



**Improving Small-Scale Farmers' Market-Oriented Agriculture Project (ISM<sup>AP</sup>)**

**Technical Manual for Horticulture Crops in *Minia* and *Assiut* Governorates**

March 2019

ISM<sup>AP</sup>



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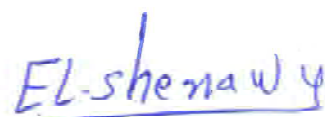
**In the Name of God, most gracious, most merciful**

The Government of Egypt aims at achieving economic welfare for agricultural communities in governorates. Great attention is paid to the poorest areas to improve the living conditions of rural inhabitants. Strategic goals were formulated in the Sustainable Agriculture Development Strategy 2030 to realize that purpose. Technical cooperation with foreign countries is utilized, and the 'Improving Small-Scale Farmers' Market-Oriented Agriculture Project (ISMAP)' in cooperation with Japan International Cooperation Agency (JICA) represents one example of this type of partnership.

ISMAP focused on increasing income of the small-scale farmers. Participation and supervision of agricultural cooperatives in Minia and Assuit assisted project implementation. In ISMAP, farming as business based on market needs was promoted in order to reach high productivity and income increase to realize farmers' welfare.

A series of activities was conducted by the technical cooperation of JICA to achieve these strategic goals and to empower both farmers and women. Farmers were guided to know the market needs. ISMAP, which has been implemented in villages of Minia and Assuit since 2014, ends in May 2019. During the project period, it achieved positive and desired results. It helped to increase the incomes of small scale farmers as well as empowering women.

I congratulate the officers and experts of the implementation team to have achieved the objective of the project and express sincere appreciation to JICA for cooperating with the Ministry for this implementation. As an output of the project, ISMAP has developed manuals and guidelines presented herewith. I sincerely hope these documents would be fully utilized to extend the ISMAP approach throughout rural Egypt.



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March 2019







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## Cultivation Manual for Horticulture Crops in Minia and Assiut Governorates

### **Tomato**

#### • **Introduction**

Tomato is one of the self-pollinate vegetables, and it belongs to the Eggplant family. It takes the first place among the vegetables concerning cultivation area, production, and consumption amount in Egypt. The cultivation area reaches about 500 to 550 thousand feddan including different seasons, and the total production is approximately 8 to 9 million tons per year.



Tomato can be cooked for many types of foods. It is a good source of vitamin C, calcium, phosphorus, iron. It also contains a high percentage of vitamin A (beta-carotene), B1 (thiamin), B2 (riboflavin), B3 (pantothenic acid) & C (ascorbic acid). Eating tomato juice leads to clean the stomach and remove indigestion expel the gases and treat constipation. Tomato contains the iron element so that the tomato will benefit the Patients with anemia.

#### • **Cultivation Environment**

##### ➤ **Cultivation Season (4 seasons)**

- Early Summer Season (Nursery preparation time: December to February, Greenhouse cultivation)
- Summer Season (Nursery preparation time: February to April)
- Nile Season (Nursery preparation time: June to August)
- Winter Season (Nursery preparation time: August to October )

##### ➤ **Temperature**

- Tomato needs warm temperature. The optimum temperature is around 15 to 30°C.
- The growth of the plant will be stopped under 10°C and the plant does not form fruits under 13°C.
- Meanwhile, high temperature causes failure of the pollination and low yield.
- The flowering and fruit growth are not affected by the day length. However, the amount of vitamin C in the fruits is affected by the intensity of light.

##### ➤ **Soil Condition**

- Tomato can be cultivated under any kinds of soil condition such as sandy soils and muddy soils.
- The cultivation soil should have good drainage characteristics, and not have any nematode and disease.
- Tomato can be grown under salinity condition with lower than 2.5 EC, however, it will be

affected by the high salinity condition and decreased the yield.

- The suitable soil pH for tomato cultivation is from 6.0-7.0.

- **Suitable Cultivation Type & Variety in Upper Egypt**

The suitable varieties in Upper Egypt is as follows;

Season	Variety Name	Fruits Weight	Earliness	Tolerant
Summer	GS 12	100 – 130 g	Early	-
	Nema 140	80 – 100 g	Early	Nematode
	Super Strin B	100 – 130 g	Late	-
	Super Jackal	100 – 130 g	Late	Wilt Virus
	550	100 – 120 g	Early	Wilt Virus
	745	80 – 100 g	Early	Wilt Virus
Nile	Marwa	100 – 120 g	Early	Wilt Virus
	765	130 – 160 g	Extremely Late	Wilt Virus
	Tomland	100 – 130 g	Late	Wilt Virus
	Fiza	100 – 130 g	Early	Nematode, Wilt Virus and Powdery Mildew
	009	130 – 150 g	Late	Wilt Virus
	010	120 – 150 g	Late	Wilt Virus
Winter	095	130 – 180 g	Late	Nematode
	448	120 – 150 g	Middle	Wilt Virus



- **Seedling Preparation**

Good seedlings have several characteristics and been applied some treatments. Farmers should check these points at the nursery. The characteristics and treatments are as follows:

- It has 4 to 5 of real leaves.
- The plant height is 12 to 15cm.
- It has a good root system.
- The shape is straight and no deformity.
- No infection of disease, specifically viruses, and no insects attack.
- Fungicides and pesticides have applied to the nursery bed.

- **Field Management**

- **Land Preparation for Old land**

- Before making planting ridge, Fertilizers should be applied as follows;
- At the plowing time, 20-30m<sup>3</sup> of manure or 10-15m<sup>3</sup> of poultry manure with 400kg of calcium



super phosphorus should be applied per one feddan.

- In addition, if the previous crop is wheat or linen, 100kg of ammonium sulfates should be applied for one feddan in order to activate bacteria for decomposition the crop residue.
- In case of not applying organic fertilizers or calcareous lands, 400kg of calcium super phosphorus should be applied two times, land preparation and first irrigation for one feddan.
- Additionally, 100kg of agricultural sulfur and 50kg of potassium sulfates also should be applied at the planting time.

➤ **Land Preparation for New land**

- At the plowing time, some fertilizers should be mixed. The amount of fertilizers for one feddan is as follows;
- 40m<sup>3</sup> of manure, or 20m<sup>3</sup> of poultry manure, or 10 tons of compost + 200kg of super phosphate + 50kg of potassium sulfate + 100kg of ammonium sulfate + 150kg of agricultural sulfur + 25kg of magnesium sulfate.
- After mixing the fertilizers with soil very well, irrigation water should be applied for 3-4 hours before 3 days of transplanting in order to accelerate the decomposition of the organic matter and avoid the damage for the seedling by the chemical fertilizers.

➤ **Planting Method**

- Make 6 to 8 planting ridges in 7meters. The spacing between plants is 20 to 40 cm, which is changed by the variety.
- It is better to transplant the seedlings in the late afternoon or in the early morning to avoid the damage from high temperature.
- Irrigation should be applied one day before transplanting.
- Irrigate water after transplanting to avoid drying the seedling especially summer season.
- After transplanting, irrigate water in 2-3 days repeatedly in the summer season, and 4-5 days in the winter season.

➤ **Irrigation**

- The irrigation frequency depends on the nature of the soil, temperature and growth stage of the plant.
- The regular irrigation is important, especially in the flowering stage and in the fruits growing stage.
- During the summer season, the irrigation should be applied in the early morning or late evening.
- At the beginning of maturing stage, the irrigation frequency should be reduced, and it should be stopped after 50% of the fruits change the color.
- If the land has highly salinity contents, irrigation should be applied heavily and firstly.

➤ **Fertilization (Top-dressing) for 1 Feddan**

The fertilization program of top-dressing for old land is as follows;

### Recommended Fertilization Program for Old Land

Times of Top-dressing	Adding time	Early and Middle maturing varieties	Late and Extremely late maturing varieties
<b>First</b>	After 15 - 20 days from transplanting and before 1 <sup>st</sup> irrigation	150 kg of ammonium sulfate + 50 kg of potassium sulfate	200 kg of ammonium sulfate + 100 kg of potassium sulfate
<b>Second</b>	After 45 - 50 days from transplanting	200 kg of ammonium sulfate + 100 kg of potassium sulfate	250 kg of ammonium sulfate + 100 kg of potassium sulfate
<b>Third</b>	After 70-75 days from transplanting	200 kg of calcium nitrate or 100 kg of ammonium nitrate	300 kg of calcium nitrate or 150 kg ammonium nitrate
<b>Forth</b>	After 90 days from transplanting	100 kg of calcium nitrate or 50 kg of ammonium nitrate	200 kg of ammonium nitrate + 100 kg of potassium sulfate
<b>Fifth</b>	After second harvesting for late, extremely late maturing varieties and hybrid varieties		200 kg of calcium nitrate or 100 kg of ammonium nitrate

The fertilization program of top-dressing for new land with drip irrigation is as follows;

### Recommended Fertilization Program for New Land

Application time	In case of using N/P/K the following amount is added for 3-4 times/week	In case of using single fertilizers				
<b>From transplanting to 30 days</b>	4 kg of N/P/K 4 times/week	2 kg of Urea Once/week	3 kg of Ammonium sulfate 4 times/week	Ammonium nitrate	3 kg of potassium sulfate	2.5 kg of phosphoric acid Twice/week
<b>After 30-60 days from transplanting</b>	6 kg of N/P/K + 4 kg of potassium sulfate 3 times/week or 4 kg of 19/19/19 + 40 kg of 13/13/43			4-5 kg of ammonium nitrate 3 times/week	6 kg of potassium sulfate Twice/week	2 kg of phosphoric acid Twice/week
<b>From 2 months after transplanting to 10 days before Harvesting</b>	8 kg of 19/19/19 + 6 kg of potassium sulfate or 6 kg of 13/13/43 + 6 kg of 19/19/19			6 kg of ammonium nitrate twice/ week and 5 kg of calcium nitrate once/ week	8 kg of potassium sulfate 3 times/ week	1.5 kg of phosphoric acid and it is stopped with the beginning of maturing

- At the beginning of flowering stage, apply 150 kg of calcium nitrate beside the plant divided 3 times (15 days between them) or add the soluble calcium nitrate once a week with the

irrigation water (6 kg in each time) from the beginning of fruit collection in order to prevent the blossom end rot of fruits. Another method is applying fertilizers for the leaf which contains a high percentage of calcium every 10 days.

