalk borers

Plant protection measures:
- For disease: Resistant varieties
- For insect: Resistant varieties but for storage insects sanitation plus insecticides like primiphols methyl 2% dust at the rate of 35gm/100 kg grain (5ppm) and fumigation with phostoxin should be used.
- For weeds: Hand weeding at 20-25 and 45 to 50 DAE
- IPM: Resistant varieties + hand weeding + chemical and herbicide (Primagram)

Maturity in days:
- From sowing to flowering 84-121
- From sowing to harvesting 120-156

Yield Q/ha
- On research center 30-69
- On farmers field 18-20
Food quality results:

Moderate *injera* makers

Storability:

Susceptible to storage pests (Weevils)
Crop: Sorghum

Varieties: Alemaya 70, ETS 2752 and Chiro

Adaptation zone/area: - Rainfall: 870-900mm
- Altitude: >1900
- AEZ: SM1, H2

Purpose for which the crop is grown for: - Food
- Raw material

Special features: Higher seed quality and yield:

Sowing/Planting time: 15 April to 10 May

Sowing/Planting method: - Broadcasting
- Row planting

Seeding rate/ha: 10-20 Kg/ha for broadcasting
8-10 Kg/ha for row planting

Spacing:
- Between rows: 0.75m
- Between plants: 0.15m

Time of cultivation and frequency of cultivation: 6-8 leaves stage, frequency: 1

Fertilizer recommended (if any):
- DAP: 100 Kg/ha at sowing time
- Urea: 100 Kg/ha at knee stage

Irrigation amount and rate (if any): Rainfed production

Major disease, insect and weeds attacking the crop: Anthracnose, Ergot, spotted stem borer and other borers

Plant protection measures:
- For disease: Resistant varieties
- For insect: Cultural (tillage, sanitation)
- For weeds: Hand weeding at 20-25 DAE x 45-50 DAE or spraying Primagram 4lt in 400lt

Maturity in days:
- From sowing to flowering: 103-141
- From sowing to harvesting: 138-176

Yield Q/ha:
- On research center: 30-58
- On farmers field: 30-35 (On average) it depends on climatic and management condition

Food quality results: Excellent injera and genfo makers

Storability: Good
Crop: Sorghum
Variety: Gambella 1107

Adaptation zone/area:
- Rainfall >600
- Altitude <1600
- AEZ M2, SH1

Purpose for which the crop is grown:
- Food
- Raw material

Special features: Excellent seed quality:

Sowing/Planting time: First week of June:

Sowing/Planting method:
- Broadcasting
- Row planting

Seeding rate/ha:
10-20 Kg/ha for broadcasting
8-10 Kg/ha for row planting

Spacing:
- Between rows 0.75m
- Between plants 0.15m

Time of cultivation and frequency of cultivation:
6 – 8 leaves stage, frequency: one

Fertilizer recommended (if any):
- DAP 100 Kg/ha at sowing time
- Urea 100 Kg/ha at knee stage

Irrigation amount and rate (if any):
Rainfed production

Major disease, insect and weeds attacking the crop:
- Grain mold, smuts, antracnose and other leaf diseases, Stalk borer

Plant protection measures:
- For disease: this variety is resistant to major sorghum diseases (grain mold, smuts, antracnose and other leaf diseases)
- For insect: moderately resistant but for stalk borers Chemical like Karate 5% can be used at 16 g a.i./ha mixed with 400-1000 L of water sprayed 45 – 50 days after crop emergence or endosulfan 35% EC, 0.05 – 10 % a.i./ha in 600 L of water at 46 weeks after cropping.
- For weeds: Hand weeding at 20-25 DAE & 45-50 DAE, and spraying Primagram 4lt in 400lt can also be used
Maturity in days:
- From sowing to flowering: 80-95
- From sowing to harvesting: 115-130

Yield Q/ha:
- On research center: 30-50
- On farmers field: 15-20 depending on climatic and management condition

Food quality results:
Excellent injera maker

Storability:
Good
Crop: Sorghum

Variety: 76 T₁ #23, Meko, Seredo

Adaptation zone/area:  
- Rainfall: 500-600mm  
- Altitude: <1600  
- AEZ: SM₂, SA₂

Purpose for which the crop is grown for:  
- Food x  
- Raw material x

Special features of the varieties: Drought tolerance and escape, bird tolerance (in case of seredo)

Sowing/Planting time: In general 1-15 June, but the start of the rain should dictate the planting time

Sowing/Planting method:  
- Broadcasting x  
- Row planting x

Seeding rate/ha:  
10-20 Kg/ha for broadcasting  
8-10 Kg/ha for row planting

Spacing:  
- Between rows 0.75m  
- Between plants 0.15m

Time of cultivation and frequency of cultivation: 6-8 leaves stage

Fertilizer recommended (if any):  
- DAP 50 Kg/ha  
- Urea 50 Kg/ha  
- Manure

Irrigation amounts and rates (if any):  
-

Major disease, insect and weeds attacking the crop: Smuts and Stalk borers

Plant protection measures:
- For disease: resistant to most of the diseases and for smut animal urines can be also used  
- For insect: moderately resistant but for stalk borers Chemicals like Karate 5% can be used at 16 g a.i./ha mixed with 400-1000 L. of water sprayed 45-50 days after crop emergence or endosulfan 35% EC, 0.05 - 10 % a.i./ha in 600 L. of water at 46 weeks after cropping.  
- For weeds: Hand weeding at 20-25 DAE & 45-50 DAE, Primagram 4lt in 400lt can also be used.
Maturity days:
- From sowing to flowering: 60-92
- From sowing to harvesting: 95-127

Yield Q/ha:
- On research center: 30-50
- On farmers field: 15-17

Food quality results:
Good injera makers (76 T1 #23 & Meko) for seredo dehulling and composite flour technique (50:50 ratio sorghum:teff) are important.

Storability:
Good
Crop: TEF

Variety: DZ-01-196, DZ-01-354, DZ-Cr-37

Adaptation Zone/Area: Rainfall 450-550mm, growing season Altitude: 1700-2200m AEZ: Hot to Semi-arid lowland (SAI) and tepid to cool sub-moist highland (SM2).

Purpose: The grain is used for making enjera and porridge. Straw-feed for cattle and for other purpose.

Sowing/planting time: 1st weed to mid July or can be sown when rainfall is reliable and well distributed.

Sowing/planting method: broadcasting

Seeding rate: 25-30 kg/ha

Spacing: No spacing b/n rows and b/n plants

Time of cultivation and frequency of cultivation: A tef field is ploughed 2-5 times depending on soil type and weed condition. Plowing starts just after harvesting.

Fertilizer recommended: On heavy clay soils (verticols) - 60 kg N and 26 kg P$_2$O$_5$ per ha On sandy clay loam soils (Andosols) - 60 kg N and 26 kg P$_2$O$_5$ per ha

Irrigation amount and rate: No

Major disease, Insect and weeds:

Disease: tef rust, head smudge and damping-off.
Protection measure-spraying tridemorph decrease helminthosporium leafspot.

Insect: Welo bush-cricket, central shootfly and red tef worm
Protection measure-slaing of weeds in the field margins before cereals have headed deprive welo bush-cricket food and reduce its population. Earlysowing of cereals also recommended.
Application of 8-10 kg/ha of 2.6% BHS as dust is effecting in controlling welo bush-cricket.
Spraying Cypermethrin, 25% e.c. (187.5 g.a.i/ha, 750 ml/ha) or Fenitrothion, 50% e.c. (625.0 g.a.i/ha, 1.25 ml/ha) has been found effective in controlling red tef worm.

Recommended weeding practice: hand weeding 25-30 DAE
Second weeding at the stem elongation stage
2, 4-D at the rate of 0.8 to 1.2 kg/ha a.i.
Maturity days:

DZ-01-354 - require 85-130 days to mature depending on the altitude and temperature and the average is 115 days.

DZ-01-196 - it is a late maturing variety but depending on the growing environment it matures in 80-130 days.

DZ-Cr-37 - early maturing variety, requires 80-90 days to mature.

Yield - DZ-01-354  On research station 20-26 q/ha
On farmers field 17-20 q/ha
DZ-01-196  On research station 21 q/ha
On farmers field 17 q/ha
DZ-Cr-37  On research station 20 q/ha
On farmers field 15-17 q/ha
Available Technological Packages for Farm Implements

Name of implement: Erf and Mofer Attached Mould board Plow

Description: The 'Erf' and 'Mofer' Attached Mouldboard plow is a combination of simplicity of Maresha with superior performance of the mouldboard plow bottom.

Application: Primary and secondary tillage

Specification*

- Size Height 19cm, Width 20cm, Length 55 cm
- Weight 5.3 Kg
- Power requirement A pair of oxen

Advantages over existing similar equipment:

1. Deeper plowing (more water retained, roots grow deeper)
2. Complete plowing in one pass (reduction of tillage frequency, more time available for other jobs, reduction of energy spent by oxen
3. Contour plowing (No. need for cross plowing thus reduction of soil erosion)
4. Better weed control
5. Higher grain yield

* Size and weight of implement do not include those of 'Erf' and 'Mofer'
Name of implement: Winged Plow

Description: The winged plow is a slight modification of Maresha in which the two ‘deger’ boards are replaced by metallic wings.

Application: Secondary tillage and planting

Specification*

- Size Height 7.5cm, Width 55.5cm, Length 19 cm
- Weight 3 Kg
- Power requirement A pair of oxen, single ox and a pair of donkeys

Advantages over existing similar equipment:

1. Requires lower draft power than maresha
2. Covers wider area than Maresha
3. Avoids soil inversion when it is not desired
4. Incorporate fertilizer with the soil at a shallower depth during tef planting
5. Gives even and relatively level field compared to maresha

* size and weight do not include those of ‘Erf’, ‘Mofer’, ‘Maresha’ and ‘Wogel’,.
Name of implement: Single Row Planter

Description: The planter is semi automatic because seed and fertilizer metering is not dependant on ground wheels. The planter is mounted on maresha.

Application: Maize, Sorghum and Haricot bean

Specification*

- Size Height 56cm, Width 29cm, Length 32 cm
- Weight 5.4 Kg
- Power requirement A pair of oxen

Advantages over existing similar equipment:

There is no other animal drawn row planter that has been effective in placing seed and fertilizer. Compared to manual placement of seed and fertilizer, the planter saves both labour and time. Only one person can perform row planting. The planter has been extensively used by farmers for the last five years.

* Size and weight do not include those of ‘Erif’, ‘Mofer’, ‘Maresha’ ‘Deger’ and ‘Wogel’.
Name of implement: Ripper

Description: The ripper is a slight modification of the winged plow in which only the cutting blade is removed.

Application: Ripping the soil in rows (before and after rain), carries planter.

Specification*

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height</td>
<td>19.5 cm</td>
</tr>
<tr>
<td>Width</td>
<td>17 cm</td>
</tr>
<tr>
<td>Length</td>
<td>50.1 cm</td>
</tr>
<tr>
<td>Weight</td>
<td>1.5 Kg</td>
</tr>
</tbody>
</table>

Advantages over existing similar equipment:

1. Time and oxen power saving
2. Conservation of soil and water (application of conservation tillage)
3. Operates deeper than maresha
4. Facilitates narrow row planting

* Size and weight do not include those of ‘Erf’, ‘Mofer’, ‘Maresha’ and ‘Wogel’.
Name of implement: Weeder

Description: The weeder is similar to the winged plow but has got a 40 cm wide blade instead of 55 and the rods are inverted.

Application: Inter row weeding for maize and sorghum.

Specification*

- **Size**: Height 7.5cm, Width 40cm, Length 12cm
- **Weight**: 2.5 Kg
- **Power requirement**: A pair of oxen, single ox and a pair of donkeys

Advantages over existing similar equipment:

There is no other similar equipment except the hoe. Compared to manual weeding:

1. It saves labour and time of weeding
2. It earthiness up crops
3. It kills weeds between rows and burries those along the row particularly for open furrow planting system using the row planter

* Size and weight do not include those of ‘Erf’, ‘Mofer’, ‘Wogel and ‘Maresha’.
Name of implement: Single hand operated tie-ridger

Description: The single hand operated tie-ridger is mounted on maresha by removing the deger and wogel

Application: Forming tied ridges

Specification*

* Size Height 26cm, Width 38.5cm, Length 18 cm
* Weight 3.3 Kg
* Power requirement A pair of oxen

Advantages over existing similar equipment:

1. Operated by one hand only
2. Requires less draft power than maresha
3. Operates deeper and wider than maresha
4. The cost is lower than the previous tie-ridger
Name of implement: Multi-crop Thresher

Description: Engine operated axial flow thresher

Application: Maize, Sorghum, Tef, Wheat, Barley etc.

Specification:

- Size: Height 144.6cm, Width 204cm, Length 199 cm
- Weight: 200 Kg
- Power requirement: 8 hp engine

Advantages over existing similar equipment:

1. Can thresh tef in one go
2. Chops straw better
3. Separates straw from grain and chaff
4. Easily transportable in the field either manually or using animals
Name of implement: Maize Sheller

Description: Engine operated axial flow sheller

Application: Maize

Specification:

- Size Height 104cm, Width 131.5cm, Length 162cm
- Weight 250 Kg
- Power requirement 8 hp diesel engine

Advantages over existing similar equipment:

1. High capacity (up to 60 quintal/hr)
2. Clean grain (separated from cob and chaff)
3. Least breakage of grain
Crop: Haricot bean

Variety: Mexican 142

Adaptation zone/area:
- Rainfall: more than 350 to 500 mm
- Altitude: 1400 to 2000 masl
- AEZ: Wide adaptation

Purpose for which the crop is grown:
- Export and Food

Sowing/planting time:

Sowing/planting method:
Seeding rate/ha: -
Broadcasting: 100 – 120 kg/ha
Row planting: 90 – 100 kg/ha

Spacing:
- Between rows: 40 cm
- Between plants: 10 cm

Time of cultivation and frequency of cultivation:

Fertilizer recommended (if any):
- DAP: 100 kg/ha
- Urea: 50 to 100 kg/ha

Irrigation amount and rate (if any):

Major disease, insect and weeds attacking the crop:
- Diseases: Bacterial blight, Anthrachnose, Rust, etc.
- Insects: Bean fly, African boll worm, Bean Stem Maggot, Bean Bruchids
- Weeds: Different grass and broad leaved species

Plant protection measures:
- for diseases: Use of clean seed, crop rotation and use of tolerant/resistant varieties.
- for insects: High seed rate (for BSM), seed dressing with Endosolphan, crop rotation (all for field pests), keep the storage clean, avoid mixture of newly harvested products with previous season’s crop and seed dressing with Premirol Methyl at the rate of 25 gm per 10 kg of seed.
- for weeds: two times hand weeding, herbicide such as Alachlor at the rate of 4 liters/ha.
- IPM
Maturity days from:
- Sowing to harvesting: 95 - 100

Yield Q/ha:
- on research center
- on farmers field: 20 - 22

Food quality results: High canning quality:

Storability potential:
Crop: Haricot bean

Variety: Awash-1

Adaptation zone/area:
- Rainfall: more than 350 to 500 mm
- Altitude: 1400 to 2000 masl
- AEZ: Wider adaptation

Purpose for which the crop is grown: Export and Food

Sowing/planting time:

Sowing/planting method:

Seeding rate/ha: -

Spacing:
- Broadcasting: 95 - 100
- Row planting: 100 - 120
- Between rows: 40 cm
- Between plants: 10 cm

Time of cultivation and frequency of cultivation:

Fertilizer recommended (if any):
- DAP: 100 kg/ha
- Urea: 50 to 100 kg/ha
- Manure:

Irrigation amounts and rate (if any):

Major disease, insect and weeds attacking the crop:
- Diseases: Bacterial blight, Anthrachnose, Rust, etc.
- Insects: Bean fly, African boll worm, Bean Stem Maggot, Bean Bruchids
- Weeds: Different grass and broad leaved species

Plant protection measures:
- for diseases: Use of clean seed, crop rotation and use of tolerant/resistant varieties.
- for insects: High seed rate (for BSM), seed dressing with Endosolphan, crop rotation (all for field pests), keep the storage clean, avoid mixture of newly harvested products with previous season's crop and seed dressing with Premirol Methyl at the rate of 25 gm per 10 kg of seed.
- for weeds: two times hand weeding, herbicide such as Alachlor at the rate of 4 liters/ha.
- IPM
Maturity days from:  
- Sowing to harvesting: 95 - 100