- In addition to the fertilization program above, micro nutrients should be added by spraying on the vegetative part after one month from the transplanting every 15 days for 4 times. The solution for spraying is made by the chelates compounds (100 gm of iron, zinc and manganese + 25 gm of cobalt) mixed with 100 liters of water.
- Moreover, Agricultural sulfur should be added to the tomato plant after 25 days from the transplanting, namely after the first irrigation until the beginning of harvesting. Application of agriculture sulfur is very important to prevent the infection by many pests and diseases, and also it helps in the early maturing of fruits and coloring. 10-15 kg of agricultural sulfur is applied for one feddan. The quantity of agricultural sulfur will be increased up to 25 kg/ feddan in case of hybrid varieties. However it is not recommended to use the sulfur during the high temperature season such as July and August, especially in the beginning maturing and harvesting. Agricultural sulfur can protect the damage of low temperature and frost during winter season.

➤ **Replanting**

- Replanting should be done after 3 to 4 days of transplanting and at the irrigation time.
- The seedlings for the replanting should be taken from the same nursery.
- It is better to replant in the evening or early morning to avoid the damage from high temperature.

➤ **Weeding**

- Weeds are the most dangerous source of infection with insects and diseases. Therefore, farmers should remove it with the following methods:
- Manual control:
  - The first weeding is after 2-3 weeks from the transplanting. Remove the small weeds.
  - The second weeding by hoe will be conducted every 15-20 days to remove the weeds and make the planting ridge deeper to avoid the water leaking.
  - It is better to apply the irrigation after 2-3 days from the weeding.
  - Weeding by hoe also conduct after applying the fertilizers in order to cover the fertilizers by soil before the irrigation. The period between the weeding times depends on the soil type and weed density.
- Chemical control:
  - If the field is covered by perennial weeds, it is better to use pesticide. For example, apply herbicide named “Sencor” 1.7 liters mixed with 200 liters of water or “Sencor” 300 g mixed with 200 liters of water by using slayer after 15 to 20 days of transplanting.

➤ **Harvesting**

- Harvesting time depends on the variety. Expecting harvesting time is as follows;
- Early maturing variety: 60-75 days from transplanting,
- Medium maturing variety: 75-85 days from transplanting
- Late maturing variety: 85-100 days from transplanting
- Extremely late maturing variety: 100-120 days from transplanting

Do not leave the matured red fruits for a long time without harvesting because it causes destroying the plants and consequently decreases the number of fruits.

• **Maturing and Harvesting**

- **Green color Tomato (not-matured)**

In this phase, tomatoes don't contain seeds, and if the fruits are harvested in this phase, it will never turn into red color.

- **Green color Tomato (matured)**

In this phase tomatoes are matured, blossom is ended and the color is turned into pale green, and seeds are existing. Fruits need one to five days under 20°C to reach the color phase whether after harvesting or before.

- **Start of color phase**

Blossoms are ended and the color of fruits is changed by about 10%. In this phase, tomatoes can be harvested and exported far away.

- **Color changing phase**

Around 10-30 % of the fruits color is changed. In this phase, tomatoes can be exported to near countries.

- **Rose color phase**

30 to 60% of the fruits color is changed. It can be exported to Arab countries or sold in the local market under the warm weather.

- **Light red color phase**

60 to 90% of the fruits color is changed. In this phase, fruits can be sold under the cold weather.

- **Maturing phase**

90 to 100% of the fruits color is turned into red. In this phase, tomatoes are used for the food processing.

• **Post-Harvesting**

- **Sorting**

Tomatoes have to be sorted directly after harvesting and before packaging. In this process, the infected, misshapen, cracked or non-matured fruits are excluded.

- **Packaging**

This process should be done under the shadow because the sunshine raises the temperature of



fruits leading to its rot. Fruits have to be packed very well without leaving a space for moving inside the box. Tomatoes can be packed in a plastic box (50 \* 30 \* 20 cm) or carton or wooden boxes. In case of exporting, carton boxes are used with 4-8 kg capacity according to the destination.

- **Storage**

Tomatoes can be stored in the cold storage for a long time but sometimes it may be infected by fungal diseases which spoil it. Farmers can avoid such disease by conducting the good preparations such as prepare the suitable temperature storage and conduct the regular sorting during the long storing (every 7-10 days) to exclude the infected fruits time by time. The suitable temperature for tomato storage differs by its phase as follows:

**Matured green tomatoes:** The best temperature for storage is 12 to 14°C and it will be fully matured after 20 to 25 days. Humidity should be 85 to 95%.

**Partially matured tomato:** It is better to store these tomatoes under 10 to 12°C and 85 to 90% humidity. Tomatoes will become fully matured after 15 days.

• **Pest & Disease Control**

➤ Pests

**Aphids**

Aphids absorb the juice of tomato plants. It appears on the lower layer of the leaves. This infection causes stunting the plant, wreaking the plants and wrinkles the leaves. Aphids appear from May to September.



**Control:**

- Remove the grass that these insects feed on.
- Keeping the soil nutrition balance among the nitrogen, potassium, phosphorus.
- Put insect traps (e.g. yellow pan trap) near the nursery. It should be set around the nursery to catch the insects.

**Recommended pesticides**

Pesticide	Amount
Confidate 35% SC	35 cm <sup>3</sup> /100 litre of water
Confident 35% SC	75 cm <sup>3</sup> /100 litre of water
Malet 35% SC	50 cm <sup>3</sup> /100 litre of water

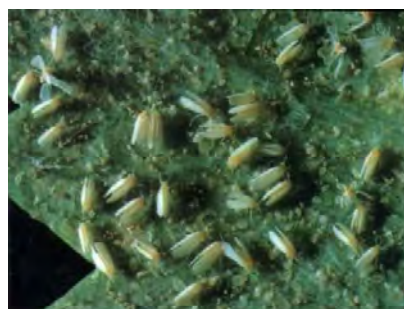
### **Tomato Whitefly**

Tomato whitefly is one of the most dangerous pests of tomato plant in Egypt. It absorbs the juice of the plants, and the leaves change the color from green to yellow around the absorbed place. Moreover, it expands the yellow leaves diseases, which cause stunting the plant growth and reduces the number of flowers, and then decrease the yield.



### **Symptoms:**

- Whitefly causes wrinkling, wilt and yellow color of leaves and general weakness by the severe infections.
- It appears from May until the end of November in nurseries and fields.
- Honeydew may appear in case of an increasing number of insects.
- TYLC symptoms will appear after 20-30 days from transplanting according to the temperatures.
- It causes:
  - Wrinkling, wilt and yellow color of leaves
  - Plant dwarfing and misshapen.
  - Decreasing of flowering
  - Small fruits and not matured.
  - Production decreasing.



### **Control:**

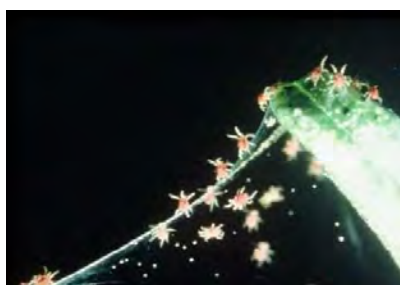
- Controlling should be continued in the field especially after transplanting for 45 days at least to control Tomato Yellow Leaf Curl Virus.
- Apply the pesticides on the vegetative part.