Yield Q/ha:  
- on research center
- on farmers field: 22 -25

Food quality results: good canning quality:

Storability potential:
| **Crop:** | Haricot bean |
| **Variety:** | Awash-melka |
| **Adaptation zone/area:** | - Rainfall: more than 350 to 500 mm  
- Altitude: 1400 to 2000 masl  
- AEZ: |
| **Purpose for which the crop is grown:** | Export and Food |
| **Sowing/planting time:** |  
| **Sowing/planting method:** | - Broadcasting:  
- Row planting:  
- Broadcasting: 100 - 120  
- Row planting: 90 - 100 |
| **Seeding rate/ha:** | -  
- Broadcasting: 100-120  
- Row planting: 90 - 100 |
| **Spacing:** | - Between rows: 40 cm  
- Between plants: 10 cm |
| **Fertilizer recommended (if any):** | - DAP: 100 kg/ha  
- Urea: 50 to 100 kg/ha  
- Manure: |
| **Irrigation amount and rate (if any):** | Rainfed production |
| **Major disease, insect and weeds attacking the crop:** |  
| **Diseases:** | Bacterial blight, Anthracnose, Rust, etc.  
| **Insects:** | Bean fly, African boll worm, Bean Stem Maggot, Bean Bruchids  
| **Weeds:** | Different grass and broad leaved species |
| **Plant protection measures:** |  
| **for diseases:** | Use of clean seed, crop rotation and use of tolerant/resistant varieties.  
| **for insects:** | High seed rate (for BSM), seed dressing with Endosolphan, crop rotation (all for field pests), keep the storage clean, avoid mixture of newly harvested products with previous season’s crop and seed dressing with Premirol Methyl at the rate of 25 gm per 10 kg of seed.  
| **for weeds:** | two times hand weeding, herbicide such as Alachlor at the rate of 4 liters/ha.  
| **IPM** | |
| **Maturity days from:** |  
| **Sowing to flowering:** |  
| **Sowing to harvesting:** | 95 - 100 |
Yield Q/ha:
- on research center
- on farmers field: 22 - 25

Food quality results: Good canning quality

Storability potential:
Crop: Haricot bean

Variety: Red Wolita

Adaptation zone/area:
- Rainfall: more than 350 to 500 mm
- Altitude: 1400 to 2000 masl
- AEZ: Wide adaptation

Purpose for which the crop is grown:
- Food

Sowing/planting time:

Sowing/planting method:
Broadcasting:
Row planting:

Seeding rate/ha: -
Broadcasting: 100 - 120
Row planting: 90 - 100

Spacing:
- Between rows: 40 cm
- Between plants: 10 cm

Fertilizer recommended (if any):
- DAP: 100 kg/ha
- Urea: 50 to 100 kg/ha
- Manure:

Irrigation amount and rate (if any):
Rainfall production

Major disease, insect and weeds attacking the crop:
Diseases: Bacterial blight, Anthrachnose, Rust, etc.
Insects: Bean fly, African boll worm, Bean Stem Maggot, Bean Bruchids
Weeds: Different grass and broad leaved species

Plant protection measures:
- for diseases: Use of clean seed, crop rotation and use of tolerant/resistant varieties.
- for insects: High seed rate (for BSM), seed dressing with Endosolphan, crop rotation (all for field pests), keep the storage clean, avoid mixture of newly harvested products with previous season’s crop and seed dressing with Premiro Methyl at the rate of 25 gm per 10 kg of seed.
- for weeds: two times hand weeding, herbicide such as Alachlor at the rate of 4 liters/ha.
- IPM (Cultival + chemical control)

Maturity days from:
- Sowing to flowering:
- Sowing to harvesting: 95
Yield Q/ha:

- on research center
- on farmers field: 15

Food quality results: acceptable red color

Storability potential:
Crop: Haricot bean

Variety: Brown speckled

Adaptation zone/area: - Rainfall: more than 350 to 500 mm
- Altitude: 1400 to 2000 masl
- AEZ: Widely adapted

Purpose for which the crop is grown: Food

Sowing/planting time:

Sowing/planting method: - Broadcasting: 100 - 110
- Row planting: 80 - 90

Seeding rate/ha:

Spacing: - Between rows: 40 cm
- Between plants: 10 cm

Fertilizer recommended (if any): - DAP: 100 kg/ha
- Urea: 50 to 100 kg/ha
- Manure:

Irrigation amount and rate (if any): Rainfall production

Major disease, insect and weeds attacking the crop:

Diseases: Bacterial blight, Anthrachnose, Rust, etc.
Insects: Bean fly, African boll worm, Bean Stem Maggot, Bean Bruchids
Weeds: Different grass and broad leaved species

Plant protection measures:

- for diseases: Use of clean seed, crop rotation and use of tolerant/resistant varieties.
- for insects: High seed rate (for BSM), seed dressing with Endosolphan, crop rotation (all for field pests), keep the storage clean, avoid mixture of newly harvested products with previous season’s crop and seed dressing with Premirol Methyl at the rate of 25 gm per 10 kg of seed.
- for weeds: two times hand weeding, herbicide such as Alachlor at the rate of 4 liters/ha.
- IPM

Maturity days from:

Sowing to harvesting: 92
Yield Q/ha:
- on research center 20-25
- on farmers field: 15-17

Food quality results:

Storability potential: Good
Crop: Haricot bean

Variety: Roba

Adaptation zone/area:  
- Rainfall: more than 350 to 500 mm  
- Altitude: 1400 to 2000 masl  
- AEZ: Wider adaptation

Purpose for which the crop is grown: Food

Sowing/planting time:

Sowing/planting method:  
- Broadcasting:  
- Row planting:

Seeding rate/ha:  
- Broadcasting: 100 - 120  
- Row planting: 90 - 100

Spacing:  
- Between rows: 40 cm  
- Between plants: 10 cm

Fertilizer recommended (if any):  
- DAP: 100 kg/ha  
- Urea: 50 to 100 kg/ha  
- Manure:

Irrigation amount and rate (if any): Rainfall production

Major disease, insect and weeds attacking the crop:

Diseases: Bacterial blight, Anthrachnose, Rust, etc.
Insects: Bean fly, African boll worm, Bean Stem Maggot, Bean Bruchids
Weeds: Different grass and broad leaved species

Plant protection measures:

- for diseases: Use of clean seed, crop rotation and use of tolerant/resistant varieties.
- for insects: High seed rate (for BSM), seed dressing with Endosolphan, crop rotation (all for field pests), keep the storage clean, avoid mixture of newly harvested products with previous season’s crop and seed dressing with Premirol Methyl at the rate of 25 gm per 10 kg of seed.
- for weeds: two times hand weeding, herbicide such as Alachlor at the rate of 4 liters/ha.
- IPM

Maturity days from:  
- Sowing to harvesting: 95

Yield Q/ha:  
- on research center
- on farmers field: 24

Food quality results: good for shiro, kik, sambussa
Storability potential: very good
Crop: Haricot bean

Variety: Atndaba

Adaptation zone/area:
- Rainfall: more than 350 to 500 mm
- Altitude: 1400 to 2000 masl
- AEZ: Food

Purpose for which the crop is grown:
- Food

Sowing/planting time:

Sowing/planting method:
- Broadcasting:
- Row planting:

Seeding rate/ha:
- Broadcasting: 100 - 120
- Row planting: 90 - 100

Spacing:
- Between rows: 40 cm
- Between plants: 10 cm

Fertilizer recommended (if any):
- DAP: 100 kg/ha
- Urea: 50 to 100 kg/ha
- Manure:

Irrigation amount and rate (if any):
- Rainfall production

Major disease, insect and weeds attacking the crop:

Diseases: Bacterial blight, Anthrachnose, Rust, etc.
Insects: Bean fly, African boll worm, Bean Stem Maggot, Bean Bruchids
Weeds: Different grass and broad leaved species

Plant protection measures:
- for diseases: Use of clean seed, crop rotation and use of tolerant/resistant varieties.
- for insects: High seed rate (for BSM), seed dressing with Endosolphan, crop rotation (all for field pests), keep the storage clean, avoid mixture of newly harvested products with previous season's crop and seed dressing with Premirol Methyl at the rate of 25 gm per 10 kg of seed.
- for weeds: two times hand weeding, herbicide such as Alachlor at the rate of 4 liters/ha.
- IPM

Maturity days from:
- Sowing to harvesting: 92

Yield Q/ha:
- on research center
- on farmers field: 26

Food quality results:

Storability potential:
Crop: Haricot bean

Variety: Gofta

Adaptation zone/area: Rainfall: more than 350 to 500 mm
- Altitude: 1400 to 2000 masl
- AEZ: Eastern highland and related areas

Purpose for which the crop is grown: Food

Sowing/planting time:

Sowing/planting method: Broadcasting: 100-120
- Row planting: 80-90

Seeding rate/ha:

Spacing:
- Between rows: 40 cm
- Between plants: 10 cm

Time of cultivation and frequency of cultivation:

Fertilizer recommended (if any):
- DAP: 100 kg/ha
- Urea: 50 to 100 kg/ha
- Manure:

Irrigation amount and rate (if any): Rainfed production

Major disease, insect and weeds attacking the crop:

Diseases: Bacterial blight, Anthracnose, Rust, etc.