### **Recommended pesticides**

<b>Pesticide</b>	<b>Amount</b>
Agriflex 18.5% SC	240 cm <sup>3</sup> / feddan
Acetagrow 20% SP	25 gm/ 100 liters of water
Acetamore 20% SP	25 gm/ 100 liters of water
Achook 0.15%	750 cm <sup>3</sup> / feddan
Actara (THIAMETHOXAM 25%)	20 gm/ 100 liters of water
Actellic 50% EC	375 cm <sup>3</sup> / 100 liters of water
Amedamix 70% WG	30 gm/ 100 liters of water
Ocean 20% SG	125 gm/ 100 liters of water
Imaxi 35% SC (Imidacloprid)	75 cm <sup>3</sup> / 100 liters of water
Imidacloprid 20% SC	125 cm <sup>3</sup> / 100 liters of water

### **Red Spider**

- Red spider mite feeds on the plant juice from the lower surface of tomato's leaves.
- The distinguished sign of infection is the existence of yellow spots turning into bronze scattered on leaves.
- In case of severe attack, leaves will dry and fall and we will be able to see the spider net on the lower surface of leaves or between plants. It also may get around buds causing its death.



### **Control:**

- Removing weeds and dry leaves.
- Apply the irrigation during high temperature period.
- Apply the potassium fertilization and the balanced fertilization.
- When the number of spiders more than 7 on the leaves, spray one of the following insecticides:

### **Recommended pesticides**

<b>Pesticide</b>	<b>Amount</b>
Agrimec Gold 8.4% SC	60 cm <sup>3</sup> / feddan
Acramite 48% SC	35 cm <sup>3</sup> / 100 liters of water
Excellent 1.9% EC	70 cm <sup>3</sup> / feddan
Overload 25% WP	400 gm/ feddan
Biomectin 5% EC	20 cm <sup>3</sup> /100 liters of water
Gold 1.8% EC	40 cm <sup>3</sup> /100 liters of water
Delta Care 10% EC	50 cm <sup>3</sup> /100 liters of water
Diva 1.8% EW	40 cm <sup>3</sup> /100 liters of water
Zoro 3.6% EC	25 cm <sup>3</sup> /100 liters of water
Solfan 70% SC	200 cm <sup>3</sup> / 100 liters of water
Vego 5% CS	25 cm <sup>3</sup> /100 liters of water
Value 1.8% EC	40 cm <sup>3</sup> /100 liters of water
Vertimec 1.8% EC	40 cm <sup>3</sup> / 100 liters of water
Macomite 10% WP	20 gm/ 100 liters of water
Wonder 36% SC	180 cm <sup>3</sup> / feddan

### **Mole Cricket**

#### **Symptoms:**

- Mole cricket feeds on the roots of the plants under the soil surface causing its wilt.
- Tunnels are seen inside the planting ridge heading to plants.
- Infection increases in the summer and Nile season.
- Severe infection happens in light weight soil or fertilized soil



with manure.

**Control:**

- Remove the weeds well.
- Controlling of Mole cricket starts after seeing the tunnels of it in the planting ridge. The treatment will be applied after irrigation.
- Put the poisonous substance which is made by 1 liter of Pesticide named Hostathion or Chlorfan 48% EC one litter, 15 kg of milled maize, 20 liters of water, and 0.5kg of molasses. Mix all the materials well and leave it for fermentation few days, and then put it in the bottom of the furrow after the sunset and the irrigation.

**Cutworm**

**Symptoms:**

- Infection of cutworm increases in winter and spring season.
- Cutworm eats the stem of plants at the soil surface level.
- It causes death of the seedlings.
- You can see larva under the infected plants and usually the infection happens in some areas in the field.
- It appears from the germination period until the period that the stems become hard.

**Control :**

- Prepare the pesticide as a poisonous substance as follows:
- 25 kg of milled maize, 20 liter of water and the recommended amount of pesticide.
- The previous a poisonous substance is applied beside plants after sunset.

**Recommended pesticides**

Pesticide	Amount
Pyriban A 48% EC	1 litre/fed
Terraguard 48% EC	1.25 litre/fed
Dursban 48% EC (Chlorpyrifos 48%)	1 litre/fed
Sampsh 10% EC	600 cm <sup>3</sup> /fed
Super Alfa 10% EC	250 cm <sup>3</sup> /fed
Cord 72% EC	750 cm <sup>3</sup> /fed

**Cotton Leaf-worm**

Larvae of Cotton Leaf-worm feed on leaves, flowers and buds and make holes on that. The economic damage will be happen as a result of making tunnels or holes inside fruits. These holes are similar to the infection by Cotton Bollworm (*Helicoverpa armigera*). The grown larvae exist under the plants causing damages for the mature fruits which are close to the soil surface. It appears all year.





**Control:**

- Collect larvae by hand and remove infected fruits.
- Well prepare the land by hoeing, plowing and weeds control.
- Apply calcium oxide between Tomato field and Cotton or Berseem field.
- Apply 30 liters of diesel for one Feddan to the irrigation water to kill larvae in the soil.
- Use pheromone trap to reduce the number of worms.
- If the attack has been started, spray one of the following pesticides:

**Recommended pesticides**

Pesticide	Amount
Agrinate 90% SP	300 gm/fed
Excellent 1.9% EC	250 cm <sup>3</sup> /fed
Emamectin benzoate 2.15% EC	150 cm <sup>3</sup> / fed
Emamectin benzoate 5% SG	60 gm/fed
Ivemec 2% EC	80 cm <sup>3</sup> / 100 litre of water
Pasha 1.9% EC	250 cm <sup>3</sup> / fed
Pro-act 5% SG	60 gm/fed
Prochem 5% SG	60 gm /fed
Takumi 20% WG	100 gm/fed
Tracers 24% SC	50 cm <sup>3</sup> /fed

**Cotton bollworm** (*Helicoverpa armigera*)

The attack by Cotton bollworm starts from April until the end of September. Larvae ruin the reproducing parts of the plants like bods and flowers. We can see the attack of Cotton bollworm on the fruits as a round hole. Larvae prefer the green tomato fruits (immature). Larvas prefer to feed on the connected area between neck and fruit.



**Control:**

- Clean and get rid of weeds on the field.
- Collect and remove infected fruits.
- Use the pheromone traps on the field.
- In case of expanded in the field, splay the following pesticides:
  - Lannate 90% insecticide or Nudrine (Methomyl) 90% 30g for one Feddan.
  - Reldan (Chlorpyrifos Methyl) 50% 1.5 liters for one Feddan.
  - Avaunt 15% (Indoxacarb 15%) 105 cm<sup>3</sup> mixed with 100 liters of water.
  - Prochem (Emamectin benzoate) 80g mixed with one liter of water.
  - Emperor (Emamectin benzoate) 0.5% 80cm<sup>3</sup> mixed with one liter of water.

### **Tunnels liner**

Larva feeds on the leafy skin causing tunnels and getting wide. At the end of the tunnels, there are empty spots from the leaf tissues with transparent color turning into brown according to the death of tissues. It appears from March to May and August and September.



### **Control:**

- When the number of tunnels becomes 2 to 3 on one leaf, apply pesticide by the slayer.

### **Recommended pesticides**

Pesticide	Amount
Evisect (Thiocyclam hydrogen oxalate) 50% SP	500 gm/fed
Trivap 75% WP	15 gm/100 litre of water
Vapcomic 1.8% EC	40 cm <sup>3</sup> /100 liter of water

### **Nematode**

The attack of Nematode causes not only direct damage to plants but also expand the fungus disease which is in the soil.

The common Nematodes in Egypt are:

#### **A. Root-knot nematode**

- It causes tumors or root-knot and secondary root bulges.
- Leaves-yellowing.
- Become weak and dwarfing of the plants.
- Reduced the number of flowers and it leads to the low yield.



#### **B. Root-lesion nematode**

- It reduces the number of branch roots and makes ulcerates of secondary roots.
- It leads the disease by soil fungus, and it makes leaves' yellowing, plant weakness, reducing the flowering and small size of fruits.

### **Control:**

- Follow the proper cropping pattern and never transfer soil from the Nile Valley to new lands.
- Use the tolerant varieties of Nematode such as hybrid varieties.
- Use good seedlings from a trusted nursery.
- Never mix the nursery soil with any soil or sand that may transfer the Nematode.
- Never use new organic fertilizer especially produced from agricultural lands.
- Apply the recommended pesticides as follows;

### Recommended pesticides

Pesticide	Amount	Remarks
Oxineem El Nasr (Oxamyl) 24% SL	3 litre/ feddan (2 times)	In case the seedlings were not treated by pesticides
Tervigo 2% SC	2.5 litre/ feddan	
Dento 40% EC	3 litre/ feddan (2 times)	In case the seedlings was not treated by pesticides
Rugby 20% CS	1.5 litre/ feddan	
Fenatode 10% GR	20 kg/ feddan	Put the pesticide amount under the seedlings or sowing the pesticide on the planting ridges then mix it with soil and irrigate
Nemathorin 10% G	12.5 kg/ feddan	Add the pesticide amount with seedlings on the planting ridges then mix it with soil and apply the irrigation.
Nemacap 20% EC (Ethoprophos)	2.5 litre/ 100 litre of water	Spray the planting ridges before cultivation

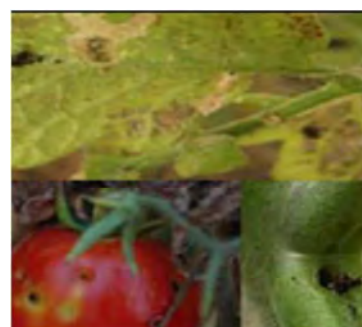
### Tuta Absoluta

#### Symptoms:

- Larva feeds on leaves and fruits and making tunnels.
- It appears in the summer season starting from April and Nile season starting from September.

#### Control:

Control should be started after 2-3 tunnels appear on a leaf. Spray the recommended pesticide below on the plants.



### Recommended pesticides

Pesticide	Amount
Agri 50% WG	500 gm/ feddan
Avaunt 15% EC	25 cm <sup>3</sup> / 100 litre of water
AQ 10% EC	40 cm <sup>3</sup> / 100 litre of water
Alverde 24% SC	100 cm <sup>3</sup> /100 liter of water
Protecto 9.4% WP	400 gm/ feddan
Prochem 5% SG	120 gm / feddan
Biotect 9.4% WP	400 gm/ feddan
Trigard 75% WP	50 gm/ 100 litre/ feddan
Dipel DF 6.4% WG	400 gm/ feddan
Demeuron (Hexaflumuron) 10% EC	200 cm <sup>3</sup> / feddan
Radiant SC 12%	100 cm <sup>3</sup> / feddan
Voliam Flexi 30% SC (Thiamethoxam 20%)	80 gm/ feddan
Coragen 20%	60 cm <sup>3</sup> / feddan

➤ Disease

**Early Blight**

**Reasons:**

- Fungus: *Alternaria solani*

**Symptoms:**

- Black spots appear on the old leaves of small plants.
- Spots extend and circle loops start to appear around its center, these spots look like an eye.
- Tissues around spots turn into yellow color.
- The high temperature and humidity condition expand the disease easily.
- Similar spots on leaves appear also on the stem and it may cause crown rot.
- Spots appear on the connection part of fruits with neck and stem and the infected fruits fall.



**Control:**

- Apply cropping pattern, without repeating of tomato or same crop family of tomato e.g. Eggplant, Pepper and Irish Potato.
- Pick up the infected plants and burn it out of the field.
- Apply the potassium fertilizer.
- Spray the following pesticides every 15 days:

**Recommended Fungicides**

Pesticide	Amount
Azo Star 25% SC	50 cm <sup>3</sup> / 100 litre of water
Atlas 25% EC	50 cm <sup>3</sup> / 100 litre of water
Acrozil 69% WP	250 gm/ 100 litre of water
Antracol 70% WP	300 gm/ 100 litre of water
Oxy Plus 47.89 WP	250 gm/ 100 litre of water
Open 72% SC (Chlorothalonil)	350 gm/ 100 litre of water
Bravo Top 55% SC	500 cm <sup>3</sup> / feddan
Polyram 80% DF	250 gm/ 100 litre of water
Bio-zeid 2.5% (10 million cells/gm) WP	250 gm/ 100 litre of water
Tazolen 72% WP	250 gm/ 100 litre of water

**Late Blight**

Late blight is one of the most dangerous diseases for Tomato and Potato.

**Reason:**

- Fungus: *Phytophthora infestans* (Potato late blight fungus)

**Symptoms:**

- Late blight damage increase under the cold weather and high humidity condition.
- Fungus can infect all parts of the plant.
- Small watery-black spots appear on leaves.





- Spots spread fast and white rot appears on the edges of the bottom surface of leaves.
- During 48 hours the color of leaves and stem change into brown.
- Big black spots cover the infected tissues on the fruit surface.

**Control:**

- Use the resisted variety and apply following cropping pattern. Tomato and potato are not cultivated consecutive.
- For prevention, spray the following pesticide every 7-10 days:
  - 250 g of Ridomil Gold (Metalaxyl M) for one Feddan.
  - 200 g of Cobalt Acrobat mixed with 100 liters of water.

**Root rot and seedling death**

**Reasons:**

- Funguses, e.g. Pythium spp. and Rhizoctonia spp.

**Symptoms:**

- Appearance of watery spots with brown color on the stem near to the surface of the soil.

**Control:**

- Seeds have to be kept in a clean place before cultivation.
- Avoid cultivation in a soil with high percentage of nitrogen. Nitrogen can be added after the formation of real leaves.

**Recommended Fungicides**

Pesticide	Amount	Remarks
Aracur 72.2% SL	1 cm <sup>3</sup> / 1 litre of water	Seeds treatment at the nursey
Previcur Energy 84% SL	3 cm <sup>3</sup> / 1litre of water	At the field
Pink S 30% SL	1 cm <sup>3</sup> / 1litre of water	Seeds treatment at the nursey
Vitavax (200) 75% WP	1.5 gm/ kg of seeds	Seeds treatment at the nursey
Moon Cut 25% WP	3 gm/ kg of seeds	Seeds treatment at the nursey
Uniform 39% SE	650 cm <sup>3</sup> / feddan	Soil treatment after cultivation

**Blossom End Rot**

**Reasons:**

- Lack of calcium.
- Irregular irrigation.
- Excessive use of ammonium sulfate.

**Symptoms:**

- Rot of the blossom end with brown-black color.

**Control:**

- Prevent the high dry condition.
- Apply the organic fertilizers especially in sandy soil.



- The last application of nitrogen fertilizer should be a calcium nitrate.
- Spray chelated calcium fertilizers for leaves. The fertilizers as follows;  
Microcat-calcium Boron (contain 6% chelated calcium) or Solid Extra (contain 7% calcium) or Golden Calbor (contain 11% chelated calcium) or Calcium Star (contain 14% chelated calcium) or Booramim (contain 19% chelated calcium).

### **Powdery Mildew**

#### **Symptoms**

- Infection appears on the surface of leaves in a shape of yellow spots and white spots on the opposite side. In case of severe infection these spots turning into brown and dry.
- The spots start to appear after 2 months from the cultivation but it depends on the cultivation season.



#### **Control**

Spray the fungicide below both upside and back side of the surfaces of the leaves.

#### **Recommended Fungicides**

<b>Pesticide</b>	<b>Amount</b>	<b>Remarks</b>
Ictaprete 98% DP	30 kg/ feddan	Dusting
Pronto 32% Sc	400 cm <sup>3</sup> / feddan	
Topas (100) 10% EC	25 cm <sup>3</sup> / 100 litre of water	
Domark 10% EC	50 cm <sup>3</sup> / 100 litre of water	
Agricultural Soreil KZ 98% D	30 kg/ feddan	Dusting
Sirocco 96% DP	30 kg/ feddan	Dusting
Cabritol 80% WG	250 gm/ 100 litre of water	
Master 25% EC	150 cm <sup>3</sup> / 100 litre of water	

### **Sun blight**

#### **Reasons:**

- The fruits is exposed by the heavy sunlight.

#### **Symptoms**

- Appear white spot on fruits while its color is still green.
- In severe infection, the spot color turns from white to pale-yellow.

#### **Control**

- Choosing the strong hybrid variety and it's vegetative part covers fruits.
- Intercropping with sunflower to make a shade on tomato plants. The sunflower is cultivated every 3 lines of tomato.
- Covering fruits with mulching materials such as rice straw.

### **Frost**

### **Reasons**

- Low temperature lower than 8°C.

### **Symptoms**

- The newly growing parts become a purple color.
- New leaves become wrapping.
- Fruits look like boiled.

### **Control method**

- Irrigation the field when expecting frost.
- Use potassium fertilizer and micronutrients.
- Spraying agricultural sulfur powder when fruits start maturing.

## **Cucumber**

- **Introduction**

Cucumber belongs to Cucurbitaceae. It is one of the important crops which are eaten fresh in Egypt. Nowadays, cucumber is cultivated in all season after introducing greenhouses in Egypt, it was cultivated only in the summer or Nile seasons before that time. Many varieties including hybrid started to appear after introducing greenhouses which can provide a high quantity of production and also high quality. Cucumber is one of the profitable crops.



Cucumber is one of the fundamental vegetables which are consumed in daily life, and the demand is always high, so the price has a lot of ups and downs according to the supply in the market. Therefore, Cucumber can be a profitable crop for farmer's income in case of the high demand season in the market.

- **Cultivation Environment**

- **Cultivation Season (3 seasons)**

- Summer Season (Planting time: February to March)
- Nile Season (Planting time: August to September)
- Winter Season (Planting: October to November )

- **Temperature**

- Cucumber can be grown under 25 to 35°C, and it cannot be grown more than 40°C.
- High-temperature resistance variety can be grown under high-temperature condition, e.g., Tyson, Hayel.

- **Soil Condition**

- Cucumber can be cultivated in any kinds of soils which have good drainage and free from the nematode, except heavy clay and salty soil.
- In the case of the high level of calcareous soil, it is important to apply organic fertilizer, potassium, phosphorus, and microelements.
- Cucumber can be cultivated sandy new land, and it is important to fertilize the soil with organic and chemical fertilizers.
- The suitable soil pH for cucumber cultivation is from 5.5-6.7.