Insects: Bean fly, African boll worm, Bean Stem Maggot, Bean Bruchids

Weeds: Different grass and broad leaved species

Plant protection measures:
- for diseases: Use of clean seed, crop rotation and use of tolerant/resistant varieties.
- for insects: High seed rate (for BSM), seed dressing with Endosolphan, crop rotation (all for field pests), keep the storage clean, avoid mixture of newly harvested products with previous season’s crop and seed dressing with Premirol Methyl at the rate of 25 gm per 10 kg of seed.
- for weeds: two times hand weeding, herbicide such as Alachlor at the rate of 4 liters/ha.

Maturity days from Sowing to flowering: 92

Yield Q/ha
- on research center
- on farmers field: 26

Food quality results:

Storability potential:
Crop: Haricot bean

Variety: Ayenev

Adaptation zone/area:
- Rainfall: more than 350 to 500 mm
- Altitude: 1400 to 2000 masl
- AEZ: Eastern highlands and related areas

Purpose for which the crop is grown: Food

Sowing/planting time:

Sowing/planting method:
- Broadcasting:
- Row planting:

Seeding rate/ha:
- Broadcasting: 100 - 120
- Row planting: 80 - 100

Spacing:
- Between rows: 40 cm
- Between plants: 10 cm

Fertilizer recommended (if any):
- DAP: 100 kg/ha
- Urea: 50 to 100 kg/ha
- Manure:

Irrigation amount and rate (if any): Rainfed production

Major disease, insect and weeds attacking the crop:

Diseases: Bacterial blight, Anthrachnose, Rust, etc.
Insects: Bean fly, African boll worm, Bean Stem Maggot, Bean Bruchids
Weeds: Different grass and broad leaved species

Plant protection measures:
- for diseases: Use of clean seed, crop rotation and use of tolerant/resistant varieties.
- for insects: High seed rate (for BSM), seed dressing with Endosolphan, crop rotation (all for field pests), keep the storage clean, avoid mixture of newly harvested products with previous season's crop and seed dressing with Premirol Methyl at the rate of 25 gm per 10 kg of seed.
- for weeds: two times hand weeding, herbicide such as Alachlor at the rate of 4 liters/ha.
- IPM

Maturity days from Sowing to harvesting: 91

Yield Q/ha
- on research center
- on farmers field: 35

Food quality results:

Storability potential:
Crop: Haricot bean
Variety: Beshbesh

Adaptation zone/area:
- Rainfall: more than 350 to 500 mm
- Altitude: 1400 to 2000 masl
- AEZ:

Purpose for which the crop is grown: Food

Sowing/planting time:

Sowing/planting method:
- Broadcasting:
- Row planting:

Seeding rate/ha:
- Broadcasting: 90 - 100
- Row planting: 70 - 80

Spacing:
- Between rows: 40 cm
- Between plants: 10 cm

Fertilizer recommended (if any):
- DAP: 100 kg/ha
- Urea: 50 to 100 kg/ha
- Manure:

Irrigation amount and rate (if any): Rainfed production

Major disease, insect and weeds attacking the crop:
Diseases: Bacterial blight, Anthrachnose, Rust, etc.
Insects: Bean fly, African boll worm, Bean Stem Maggot, Bean Bruchids
Weeds: Different grass and broad leaved species

Plant protection measures:
- for diseases: Use of clean seed, crop rotation and use of tolerant/resistant varieties.
- for insects: High seed rate (for BSM), seed dressing with Endosolphan, crop rotation (all for field pests), keep the storage clean, avoid mixture of newly harvested products with previous season’s crop and seed dressing with Premirol Methyl at the rate of 25 gm per 10 kg of seed.
- for weeds: two times hand weeding, herbicide such as Alachlor at the rate of 4 liters/ha.

IPM

Maturity days from:
- Sowing to flowering: 83

Yield Q/ha
- on research center
- on farmers field: 25-30

Food quality results:

Storability potential:
<table>
<thead>
<tr>
<th><strong>Crop:</strong></th>
<th>Haricot bean</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Variety:</strong></td>
<td>Melkie</td>
</tr>
<tr>
<td><strong>Adaptation zone/area:</strong></td>
<td>- Rainfall: more than 350 to 500 mm</td>
</tr>
<tr>
<td></td>
<td>- Altitude: 1400 to 2000 masl</td>
</tr>
<tr>
<td></td>
<td>- AEZ:</td>
</tr>
<tr>
<td><strong>Purpose for which the crop is grown:</strong></td>
<td>- Food</td>
</tr>
<tr>
<td><strong>Sowing/planting time:</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Sowing/planting method:</strong></td>
<td>- Broadcasting: 90 - 100</td>
</tr>
<tr>
<td></td>
<td>- Row planting: 70 - 80</td>
</tr>
<tr>
<td><strong>Seeding rate/ha:</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Spacing:</strong></td>
<td>- Between rows: 40 cm</td>
</tr>
<tr>
<td></td>
<td>- Between plants: 10 cm</td>
</tr>
<tr>
<td><strong>Fertilizer recommended (if any):</strong></td>
<td>- DAP: 100 kg/ha</td>
</tr>
<tr>
<td></td>
<td>- Urea: 50 to 100 kg/ha</td>
</tr>
<tr>
<td></td>
<td>- Manure:</td>
</tr>
<tr>
<td><strong>Irrigation amount and rate (if any):</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Major disease, insect and weeds attacking the crop:</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Diseases:</strong></td>
<td>Bacterial blight, Anthrachnose, Rust, etc.</td>
</tr>
<tr>
<td><strong>Insects:</strong></td>
<td>Bean fly, African boll worm, Bean Stem Maggot, Bean Bruchids</td>
</tr>
<tr>
<td><strong>Weeds:</strong></td>
<td>Different grass and broad leaved species</td>
</tr>
<tr>
<td><strong>Plant protection measures:</strong></td>
<td>Use of clean seed, crop rotation and use of tolerant/resistant varieties.</td>
</tr>
<tr>
<td></td>
<td>High seed rate (for BSM), seed dressing with Endosolphan, crop rotation (all for field pests), keep the storage clean, avoid mixture of newly harvested products with previous season’s crop and seed dressing with Premirol Methyl at the rate of 25 gm per 10 kg of seed.</td>
</tr>
<tr>
<td></td>
<td>two times hand weeding, herbicide such as Alachlor at the rate of 4 liters/ha.</td>
</tr>
<tr>
<td><strong>Maturity days from:</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Sowing to flowering:</strong></td>
<td>82</td>
</tr>
<tr>
<td><strong>Yield Q/ha:</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>on research center</td>
</tr>
<tr>
<td></td>
<td>on farmers field: 23</td>
</tr>
<tr>
<td><strong>Food quality results:</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Storability potential:</strong></td>
<td></td>
</tr>
</tbody>
</table>
Crop: Haricot bean

Variety: Zebra

Adaptation zone/area:
- Rainfall: more than 350 to 500 mm
- Altitude: 1400 to 2000 masl
- AEZ: Food

Purpose for which the crop is grown:

Sowing/planting time:

Sowing/planting method:
- Broadcasting: 100-120
- Row planting: 80 - 90

Seeding rate/ha:

Spacing:
- Between rows: 40 cm
- Between plants: 10 cm

Fertilizer recommended (if any):
- DAP: 100 kg/ha
- Urea: 50 to 100 kg/ha
- Manure:

Irrigation amount and rate (if any): 

Major disease, insect and weeds attacking the crop:

Diseases: Bacterial blight, Anthrachnose, Rust, etc.
Insects: Bean fly, African boll worm, Bean Stem Maggot, Bean Bruchids
Weeds: Different grass and broad leaved species

Plant protection measures:
- for diseases: Use of clean seed, crop rotation and use of tolerant/resistant varieties.
- for insects: High seed rate (for BSM), seed dressing with Endosolphan, crop rotation (all for field pests), keep the storage clean, avoid mixture of newly harvested products with previous season’s crop and seed dressing with Premirol Methyl at the rate of 25 gm per 10 kg of seed.
- for weeds: two times hand weeding, herbicide such as Alachlor at the rate of 4 liters/ha.
- IPM

Maturity days from
- Sowing to flowering: 97

Yield Q/ha
- on research center
- on farmers field: 29

Food quality results:

Storability potential:
Crop: Haricot bean
Variety: Gobe Rasha

Adaptation zone/area:
- Rainfall: more than 350 to 500 mm
- Altitude: 1400 to 2000 masl
- AEZ: Humid tropics

Purpose for which the crop is grown: Food

Sowing/planting time:

Sowing/planting method:
- Broadcasting: 90 - 100
- Row planting: 70 - 80

Seeding rate/ha:

Spacing:
- Between rows: 40 cm
- Between plants: 10 cm

Fertilizer recommended (if any):
- DAP: 100 kg/ha
- Urea: 50 to 100 kg/ha
- Manure:

Irrigation amount and rate (if any):

Major disease, insect and weeds attacking the crop:
Diseases: Bacterial blight, Anthracnose, Rust, etc.
Insects: Bean fly, African boll worm, Bean Stem Maggot, Bean Bruchids
Weeds: Different grass and broad leaved species

Plant protection measures:
- for diseases: Use of clean seed, crop rotation and use of tolerant/resistant varieties.
- for insects: High seed rate (for BSM), seed dressing with Endosolphan, crop rotation (all for field pests), keep the storage clean, avoid mixture of newly harvested products with previous season’s crop and seed dressing with Premirol Methyl at the rate of 25 gm per 10 kg of seed.
- for weeds: two times hand weeding, herbicide such as Alachlor at the rate of 4 liters/ha.

Maturity days from
- Sowing to flowering: 95

Yield Q/ha
- on research center
- on farmers field: 25

Food quality results:
Storability potential:
Crop: Haricot bean

Variety: Tabor

Adaptation zone/area:
- Rainfall: more than 350 to 500 mm
- Altitude: 1400 to 2000 masl
- AEZ: Southern Ethiopia

Purpose for which the crop is grown: Food

Sowing/planting time:

Sowing/planting method:
- Broadcasting: 100 - 120
- Row planting: 80 - 90

Seeding rate/ha:

Spacing:
- Between rows: 40 cm
- Between plants: 10 cm

Fertilizer recommended (if any):
- DAP: 100 kg/ha
- Urea: 50 to 100 kg/ha
- Manure:

Irrigation amount and rate (if any):

Major disease, insect and weeds attacking the crop:
Diseases: Bacterial blight, Anthrachnose, Rust, etc.
Insects: Bean fly, African boll worm, Bean Stem Maggot, Bean Bruchids
Weeds: Different grass and broad leaved species

Plant protection measures:
- for diseases: Use of clean seed, crop rotation and use of tolerant/resistant varieties.
- for insects: High seed rate (for BSM), seed dressing with Endosolphan, crop rotation (all for field pests), keep the storage clean, avoid mixture of newly harvested products with previous season's crop and seed dressing with Premirol Methyl at the rate of 25 gm per 10 kg of seed.
- for weeds: Two times hand weeding, herbicide such as Alachlor at the rate of 4 liters/ha.

Maturity days from
- Sowing to flowering: --
- Sowing to harvesting: --

Yield Q/ha
- on research center
- on farmers field: 25

Food quality results:

Storability potential:
Crop: Tomato  
Variety: Marglobe  
Growth habit: Tall  
Adaptation Zone/Area: Rainfall: Irrigated  
Altitude: 600-2000  
AEZ: Center rift valley areas, western and Eastern  
Purpose for which the crop is grown: For Export  
For Food  
Planting/Transplanting time: August - November  
Planting method:  
- Direct  
- Transplant  
Seeding rate/ha: For Direct 3-4 kg  
For Transplant 200-300gm  
Stage of/ transplanting: 28-35 days after sowing or 2-3 true leaf stage or 12-15cm of height  
Spacing: B/n rows 100 cm  
B/n plants 30 cm  
Plant population/ha: 33,330  
Fertilizer recommended (if any): DAP 200 kg/ha at planting transplanting  
Urea 100 kg/ha insplit application i.e. 5 kg/ha side dressing at 1½ month, 50 kg/ha at 2½ months after transplanting.  
Time of cultivation and frequency of cultivation: 2 weeks after transplanting and 3-4 times of cultivation required  
Irrigation amount and frequency of cultivation: Irrigation Depends on weather and soil condition; Hence, at early stage less amount of water with high frequency and at later stage high amount of water with less frequency is reminded or irrigate 5-7 days interval at early stage and 7-10 days interval at latter stage.
Major disease: (Septoria leas spot, late blight, early blight, powdery molder, virus, nematod)

Major insect: Potato tuber moth, African ball worm.

Major weeds: Orobanche

Plant protection measures: For disease Captatol (0.2% Redomil 0.23%) at 7 days interval
For insect Cypermentrin, Karath at 100 ai/ha
For weeds hand weeding (removing the weeds before flowering and burning in recommended.

Maturity days: From sowing to transplanting 28-35 days but depends on climatic conditions From sowing to harvesting 100-110 days

Yield Q/ha: On research center 320-350 On Farmers field 90-100

Fruit shape: Globular

Food quality result: Good for fresh market

Storability potential: Medium
| **Crop:** | Tomato |
| **Variety:** | Melkashola |
| **Growth habit:** | Short |
| **Adaptation Zone/Area:** | Rainfall: Irrigated  
Altitude: 1000-2000  
AEZ: Central rift valley areas |
| **Purpose for which the crop is grown:** | For export  
For food  
For raw material |
| **Planting/Transplanting time:** | August - November |
| **Planting method:** | Direct  
Transplant |
| **Seeding rate/ha:** | For Direct 3-4 kg  
For Transplant 200-300gm |
| **Stage of/ transplanting:** | 28-35 days after serving or 2-3 true leaf stage or 12-15 cm of height |
| **Spacing:** | B/n rows 100 cm  
B/n plants 30 cm |
| **Plant population/ha:** | 33,330 |
| **Fertilizer recommended (if any):** | DAP 200 kg/ha at planting transplanting  
Urea 100 kg/ha side insplit application i.e. 50 kg/ha at 1½ and 50 kg/ha at 2½ month after transplanting |
| **Time of cultivation and frequency of cultivation:** | Time of cultivation starts soon weeded are observed and 3-4 times of weeding is recommended. |
| **Irrigation amount and frequency of cultivation:** | It depends on climatic and soil condition, However, at early stage less amount of water with high frequency and at later stage high amount of water with less frequency is reminded or irrigate at 5-7 days interval at early stage and 10-12 days interval at latter stage. |
| Major disease:                                                                 | (Septoria leas spot, late blight, early blight, powdery molder, virus, nematod) |
| Major pest:                                                                    | Potato tuber moth, African ball worm.                                           |
| Major weeds:                                                                   | Orobanche                                                                      |
| Plant protection measures:                                                     |                                                                               |
|   Disease:                                                                     | For disease Captatol (0.2% Redomil 0.23%) at 7 days interval                  |
|   Pests:                                                                       | For insect Cypermentrin, Karath at 100 ai/ha                                  |
|   Weeds:                                                                       | Hand weeding (remaining the weeds before flowering and burning is recommended) |
| Maturity days:                                                                 | From sowing to transplanting 28-40 days                                         |
|                                                                               | From sowing to harvesting 100-110 days                                         |
| Yield Q/ha:                                                                   | On research center 400-450                                                    |
|                                                                               | On Farmers field 150-200                                                       |
| Fruit shape:                                                                  | Cylenderical                                                                   |
| Food quality result:                                                          | Very good for local wot and processing industry.                               |
| Storability potential:                                                        | High                                                                           |
Crop: Tomato
Variety: Money maker
Growth habit: Tall

Adaptation Zone/Area:
Rainfall: Irrigated
Altitude: 500-2000
AEZ: Central rift valley areas, western and eastern part of the country.

Purpose for which the crop is grown:
For export
For food

Planting/Transplanting time:
August - November

Planting method:
Direct
Transplant

Seeding rate/ha:
For Direct 3-4 kg
For Transplant 200-300gm

Stage of transplanting:
28-35 days after serving or 2-3 true leaf stage or 12-15cm of height

Spacing:
B/n rows 100 cm
B/n plants 30 cm

Plant population/ha:
33,330

Fertilizer recommended (if any):
DAP 200 kg/ha at planting transplanting
Urea 100 kg/ha side insplit application i.e 50 kg/ha at 1½ and 50 kg/ha at 2½ month after transplanting

Time of cultivation and frequency of cultivation:
2 weeks after transplanting and 3-4 times of cultivation required

Irrigation amount and frequency of cultivation: Depends on climatic and soil condition; However, at early stage less amount but high frequency and at later stage high amount but less frequency of irrigation is recommended or irrigate 5-7 days interval at early stage and 10-12 days interval at the latter stage.
Major disease: (Septoria leas spot, late blight, early blight, powdery molder, virus)

Major insect: Potato tuver moth, African ball worm.

Major weeds: Orobanche

Plant protection measures:
   Disease: For disease Captatol (0.2% Redomil 0.23%) at 7 days interval
   Pest: For insect Cypermentrin, Karath at 100 ai/ha
   Weeds: For hand weeding (weeding the weeds before flowering and burning is recommended.

Maturity days: From sowing to transplanting 28-35 days but depends on climatic conditions
   From sowing to harvesting 110-120 days

Yield Q/ha:
   On research center 300
   On Farmers field 90-100

Fruit shape: Round

Food quality result: Preferred for fresh market

Storability potential: Medium
Crop: Tomato  
Variety: Roma VF  
Growth habit: Short  

Adaptation Zone/Area: Rainfall: Irrigated  
Altitude: 700-2000  
AEZ: Central rift valley areas  

Purpose for which the crop is grown: Export X  
Food X  
Raw material X  

Planting/Transplanting time: August - November  
Planting method: Direct X  
Transplant X  

Seeding rate/ha: For Direct 3-4 kg  
For Transplant 200-300gm  

Stage of/ transplanting: 28-35 days after transplanting or at 2-3 true leaf stage  

Spacing:  
B/n rows 100 cm  
B/n plants 30 cm  

Plant population/ha: 33,330  

Fertilizer recommended (if any): DAP 200 kg/ha broadcasted at saving/transplanting  
Urea 100 kg/ha side insplit application i.e 50 kg/ha at 1½ and 50 kg/ha at 2½ month after transplanting  

Time of cultivation and frequency of cultivation:  
Start cultivation soon weeds are observed and 3-4 cultivation required.  

Irrigation amount and frequency of cultivation:  
Irrigated depends on climatic and soil condition; Hence, less amount with high frequency and at later stage high amount of water with less frequency is recommended or irrigate 5-7 days interval at early stage and 10-12 days interval at the latter stage.  

Major disease, Insect and weeds attacking the crop:  
Major disease (septoria leas spot, late blight, early blight, powdery molder, virus, nematod)  
Major pest potato tuber moth, African ball worm.
Plant protection measures: For disease Captatol (0.2% Redomil 0.23%) at 7 days interval

For insect Cypermentrin, Karath at 100 gas/ha
For weeds hand weeding

Maturity days:
From sowing to transplanting 28-35 days but depends on climatic conditions
From sowing to harvesting 95-100 days

Yield Q/ha:
On research center 300-400
On Farmers field 90-100

Fruit shape:
Pear

Food quality result:
Very good for processing industry

Storability potential:
High
Crop: Pepper
Variety: Mareko fana
Growth habit: Short
Adaptation Zone/Area: Rainfall: Altitude: AEZ: 
Purpose for which the crop is grown: Export Food Raw material 
Planting/Transplanting time: Mid March - April (Rainfed)
Planting method: Direct 
Seeding rate/ha: For Direct For Transplant 0.75 -1 kg
Stage of/ transplanting: 
Spacing: B/n rows 70 B/n plants 30
Plant population/ha: 41,670
Fertilizer recommended (if any): DAP 200 kg/ha broadcasted at transplanting Urea 100 kg/ha insplit application i.e 50 kg/ha at 1⅔ months and 50 kg/ha at 2⅔ months after transplanting Manure (if any) Compost (if any)
Time of cultivation and frequency of cultivation: Start cultivation soon weeds are observed and 3-4 cultivation required.
Irrigation amount and frequency of cultivation: Rainfed production
Major disease, Insect and weeds attacking the crop: Plant protection measures: For disease are clean seed For insect Cypermentnin or Karath For weeds hand weeding
Maturity days: From sowing to transplanting 50-60 days after sowing or at six true leaf stage, at 15-20cm receipt From sowing to harvesting 220-240
Yield Q/ha: On research center 15 On Farmers field 8-10
Fruit shape: Dark red
Food quality result: Preferred by local consumers
Storability potential: Good
Crop: Pepper

Variety: Bako local

Growth habit: Short

Adaptation Zone/Area: Rainfall: -
Altitude: -
AEZ: -

Purpose for which the crop is grown: Export
Food
Raw material -

Planting/Transplanting time: Mid March: April (Rainfed)

Planting method: Direct
Transplant X

Seeding rate/ha:
For Direct -
For Transplant 0.75 - 1 kg

Stage of/ transplanting:

Spacing:
B/n rows 70
B/n plants 30

Plant population/ha: 41, 670

Fertilizer recommended (if any): DAP 200 kg/ha broadcasted at transplanting
Urea 100 kg/ha insplit application i.e 50 kg/ha at 1½ months and 50 kg/ha at 2½ months after transplanting

Time of cultivation and frequency of cultivation: Start cultivation soon weeds are observed and 3-4 cultivation required.

Irrigation amount and frequency of cultivation: Rainfed production

Major disease, Insect and weeds attacking the crop:

Plant protection measures: For disease are clean seed
For insect Cypermethrin or Karath
For weeds hand weeding

Maturity days:
From sowing to transplanting 50-60 days after sowing or at six true leaf stage, at 15-20cm receipt
From sowing to harvesting 130-140

Yield Q/ha:
On research center 25
On Farmers field 8-10

Fruit shape: Light red

Food quality result: Less preferred by local consumers

Storability potential: Good
Crop: Tomato

Variety: Melka salsa

Growth habit: Short

Adaptation Zone/Area: Rainfall: Irrigated
Altitude: 1000-2000
AEZ: Central rift valley areas

Purpose for which the crop is grown: Export X
Food X
Raw material X

Planting/Transplanting time: August - November

Planting method: Direct X
Transplant X

Seeding rate/ha:
For Direct 3-4 kg
For Transplant 200 -300 gm

Stage of/ transplanting: 30-40 days after sowing or 2-3 true leaf stage or 12-15 cm height.

Spacing:
B/n rows 100
B/n plants 30

Plant population/ha: 33, 330

Fertilizer recommended (if any): DAP 200 kg/ha broadcasted at sowing/transplanting
Urea 100 kg/ha insplit application i.e 50 kg/ha at 1½ months and 50 kg/ha at 2½ months after transplanting

Time of cultivation and frequency of cultivation:
Start cultivation soon weeds are observed and 3–4 cultivations are required.

Irrigation amount and frequency of cultivation:
Depends on climatic and soil condition but less amount of water with high frequency and at later stage high amount of water with less frequency of watering in recommended.