- **Cultivation Type & Variety**

- **Cultivation Type**

- Direct sowing or Transplanting of seedling

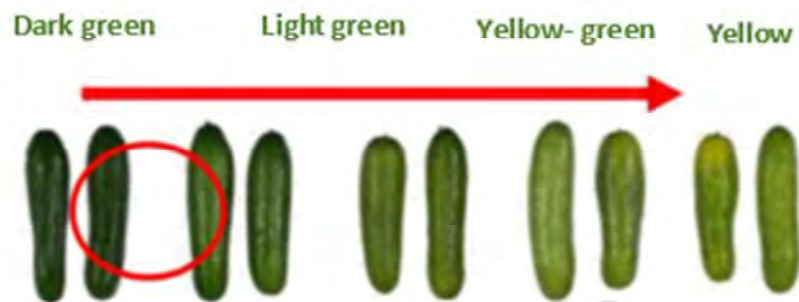
- **Suitable Variety for Upper Egypt**

- Hayel
- Bahy
- Afdal
- **Field Management**
  - **Land Preparation**
    - Before planting, land should be plowed two times for both old and new land.
    - After plowing, make a ditch with 20-25cm depth, in order to apply organic and chemical fertilizer as a basal dressing, and then covered it with soil.
    - Following the fertilizer applying, make a planting ridge and apply irrigation water.
    - After the irrigation, sowing can be done after three days in sandy land and ten days in clayey soil land.
  - **Planting Method**
    - For one feddan farmland cultivation, 400 - 600 gram of seeds is required, and it produces approximately 8,000 - 12,000 plants.
    - The seed should be sown on the planting ridge.
    - Planting spacing should be changed by variety, and it is approximately 30-50cm between plants.
    - The seed should be sown 2-3 seeds per place in order to avoid lack of plant.
    - And then, conduct the thinning for a seedling to cultivate one plant per place at second true leaf stage.
  - **Irrigation**
    - Cucumber needs soil humidity during the growth period, especially the flowering stage. The shortage of water during the stage cause a large loss of yield.
    - Irrigation amount differs according to the soil variety, temperature, and the plant age.
    - Irrigation should be done in the early morning or at late evening and avoid the high-temperature time, e.g., noon.
    - Cucumber should be irrigated many times because drying will decrease the yield seriously.
    - For example, applying irrigation every 5 days during Summer season cause high yield.
  - **Fertilization (Basal) for 1 Feddan**
    - Manure: 20-30m<sup>3</sup>
    - Chemical fertilizer: 200-300kg of Superphosphate, 30-45kg of Sulfur, 30-45kg of Ammonium Sulfate and 60-90kg of Potassium Sulfate
  - **Fertilization (Top-dressing) for 1 Feddan**
    - 1<sup>st</sup> top-dressing: after 45 days from planting: 100kg of Ammonium Sulfate, 100kg of Potassium Sulfate
    - 2<sup>nd</sup> top-dressing: after 15 days from 1<sup>st</sup> top-dressing: 50kg of Ammonium Nitrate and 50kg of Potassium Sulfate.

- 3<sup>rd</sup> top-dressing: it should be applied depends on the crop growth and applicable amount is same as 2<sup>nd</sup> top-dressing.

- **Harvesting**

Cucumber crop is harvested after 45-60 days from cultivation and this period will become long during the low-temperature season. In general, the harvesting period is approximately 1 to 3 months. Cucumber is harvested when it reaches a suitable size for consumption. The size of cucumber differs according to the variety and the type of consumption. Local variety is harvested when its length becomes 10-15 cm, 15-18 cm for Beta-Alpha variety, 20-25 cm for American variety and 3-5 cm for pickles making. Harvested should be carried out every 2-3 days at the beginning of the season and then it should be conducted daily, but in case of cold weather, harvesting will be conducted once a week. Cucumber will be harvested according to the size and color and these two factors are affected by the variety and temperature. Usually, cucumber will be harvested before the fully matured. The appropriate size is smaller 8-15 cm and before the seeds become big and hard, and surrounded by a gelatinous substance. Hardness and brightness of the fruit skin indicate the maturity and quality.



Cucumber is harvested manually, so the workers should be trained very well with the proper way of harvesting and be very careful regarding cleanness and never smoke during work.

For harvesting, the following things should be taken:

- Use clean plastic boxes for collection the fruit.
- Pick the fruits carefully and do not squeeze them.
- Avoid cutting the fruits.
- Do not throw the fruit strongly.
- Remove the rid of infected fruits.

**Yield**

The yield differs according to the variety and cultivation time. In general, one fed produce 7 to 15 tons.

**Storage**

Cucumber can be stored for 2 weeks under 7-10oC and 90-95% humidity.

- **Pest & Disease Control**

➤ **Pests**

**Aphids**

Aphids is one of the pests attacking cucumber and cucurbitaceous family in Egypt.

**Symptoms:**

- Leaves and growing parts will curl.
- Yellow spots on leaves are causing wilt.
- Misshapen of plants especially the growing part and small leaves.
- Spread the viral diseases.
- It appears from March to September.
- When the number of Aphids more than 2 on one leaf, apply recommended pesticides below by the slayer.



**Control:**

The number of Aphids more than 2 on one leaf, apply recommended pesticide below by the slayer.

**Recommended Pesticides**

Pesticide	Amount
Aceta 20% SP	25 gm/ 100 litre of water
Efdal Afitrid 20% SP	25 gm/ 100 litre of water
Imidor 35% SC	300 cm <sup>3</sup> / feddan
Pyrethrins 5% EC	440 cm <sup>3</sup> / feddan
Cetam (Acetamiprid) 20% SL	25 cm <sup>3</sup> / 100 litre of water
Confident 35% SC	75 cm <sup>3</sup> / 100 litre of water
Mospilan (Asetamipird) 20% SP	25 gm/ 100 litre of water

**Red Spider**

- Red spider mite feeds on the plant juice from the lower surface of cucumber leaves.
- The distinguishing sign of infection is the existence of yellow spots turning into bronze scattered on leaves.
- In case of severe attack, leaves will dry and fall, and we will be able to see the spider net on the lower surface of leaves or between plants. It also may get around buds causing its death.
- It appears April to May for summer season cultivation and July to August for Nile season cultivation.



**Control:**

- Removing weeds and dried leaves.
- When the 5 to 7 Red Spiders on one leaf, apply the recommended pesticide as follows especially lower part of the plant.



**Recommended Pesticides**

Pesticide	Amount
Abalone 1.8% EC	40 cm <sup>3</sup> / 100 litre of water
Abamex 1.8% EC	40 cm <sup>3</sup> / 100 litre of water
Abantin 1.8% EC	40 cm <sup>3</sup> / 100 litre of water
Abazeen 1.8% EC	50 cm <sup>3</sup> / 100 litre of water
Samcotin 1.8% EC	40 cm <sup>3</sup> / 100 litre of water
Vertimec 1.8% EC	40 cm <sup>3</sup> / 100 litre of water
KZ Oil 95% EC	1 litre/ 100 litre of water
Maccomite 10% (Hexythiazox)	20 gm/ 100 litre of water
Medamec 1.8% EC	40 cm <sup>3</sup> / 100 litre of water
Nissorun 5% EC	40 cm <sup>3</sup> / 100 litre of water

**White Fly**

**Symptoms:**

- Adult insects appear on the lower surface of leaves.
- At the beginning of infection yellow spots appear on the surface of leaves.
- The infection causes leaf curl, wilting, plant yellowing, and its weakness.
- The attack starts from May until November. Namely, during the late summer season, Nile and early winter seasons.



**Control:**

- Remove the weeds properly.
- Use the yellow adhesives traps.
- Apply agricultural sulfur powder, and it is better to mix the sulfur with “Diathin M” by 1:1 ratio.
- When the 5 adult insects on the leaf apply recommended pesticides as follows:

**Recommended Pesticides**

Pesticide	Amount
Admiral 10% WP	240 cm <sup>3</sup> / feddan
Oberon 24% SC	240 cm <sup>3</sup> / feddan



### **Leaf Miner**

#### **Symptoms:**

Larvas eat the leaf tissues and make tunnels. These tunnels become bigger and will be a transparent spot turning into brown according to the death of tissues. It appears from October to November and from March to April.



#### **Control:**

When there are 2 to 3 tunnels on one leaf, spray recommended pesticides as follows;

#### **Recommended Pesticides**

Pesticide	Amount
Romectin 1.8% EC	30 cm <sup>3</sup> / 100 litre of water
Lex 25% WG	60 gm/ feddan

### ➤ **Disease**

#### **Powdery mildew**

#### **Symptoms:**

Pale green or yellow spots on leaves are covered with white powder and getting bigger until covering the whole leaf then die. It appears after 30 to 35 days from cultivation.