Major disease, Insect and weeds attacking the crop:
Major disease (Septoria leaf spot, late and early blight, powdery mildew).
Major pests (ABW and PTM)
Plant protection measures:

- For disease: Redimil, Mancozeb, Pencozeb.
- For insect: Karath and Cypermenthrin
- For weeds: Hand weeding

Maturity days:

- From sowing to transplanting: 30-40 days (but depends on climatic condition)
- From sowing to harvesting: 100-120 days

Yield Q/ha:

- On research center: 400-430
- On Farmers field: 150-200

Fruit shape: Pear

Food quality result: Very good for processing industry

Storability potential: High
Crop: Onion
Variety: Adama Red

Adaptation Zone/Area: Rainfall: Irrigated
Altitude: 500-2000
AEZ: Central rift valley, Western, Eastern part of Ethiopia

Purpose for which the crop is grown: Export x Food x Raw material -

Planting/Transplanting time: August - December

Planting method: Direct
Transplant

Seeding rate/ha: For Direct 7 kg
For Transplant 3.4 - 4.00 kg

Stage of/transplanting: 40-45 days after sowing or 2-3 true leaf stage or 12-15 cm height.

Spacing: B/n rows 40x20 cm (from + bed)
B/n plants 10 cm

Plant population/ha: 333, 330

Fertilizer recommended (if any): DAP 200 kg/ha broadcasted at sowing/transplanting
Urea 100 kg/ha insplit application i.e 50 kg/ha at 1½ months and 50 kg/ha at 2½ months after transplanting

Time of cultivation and frequency of cultivation: Start cultivation soon weeds are observed and 3-4 cultivation required.

Irrigation amount and frequency of cultivation: Depends on climatic and soil condition but less amount of water with high frequency and at later stage high amount of water with less frequency of watering in recommended.
**Major disease, Insect and weeds attacking the crop:**

<table>
<thead>
<tr>
<th>Major disease</th>
<th>Redmil, MZ 63.5 kg/ha, Mancozeb, Cypermethrin Karath at 100 gm ai/ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major pests</td>
<td>Thrips</td>
</tr>
<tr>
<td>Plant protection measures:</td>
<td>For disease</td>
</tr>
<tr>
<td></td>
<td>Redmil, MZ 63.5 kg/ha, Mancozeb, Cypermethrin Karath at 100 gm ai/ha</td>
</tr>
<tr>
<td></td>
<td>Thrips</td>
</tr>
</tbody>
</table>

**Maturity days:**
- From sowing to transplanting: 40-45 days after sowing
- From sowing to harvesting: 120-135 days

**Bulb colour:**
- Dark red

**Yield Q/ha:**
- On research center: 300-350
- On Farmers field: 100-120

**Food quality result:**
- Good for local wot preparation

**Storability potential:**
- Medium
Crop: Onion  
Variety: Melkam  

<table>
<thead>
<tr>
<th>Adaptation Zone/Area</th>
<th>Rainfall</th>
<th>Altitude</th>
<th>AEZ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central rift valley, Western, Eastern part of Ethiopia</td>
<td>Irrigated 500-2000</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Purpose for which the crop is grown: Export  
Food  
Raw material  

Planting/Transplanting time: August - December  
Planting method: Direct  
Transplant  

| Seeding rate/ha | For Direct | 7 kg  
| For Transplant | 3.4 - 4.00 kg  

Stage of transplanting: 40-45 days after sowing or 2-3 true leaf stage or 12-15 cm height.  

Spacing:  
B/n rows  40x20 cm (from + bed)  
B/n plants  10 cm  

Plant population/ha: 333,330  

Fertilizer recommended (if any):  
DAP 200 kg/ha broadcasted at sowing/transplanting  
Urea 100 kg/ha insplit application i.e 50 kg/ha at 1½ months and 50 kg/ha at 2½ months after transplanting.  

Time of cultivation and frequency of cultivation:  
Start cultivation soon weeds are observed and 3-4 cultivation required.  

Irrigation amount and frequency of cultivation:  
Depends on climatic and soil condition but less amount of water with high frequency and at later stage high amount of water with less frequency of watering in recommended.
Major disease, Insect and weeds attacking the crop:
Major disease (Purple blotch, powdery mildew).
Major pests (Thrips)

Plant protection measures:
For disease Redimil, MZ 63.5 kg/ha, Mancozeb,
For insect Cypermentrin Karath at 100 gm ai/ha
For weeds Hand weeding

Maturity days:
From sowing to transplanting 40-45 days after sowing
From sowing to harvesting 120-135 days

Bulb colour:
Red

Yield Q/ha:
On research center 350-400
On Farmers field 100-120

Food quality result:
Good for local wot preparation

Storability potential:
Medium
| **Crop:** | Onion |
| **Variety:** | Red Creole |
| **Growth habit:** | Short |
| **Adaptation Zone/Area:** | Rainfall: Irrigated |
| | Altitude: 500-2000 |
| | AEZ: Central rift valley, Western, Eastern part of Ethiopia |
| **Purpose for which the crop is grown:** | Export X |
| | Food X |
| | Raw material - |
| **Planting/Transplanting time:** | August - December |
| **Planting method:** | Direct X |
| | Transplant X |
| **Seeding rate/ha:** | For Direct 7 kg |
| | For Transplant 3.4 - 4 kg |
| **Stage of transplanting:** | 40-45 days after sowing or 2-3 true leaf stage or 12-15 cm height. |
| **Spacing:** | B/n rows 40x20 cm (from + bed) |
| | B/n plants 10 cm |
| **Plant population/ha:** | 333, 330 |
| **Fertilizer recommended (if any):** | DAP 200 kg/ha broadcasted at sowing/transplanting |
| | Urea 100 kg/ha insplit application i.e 50 kg/ha at 1½ months and 50 kg/ha at 2½ months after transplanting. |
| **Time of cultivation and frequency of cultivation:** | Start cultivation soon weeds are observed and 3-4 cultivation required. |
| **Irrigation amount and frequency of cultivation:** | Depends on climatic and soil condition but less amount of water with high frequency and at later stage high amount of water with less frequency of watering in recommended. |
Major disease, Insect and weeds attacking the crop:

Major disease (Purple blotch, powdery mildew).
Major pests (Thrips)

Plant protection measures:
For disease: Redimil, MZ 63.5 kg/ha,
Mancozeb,
For insect: Cypermentrin Karath at 100 gm ai/ha
For weeds: Hand weeding

Maturity days:
From sowing to transplanting 40-45 days after sowing
From transplanting to harvesting 130-140 days

Bulb colour: Light red

Yield Q/ha:
On research center 300-350
On Farmers field 90-100

Food quality result: Less preferred

Storability potential: Good
## Plant pathology extension packages for major crops diseases

<table>
<thead>
<tr>
<th>Crop</th>
<th>Major disease</th>
<th>Control measure</th>
<th>Rate of application</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tomato</td>
<td>Late blight</td>
<td>Fungicide spray</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1. Ridomil MZ 63.5 WP</td>
<td>3.5 kg/ha</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Ridomil Gold*</td>
<td>350g/100lit.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Mancozeb*</td>
<td>2.5 kg/ha</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>4. Fungomil 72 WP*</td>
<td>2.5 kg/ha</td>
<td></td>
</tr>
<tr>
<td>Onion</td>
<td>Purple blotch</td>
<td>Fungicide spray</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1. Mancozeb</td>
<td>3 kg/ha</td>
<td></td>
</tr>
<tr>
<td>Sorghum</td>
<td>Loose smut</td>
<td>Seed dressing chemicals</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1. Thiram</td>
<td>2.5 g a.i. per kg.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Apron star</td>
<td>1.05 g a.i. per kg.</td>
<td></td>
</tr>
<tr>
<td>Sorghum</td>
<td>Covered smut</td>
<td>Seed dressing chemicals</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1. Thiram</td>
<td>2.5 g a.i. per kg.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Apron star</td>
<td>1.05 g a.i. per kg.</td>
<td></td>
</tr>
<tr>
<td>Sorghum</td>
<td>Loose smut</td>
<td>Seed treatment using Livestock</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>urine (Cow, Goat)</td>
<td>500 ml of urine + 500 ml of water</td>
<td>Seeds should properly soaked for 20 minutes and sun dried</td>
</tr>
</tbody>
</table>

* Fungicides on pipeline (Under verification stage)
### Plant pathology extension packages for major crops diseases

<table>
<thead>
<tr>
<th>No.</th>
<th>Crop</th>
<th>Major insects affecting crops</th>
<th>Methods of control</th>
</tr>
</thead>
</table>
| 1   | Sorghum  | Stalk borer<br>Bursola fœna<br>Chilo partellus | Insecticide (cyhalothrin 5% EC 16 g a.i./ha) at 15 and 45 days after emergence  
- Inter cropping sorghum with legumes 
- Early planting at the beginning of rain 
- Horizontal placement of stalks in the sun against diapausing larvae |
|     |          |                               | Inter cropping sorghum with legumes  
Early planting at the beginning of rain  
Horizontal placement of stalks in the sun against diapausing larvae |
| 2   | Bean     | Bean stem magots (Bean fly)   | Early planting soon after the onset of rains  
- Closed spacing  
- Seed dressing with Endosulfan at the rate of 5 g a.i./kg of seed |
| 3   | Onion    | Onion thrips<br>Thrips tabaci | Deep seedlings in 0.1% a.i. diazinon  
- Spray with cypermethrin at the rate of 50-75 g a.i when the population reaches threshold level (5 thrips per plant)  
- Cyhalothrine (5% EC) at the rate of 320 ml/ha |
| 4   | Tomato   | Potatotuber moth (Phthorimaea opercaulily and African bollworm (Helicoverpa armigera) | Using  
Resistant varieties: Pusaerly duwarf, Pusaruby, Seedathing and Serio (Melkasalsa)  
- Spray with Cypermethrine at the rate of 75 g a.i./ha or Cyhalotrine (5% EC) at the rate of 320 ml/ha |
| 5   | Citrus   | Red scale                     | White oil (summer oil) 2% a.i. about 3 spray is needed, on heavy infested trees, one in March/April and 1-2 in September. |
# Weed science research section at MARC

<table>
<thead>
<tr>
<th>Crops</th>
<th>Cultural weed control method in week</th>
<th>Herbicidal weed control rules/ha &amp; water/ha</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cereals</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wheat</td>
<td>4 week to 6 weeks</td>
<td>1 l/ha of, 4-D for broad leaf</td>
<td>Weeds with 250-300 l of water/ha</td>
</tr>
<tr>
<td>Teff</td>
<td>5 &quot; 9 &quot;</td>
<td>1 l/ha of puma supper</td>
<td>The water required is the same as above</td>
</tr>
<tr>
<td>Maize</td>
<td>3 &quot; 6 &quot;</td>
<td>1 l/ha of 2, 4-D</td>
<td></td>
</tr>
<tr>
<td>Sorghum</td>
<td>4 &quot; 6 &quot;</td>
<td>2 kg a.i/ha of metalachlor as pre emergence water required is 250-300 l/ha</td>
<td></td>
</tr>
<tr>
<td><strong>Low land pulses</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Haricot bean</td>
<td>5 weeks to 8 weeks</td>
<td>1.6 kg a.i/ha as pre-emergence water required is 250-300 l/ha water</td>
<td>250-300 l/ha of water</td>
</tr>
<tr>
<td>Cowpea</td>
<td>2 &quot; 6 &quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Vegetables</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tomato</td>
<td>4 weeks to 8 weeks</td>
<td>Methobromourom 2.0 kg a.i/ha as post emergence, the water requirement for spraying the chemicals are almost in same range i.e 250-300 l/ha</td>
<td>250-300 l/ha</td>
</tr>
<tr>
<td>Onion</td>
<td>4 &quot; 8 &quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capsicum</td>
<td>5 &quot; 8 &quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Fruits</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oranges</td>
<td>Slashing/moving both broad leaves or grass weeds when they are actively growing a.i active ingredient and after transplanting</td>
<td>The herbicide used to control all weeds as non-selective is round-up/glyphosate rate is 5 l product/ha set/prod/ha of round up with 250-300 l water/ha.</td>
<td></td>
</tr>
<tr>
<td>Mandarins</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grapes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bananas</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Citrus and Banana Potential Varieties and their Recommended Spacings

A. Citrus

Potential orange varieties
a) Campbell Valencia
b) Olinda Valencia
c) Hamlin
d) Pine Apple Sweet Orange
e) Parent Washington navel
f) Jaffa

Potential mandarin varieties
a) Clementine
b) Fair child
c) Nova

Potential lime varieties
a) Mexican lime
b) Bears lime

Potential lemon varieties
a) Allen Eureka
b) U.C.R. improved

Recommended Spacing
a) Orange – 7-9m (between plants and rows)
b) Mandarin – 6-7m (b/n plants and rows)
c) Lime and lemon - 7-9m (b/n plants and rows)

Recommended planting time
- Mostly when the rainy season starts (Early July)

Depth of planting
- Width of hole =75cm
- Depth of hole =75cm

Recommended fertilizer application - depends on soil condition but for Melkassa and similar areas apply

a) At planting time
   - Mix the top soil with 200 grams of both DAP & urea by adding 2 bucket of manure and place the mixture back to the hole for decomposition.

b) At fruiting time
   - 500 grams of DAP/tree
   - 500 grams of urea/tree

Apply the above amount twice in a year i.e., when the rainy season starts and when supplementary irrigation starts.

POTENTIAL ROOT STALKS
Orange
- Volka Meriana, carrizo citrange
- Sour orange

Mandarin
- Sour orange, valkamariana
- Cleopatra mandarin
Lime & lemon  
- Macrophyla, rangpur lime, volkamariana

Major disease phytophtera

Control measure – use resistant root stalk varieties

Major insect – Red scale, leaf minor and thrips

Control measure
  - use Altracide at the rate of 1ml/1 liter of water twice a year
  - white oil 2%

Irrigation (supplementary)
  - Apply once every 7-10 days until the plants are well established and every 15 days there after

B. Banana

Recommended banana varieties
  a) Poyo
  b) Giant Cavandish

Spacing  
2.5m b/n plants and b/n rows

Planting hole
  - Depth 50 cm
  - Width 50cm

Fertilizer recommendation - usually depends on soil condition, However for Melkassa and similar areas apply at planting
  - Urea 100 grams
  - DAP 100 grams
  - Manure 1 Bucket

Irrigation
  Every 10-15 days out usually depend on the soil and climatic conditions.
<table>
<thead>
<tr>
<th>No</th>
<th>Variety</th>
<th>Year of Introduction</th>
<th>Rainfall (mm)</th>
<th>Status</th>
<th>Seedling</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Hass (Flower type A)</td>
<td>1986</td>
<td>☐ 1000</td>
<td>Supplemental irrigation is used if it can be grown below this amount of rainfall.</td>
<td>☐ 1000</td>
<td>Upper Awash Agroindustry Enterprise (UAAIE) and Ziway Farm and Melkassa Agricultural Research Center.</td>
</tr>
<tr>
<td>2</td>
<td>Pinkerton (A),</td>
<td>1986</td>
<td>☐ 1000</td>
<td>Supplemental irrigation is used if it can be grown with lower rainfall.</td>
<td>☐ 1000</td>
<td>Upper Awash Agroindustry Enterprise, Ziway Farm and Melkassa Agricultural Research Center.</td>
</tr>
<tr>
<td>3</td>
<td>Ettinger (A),</td>
<td>1986</td>
<td>☐ 1000</td>
<td>Supplemental irrigation is used if it can be grown with lower rainfall.</td>
<td>☐ 1000</td>
<td>Upper Awash Agroindustry Enterprise, Ziway Farm and Melkassa Agricultural Research Center.</td>
</tr>
<tr>
<td>4</td>
<td>Fuerte (Flower type B)</td>
<td>1986</td>
<td>☐ 1000</td>
<td>Supplemental irrigation is used if it can be grown with lower rainfall.</td>
<td>☐ 1000</td>
<td>Upper Awash Agroindustry Enterprise, Ziway Farm and Melkassa Agricultural Research Center.</td>
</tr>
<tr>
<td>5</td>
<td>Nahal (B)</td>
<td>1986</td>
<td>☐ 1000</td>
<td>Supplemental irrigation is used if it can be grown with lower rainfall.</td>
<td>☐ 1000</td>
<td>Upper Awash Agroindustry Enterprise, Ziway Farm and Melkassa Agricultural Research Center.</td>
</tr>
<tr>
<td>6</td>
<td>Bacon (B)</td>
<td>1986</td>
<td>☐ 1000</td>
<td>Supplemental irrigation is used if it can be grown with lower rainfall.</td>
<td>☐ 1000</td>
<td>Upper Awash Agroindustry Enterprise, Ziway Farm and Melkassa Agricultural Research Center.</td>
</tr>
</tbody>
</table>