#### **Control:**

Powdery mildew can be controlled by the chemicals below;

#### **Recommended Pesticides**

Pesticide	Amount
Pandel 8% SC	250 gm/ 100 liter of water
Penazole 10% EC	100 cm <sup>3</sup> / 100 litre of water
Biozeid 2.5% (10 million cell/gm) WP	250 gm/ 100 litre of water
(Trichoderma album)	25 cm <sup>3</sup> / 100 litre of water
Talendo (Proquinazid) 20% Ec	50 cm <sup>3</sup> / 100 litre of water
Domark (Tetraconazol) 10% EC	20 cm <sup>3</sup> / 100 litre of water
Ritreap 5% EW	200 gm/ 100 litre of water



#### **Downy mildew**

#### **Symptoms:**

Yellow spots appear on leaves and getting bigger so fast then they become integrated together. At the opposite side of leaves you can find grey downy spots.



#### **Control:**

It is better to apply the fungicides at the beginning of the infection.

Downy mildew can be controlled by the fungicides bellow;

**Recommended Pesticides**

Pesticide	Amount
Addis 69% WG	250 gm/ 100 litres of water
Aracur 72.2% SL	250 cm <sup>3</sup> / 100 litres of water
Astro 25% SC	50 cm <sup>3</sup> / 100 litres of water
Amistar 25% SC	50 cm <sup>3</sup> / 100 litres of water
Amisto 25% SC	50 cm <sup>3</sup> / 100 litres of water
Infinito 68.75% SC	125 cm <sup>3</sup> / 100 litres of water



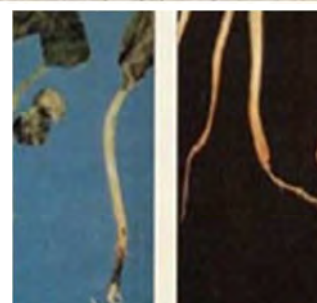
**Death of seedlings and root rot**

Death of seedlings and root rot is the most dangerous disease on cucurbits. It is caused by fungus from the soil. This disease causes many missing plants in the nursery cells and reducing the healthy plants whether in nursery or cultivation field. It appears after 21 to 30 days of cultivation.



**Symptoms:**

- Watery spots appear on the stem near the soil which extends to roots leading to wilt and plant death.
- Appears of ulcers with brown color in root tissues.
- Some disease symptoms will appear together such as plant dwarfing, root system dwarfing and its rot until the plant becomes weak and pull it from the soil easily.
- These different symptoms refer to the types of fungus, and it is depends on the environmental conditions.



**Control:**

- Use the certificated seed.
- Cultivate the disease tolerant variety.
- Not irrigate with excessive water.
- Keep the seed under the lower temperature with lower moisture condition.
- Apply fungicide for seed treatment.

**Recommended Pesticides**

Pesticide	Amount	Remarks
Previcur N (Propamocarb Hydrochloride) 72.2%	2.5 cm <sup>3</sup> /liter of water	Soil treatment – spray the soil around the plants
Pink S 30% SL	1 cm <sup>3</sup> /liter of water	Soil treatment - spray the soil around the plants
Tachigaren (Hymexazol) 30% SL	1 cm <sup>3</sup> /liter of water	Soil treatment - spray the soil around the plants

Topsin M 70% WP	1 gm/litre of water	Soil treatment - spray the soil around the plants
Defender 11.1% SS	2.5 gm/liter of water	Soil treatment - spray the soil around the plants
Vitavax (200) 75% WP	1 gm/liter of water	Soaking the seeds for 24 hours then leave them between layers of wet fabric with the same solution for another 24 hours
Hyxatin 30% SL	1 cm <sup>3</sup> / litre of water	Soil treatment - spray the soil around the plants
Uniform (390) 39% SE	650 cm <sup>3</sup> /fed	Soil treatment - spray the soil around the plants

### **Fusarium wilt**

Fusarium wilt is also one of the most important and dangerous diseases on cucumber crop which give negative effects on the quality and quantity of production. It infects all the growing stages of the plant and it only infects cucumber crop. The suitable temperature for the fungus is 20°C with low humidity.

### **Symptoms:**

- Wilt and falling of small plants before or after an appearance from the soil surface, decomposing of scale tissues of plant and the yellowish of leaves.
- Plant leaves wilt gradually within several days, and the edge of leaves die, and then the plant dies. The symptoms of this disease appear on the part of branches but soon the whole plant wilts.
- The infection occurs in the light soil which is polluted with nematode and in not-clean nurseries also. The fungus is transferred by seeds and lives in the soil for many years and infection happens through roots and plant skin.

### **Control:**

- Use the certificated seed.
- Cultivate the disease tolerant variety.
- Keep the seed under the lower temperature with lower moisture condition.
- Apply fungicide for seed treatment. One of the fungicides named Rizolez T, Vitavax, Thiram, Topsin M70 2g mixed with 1 liter of water and soak the seeds 12 hours in the fungicide solution. After the treatment, keep the seeds on the wet cloth for 12 hours and then sow in the soil.
- Keep the crop rotation.
- Conduct monitoring the field regularly, and removing the infected plants as soon as possible and then burning it outside of the cultivation field or put in the soil very deeply.

### **Gummy stem blight**

#### **Symptoms:**

- This disease causes quick death to small plants.
- Dark-red spots (its diameter about 5 mm) appear on the stem of plants, and sometimes they are surrounded by yellow color.
- Wilt starts from the edges of leaves and getting inside to the center of leaf causing leaf's blight.
- Ulcers appear on the stem and longitudinal cracks with brown color spill gummy liquid with red color which containing fungus with black color sometimes.



#### **Control:**

When the symptoms appear, apply the recommended fungicides as soon as possible.

#### **Recommended fungicides**

<b>Pesticide</b>	<b>Amount</b>
Daconil 72% SC	250 cm <sup>3</sup> / 100 litres of water
Score 25% EC	50 cm <sup>3</sup> / 100 litres of water
Chlorocal 75% WP	250 gm/ 100 litres of water

## Pepper

- **Introduction**

Pepper belongs to Potato Family. There are two types of peppers, Sweet peppers, and Chili peppers. The peppers are one of the important exporting vegetables. It contains several high nutritious which the human body needs such as vitamin C and Carotene. The capsaicin which is contained in chili variety can be used for the treatment of Rheumatic and Lumbago diseases. The two types of peppers can be used for pickles processing, hot sauce, and chili powder, especially in hot places. The origin of peppers is South America. It was found in the wild places, and it distributed to India and all over the world.



- **Cultivation Environment**

- Cultivation Season (3 seasons)

- Early Summer Season (Nursery: December to January, Transplanting: February to March)
- Summer Season (Nursery: February to March, Transplanting time: April to May)
- Nile Season (Nursery: May to June, Transplanting time: July to August)

- Temperature

- The pepper prefers the high-temperature condition. The optimum temperature is 25 to 30°C during daytime and 15 to 20°C during night time. The growing will be slow down under 15°C and stopped less than 10°C.

- Soil Condition

- Pepper can be cultivated in both old land and new land.
- The suitable soil pH for cucumber cultivation is from 6.0-6.5.

- **Cultivation Type & Variety**

- Cultivation Type

- Transplanting of seedling

- Suitable Varieties in Upper Egypt

- Omega
- Laheeb
- Karn Ghazal
- Gas
- Super fire

- **Amount of Seed**

- 150 to 200g for one Feddan

- **Cultivation in the Nursery**

- The cultivation in the nursery should be started before 1.5 to 2 months of Transplanting.
  - Apply 150 kg of superphosphate for each fed. Mix the superphosphate with the soil after first plowing.
  - Make 14 lines in 7m in old lands or make a small square plot, 1 m \* 1 m in new lands.
  - In low temperature for early summer cultivation, it is recommended to use the plastic tunnel for the nursery.
  - The common nursery currently is planting using a plastic tray, and it should be kept in the greenhouse and put on the metallic material with the height more than 90cm. It can avoid the damage from mites and whitefly.
  - Stop the irrigation for 7 to 10 days before transplanting to the field whether in open field or greenhouse or plastic tunnels.
  - Appropriate seedling characteristics are:
    - Smaller than 15cm height
    - the Stem should be thick and hard
    - No any damage from disease and pests
    - Well expanded root
    - Bright green color leaves
- **Field Management**
- ***Cultivation in the Old Land***
- Irrigate the nursery with few amounts of water before transplanting to prevent the damage from the uprooting.
  - Soak the roots of seedling into a fungicide to protect it from the fungus rots.
  - Select the location of the transplanting land, it should be away from the Potato Family farmland.
  - Apply following fertilizers per Feddan at the plowing:
    - 30 m<sup>3</sup> of decomposed manure
    - 150 kg of calcium superphosphate
    - 50 kg of potassium sulfates
    - 50 kg of ammonium sulfates
  - Make 10 planting ridges in 7m for transplanting.
  - Cultivate the seedlings in the northern side of the line with 30 to 40 cm of distance between plants and cover the roots well with the soil.
  - Irrigate the land after the transplanting.
  - Put the poisonous substance in the evening as a protection from the digger and cutworm.
  - It is recommended to follow the following fertilizing program. It should be applied besides the plant manually and then apply irrigation:

**Table: Recommended Amount of Fertilizer for new land for one Feddan (kg)**

Cultivation time	The kind of fertilizers	Amount	In the case of
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			<b>Urea 46%</b>
After 1 month of cultivation	Ammonium sulfates	200	100
After 2 months of cultivation	Ammonium sulfates	200	100
After the appearance of 60% of flowers	Calcium superphosphate	150	150
	Ammonium sulfates	200	100
	Potassium sulfates	150	150
After the 2nd Harvesting	Ammonium sulfates	50	25
After the 4th Harvesting	Ammonium sulfates	50	25
After the 6th Harvesting	Ammonium sulfates	50	25

➤ ***Cultivation in the New Land***

- It is recommended to use drip irrigation system for cultivation in new lands.
- Make 5-6 lines/ 7 m according to the water hoses. The seedlings are put around the water hoses' holes.
- Apply the following amount of manure or compost per Feddan at the plowing. Make the holes in the soil beside the irrigation hoses with a depth of 25 cm and put the following fertilizers and then mix them well with the soil:
  - 40 m<sup>3</sup> of decomposed manure or 10 tons of compost
  - 40 kg of calcium superphosphate
  - 100 kg of potassium sulfates
  - 100 kg of ammonium sulfates
  - 150 kg of agricultural sulfur
- After mixing the fertilizers above well with the soil, irrigate for 3-4 hours before the cultivation.
- For top dressing, apply the fertilizers that contain NPK elements by dissolving in the irrigation water.

**Table: Recommended Amount of Fertilizer by Month for one Feddan (g/m<sup>3</sup>)**

<b>Type of Fertilizer</b>	<b>Feb</b>	<b>Mar.</b>	<b>Apr.</b>	<b>May</b>	<b>Jun.</b>	<b>Jul.</b>	<b>Aug.</b>	<b>Sep.</b>	<b>Oct.</b>	<b>Nov.</b>
Nitrates ammonia	500	600	750	750	600	600	400	300	300	300
Phosphate acid	150	150	250	250	250	300	150	150	100	100
Potassium sulfates	500	750	1250	1250	1250	750	500	400	300	300
Magnesium sulfate	75	25	150	150	150	125	75	75	50	50
Calcium nitrates	-	-	450	450	300	250	250	100	50	-

- It is better not to mix the fertilizers which contain Calcium and contain sulfur or phosphate. Because the deposition of Calcium is formed of gypsum and it decreases the benefit of fertilizers nutritious.
- Replanting :
  - Replanting will be conducted after 15 to 20 days, and the new seedlings should be taken from the same nursery and the same age.
- Weeding:
  - Weeding should be conducted 4 to 5 times during the cultivation period both new and old lands. Usually, it should be done every 2 to 3 weeks.

➤ Irrigation :

- The regular in irrigation is important. The irrigation times depend on the type of the soil and the temperature. Usually, first irrigation should be done 4 to 5 days after transplanting and the second one should be done 12 to 20 days after the first one.

➤ Harvesting :

- It can be harvested about 2 months after transplanting.
- After harvesting, put the produce in plastic boxes to prevent any damage and transfer it to under shade place.

• **Maturing signs and Harvesting**

The maturing degree effects on the marketing and storage of pepper. Therefore peppers should be collected when it reaches the appropriate size of harvesting of the variety (hard and bright green color) before turning into yellow or red. On the other hand, the un-matured pepper is dark green color, not bright green color and in this phase fruits are easy to spoil after harvesting. In general, peppers can be harvested after 3 months from the cultivation under warm weather or 4 months under the cold weather. Fruits should be collected every 3-4 days in the warm weather and every 7-10 days in the winter. Production of one feddan is 6 to 15 tons according to the season, variety, soil, fertilization, and irrigation.

The followings should be observed during harvesting:

- Harvesting should be conducted in the early morning and avoid it after raining or irrigation because this leads to the swelling of the surface and become easy to scratch it.
- Do not tug the fruits because this can rupture the tissues around the neck causing fungal infection and loss of humidity.
- Do not push on the fruits by hand during harvesting because this will smash the fruits.
- It is better to use harvesting scissors.
- Leave a small peduncle from the neck of fruits because the long peduncle will make a damage to the other fruits during harvesting.
- Fruits are collected on the clean plastic sheet to avoid the scratch of the fruits during Post-harvest handling.

• **Sorting**

Exclude the damaged peppers such as scratched, broken, fungal diseases or sun blight.

• **Packaging**

Peppers are packed in plastic or carton boxes and never pack it in sacks in order to prevent any damages during the marketing. It is better to sort the production before packaging



according to the volume. Do not make a space between peppers. It can also be packed in perforated



polyethylene bags (1 kg capacity) then put them in the big plastic boxes.

- **Storage**

Pepper is stored under 7 to 10°C with 90 to 95% humidity where it can keep its quality for 3 weeks. As same as tomato, pepper can be damaged by cold temperature if it is stored under less than 7°C, on the other hand, temperature more than 10°C leads maturing.

- **Leaving the plants in the field during the winter season**

- This method can be applied only for the chili peppers because it has a wooden stem and it can afford for cold in winter.
- This cultivation method is mainly applied in Giza and Beni-Suef governorates in the autumn season.
- Seedlings are cultivated in August.
- Peppers can be harvested for 4-5 times during November and December according to the warm weather.
- Under the low temperature in December, plants will be cut remaining above 25 cm from the soil surface, and manures will be applied in the planting ridges and then protecting the plants from cold.
- In February, planting ridges are remade by hoes after applying nitrogen fertilizers and heavy irrigation, and then the peppers can be harvested by the end of March, again.
- The advantage of the method can sell the produce during the higher price season, but plants will be affected by disease easily, especially viral disease and attacked by mole crickets as well.

- **Pest & Disease Control**

- **The Main Dangerous Pests of Pepper**

**Mole Cricket**

Both larval and adult of mole cricket feed the roots and the bottom of the stem under the soil surface and which leads wilting and death of the plant. The farmer can find some tunnels on the surface of the soil. Mole cricket affects the plants in the nursery and also the farmland.

**Control:**

- Prepare the land well before cultivation by plowing it and exposing it to the sun.
- Remove the weeds well.
- Put the poisonous substance which is made by 1 liter of Pesticide named *Hostathion*, 15 kg of milled maize, 20 liters of water, and 0.5kg of molasses. Mix all the material well and leave it for fermentation few days, and then put it in the bottom of the furrow after the sunset and the irrigation.

**Cutworm**

Cutworm attacks specifically the plants in the nursery. You can see the affected plants lying down on

the ground and separated from its roots, even you cannot find the worm near the plant.

**Control :**

- Cleaning the field and removing the weeds.
- Collect all the worms that can be found under the plant, and burn it.
- Put the poisonous substance which is made by 1 liter of Pesticide named *Hostathion*, 20 kg of wheat bran, 20 liters of water, and 0.5kg of molasses. Mix all the material well and leave it for fermentation few days, and then put it in the bottom of the furrow after the sunset and the irrigation.

**Aphids**

Aphids can be found on the lower surface of the leaves and buds which cause wrinkling of leaves and distortion the buds. In case of intensive attack, the blight starts to appear, and also some funguses grow up and transfer to the other plants. The infection will be increased in the Nile and summer seasons.

**Control :**

- Care about the nutritional balance and not apply an excessive amount of nitrogen fertilizers.
- Remove the weeds well.
- Spray the following pesticides with 400-600 liters of water per Feddan
  - Mospilan 20% 100 g/ Feddan
  - Sumithion 50% 1 liter/ Feddan
  - Admire 20% 500 cm<sup>3</sup>/ Feddan
  - Some mineral oils for summer season cultivation 4 liters/ Feddan

**Whitefly**

Both larval and adult of whitefly feed the juice of the plant. The fly could be found on the lower surface of the leaves which cause wrinkling of the leaves. The attack of the Whitefly will be increased during the Nile season (Sep-Oct) and late summer season.

**Control :**

- Care about the nutritional balance.
- Remove the weeds well.
- Spray the following pesticides per Feddan
  - Mospilan 20 % 25g with 100 liters of water.
  - Admire 20% 120 cm<sup>3</sup> with 100 liters of water.
  - Actellic 5% 375cm<sup>3</sup> with 100 liters of water.
  - Selecron 72% 187.5 cm<sup>3</sup> with 100 liters of water.
  - Biosect 200 g with 100 liters of water.

**Beet armyworm and Cotton leafworm**

It feeds on the leaves, buds, and fruits, so it makes some holes on these. The attacks by the worms increase from August to November.

**Control:**

- Remove the weeds well.
- Spray one of the pesticides as listed below:
  - \*Lannate 90% 75 g with 100 liter of water
  - \* Match 5% 40 cm<sup>3</sup> with 100 liter of water
  - \* Roldan 50% 250 cm<sup>3</sup> with 100 liter of water
  - \* Dipel 2% 200 gm for Feddan
  - \* Econik Pio 300 gm for Feddan

**Red Spider (*Tetranychus urticae* Koch):**

It lives on the lower surface of the leaves, and the symptoms appear in the form of yellow blotches on the leaves, and turn the color to Bronze color, and then brown color as time passed. After the infection becomes severe, the leaves start to wilt and fall and also you can see spider net among the leaves' veins. The infects appears during spring and summer seasons.

**Control:**

- Remove the weeds well.
- Shorten the days between irrigations during high temperature.
- Spray one of the following materials mixing with 400-600 liter of water;
  - \* Mineral oil 4 liters.
  - \* Nutritional oil Natirlo 90% 1 kg for 1 Feddan
  - \* Micronized sulfur 1kg for 1 Feddan
  - \* Vertimec 1.6 % 160cm<sup>3</sup> for 1 Feddan.
  - \* linger starch 36% 180cm<sup>3</sup> for 1 Feddan.

**Thrips**

Thrips feed on leaves, pods and fruits causing white-silver spots which will turn into black.

It also causes the fall of flowers and decreases the production.

**Control:**

- Clean the field and remove the weeds well.

**Recommended fungicides**

Pesticide	Amount
Radiant 12% SC	100 cm <sup>3</sup> /fed



➤ **Diseases of the pepper**

**Damping-off**

This is a kind of fungus disease. Some of the leaves of the infected plant will curl with a green color, and the surface of the bottom of the stem will have a crack. The root of the infected plant is changed to dark color.

**Control :**

Immediately picking up the infected plant and burn it outside of the farmland.

Apply fungicide to the seed with one of the followings:

Finafax/ Katpan Othiram: 1.5g for 1kg of seed.

Rizolex/ thiram: 3g for 1kg of seed.

Topsin M70: 1.5g for 1kg of seed.

Chagrin: 1g for 1kg of seed.

Also treat the soil which was infected plant should be applied fungicides, e.g. Topsin 1.5g, Rizolex 3g and Proticior N 2.5cm<sup>3</sup>.

**Powdery Mildew**

The appearance of white blotches upper surface of the leaves, and the blotches covered with white powder. The intense infection leaves become yellow color and blight.



**Control:**

Spray micron sulfur 250g or Cooper Oxychloride 350g with 100 liters of water every 15 days for prevention purpose.

For controlling the infection, spray the listed fungicides below each 15days:

- Afugan 150cm<sup>3</sup> mixed with 100 liters of water.
- Rubigan 25cm<sup>3</sup> mixed with 100 liters of water.
- Somi (8) 50cm<sup>3</sup> mixed with 100 liters of water.
- Score 50cm<sup>3</sup> mixed with 100 liters of water.
- Topaz 15cm<sup>3</sup> mixed with 100 liters of water.



**Blossom-end rot disease**

This is a non-infectious disease. Black rot on the bottom of the fruit (blossom-end) appears due to the deficiency of water by the irregular irrigation or lack of calcium in the soil by the excess phosphate fertilizer application. It is recommended to care with the regular irrigation and apply an appropriate amount of phosphate fertilizer to keep a proper calcium percentage.

**Eggplant**

- **Introduction**

Eggplant is one of the summer crops, so it prefers the warm temperature. Eggplant is originated in India, and it has been cultivated in South and East Asia and then expanded western countries.



- **Cultivation Environment**

- **Cultivation Season (2 seasons)**

- Early Summer Season (Nursery: December to February, Transplanting time: March to April)
    - Summer Season (Nursery: March to April, Transplanting time: May to June)
    - Nile Season (Nursery: May to June, Transplanting time: July to August)

- **Temperature**

- The appropriate temperature for Eggplant growing is 27 to 32°C in the day time and 20 to 27°C in the night time.
    - The optimal temperature for germination is 25 to 30°C.

- **Soil Condition**

- Eggplant can be cultivated in all types of soil. The optimal soil type is average clayey soil with good drainage and rich in organic matter. In general, the new land (light yellow color land) is good for early maturing variety, and the old land (heavy soil land) can achieve high productivity.
    - The suitable soil pH for Eggplant cultivation is 6.0-7.0.

- **Cultivation Type & Variety**

- **Cultivation Type**

- Transplanting of seedling

- **Variety:**

Type	Name of Variety
Round Shape	<ul style="list-style-type: none"> <li>• Classic Madrid</li> <li>• Classic Harvel</li> <li>• Mexican Banda</li> </ul>
Long Shape	<ul style="list-style-type: none"> <li>• Jaleen</li> <li>• Black Thin Soft</li> </ul>
White Eggplant	<ul style="list-style-type: none"> <li>• Soma White</li> </ul>

- **Field Management**

- **Land Preparation**

- Before transplanting, the farmland should be plowed two times. At the first plowing, 20m<sup>3</sup> to 30m<sup>3</sup> of compost should be applied for one feddan farmland. At the second plowing, apply 150kg of superphosphate for one feddan and plowing and leveling the farmland.
    - Make 10 to 12 planting ridges in 7meters and irrigate the farmland.

- **Crop Rotation**

- The yield of Eggplant will be decreased by continues cultivation. Continues cultivation will be

increasing the pests in the soil, furthermore, Eggplant takes a lot of nutrition from the soil. It is better not to cultivate the lands which cultivate Eggplant family at least in the past 5 years.

➤ **Planting Method**

- Transplant the seedling on the planting ridge with the 30cm distance between plants.
- One Feddan needs 250 to 300g of seeds. It can produce approximately 20,000 seedlings.

➤ **Characteristics of good seedling**

- The length of a seedling is less than 15cm.
- The stem is thick and root well grew.
- Not have any disease.
- The leaf is a bright green color.

➤ **Irrigation**

- Eggplant takes a lot amount of water, so it should be irrigated regularly according to its needs.
- After transplanting, apply irrigation immediately, and the second irrigation should be done after 4 to 5 days. The third irrigation is after 12 to 20 days after transplanting.
- Give attention to the amount of irrigation water especially in the flowering stage in order to avoid the decrease in the number of fruits.

➤ **Replanting**

- Replanting should be done after 10 to 14 days from transplanting.
- The seedling for the replanting should be the same size and same variety. It is better use the seedlings from the same nursery.

➤ **Fertilization for Old Land**

- The top-dressing program for old land is as the following table;

**Table: Recommended Amount of Fertilizer for one Feddan**

Time	Fertilizer	Amount
1 month after planting	• Ammonium Sulfate	200kg
2 month after planting	• Calcium Superphosphate	150kg
	• Ammonium Sulfate	200kg
In the stage of 60% flowering stage	• Ammonium Sulfate	200kg
	• Potassium Sulfate	100kg

➤ **Fertilization for New Land**

- It is better to use the drip irrigation system for the cultivation in new land. The recommended amount of fertilization program of drip irrigation is shown the following table;

**Table: Recommended Amount of Fertilizer for one Feddan by Drip Irrigation (g/ m<sup>3</sup>)**

Fertilizer	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.
Ammonium Sulfate	500	600	750	750	600	600	400	300	300
Phosphoric Acid	150	150	250	250	250	200	150	150	100
Potassium Sulfate	500	750	125	125	125	750	500	400	300
Magnesium Sulfate	75	25	150	150	150	125	75	75	50
Calcium Nitrate	0	0	450	450	300	250	250	100	0

- **Harvesting**

Eggplant can be harvested after 25 to 40 days from the transplanting. When the fruits become appropriate size for selling and then start harvesting. To identify the appropriate maturity stage of the harvest, press the fruits by the thumb. If the skin of the fruit returns very quickly, it means that it is immature, but if it returns very slowly, it indicates that the excess maturity. Do not leave the fruits to become very big size. The big fruits take a lot of nutrition from the plants and make a huge amount of seeds. Also, the consumers do not like the big size of the fruit and the price become down. Harvesting should be done every 3 to 5 days for long shape varieties and 5 to 10 days for round shape varieties.

- **Storage**

- Eggplants will be put in big sacks to be ready for selling directly.
- It can be stored for one week under 10°C and 85-90% humidity.
- Eggplants will be damaged and its color will turn into bronze if they are exposed to 7°C or less.

- **Leaving the plants in the field during the winter season**

- This method can be applied for low-temperature tolerant varieties like the local variety.
- Seedlings are cultivated in July and August and fruits can be harvested until December.
- Poultry manure is added with a rate of 10 m<sup>3</sup>/ feddan in the middle of November, and then the irrigation is reduced gradually. It will be stopped from the middle of December until the middle of February.
- The branches of the plants will be cut with three-quarters length and spray pesticide to control “Mole-cricket” in the middle of December.
- Apply irrigation and “Urea” in the middle of February, and the plants start to grow again. After 2 weeks from the irrigation and fertilization, apply fertilizer and irrigation, again.
- The advantage of the method is fruits can be sold in the higher price season, from the end of March to early of April.

- **Pest & Disease Control**

- ***Pests***

- Mole Cricket**

Both larval and adult of mole cricket feed the roots and the bottom of the stem under the soil surface and which leads wilting and death of the plant. The farmer can find some tunnels on the surface of the soil. Mole cricket affects the plants in the nursery and also the farmland.

- Control:**

- Prepare the land well before cultivation by plowing it and exposing it to the sun.
- Remove the weeds well.
- Put the poisonous substance which is made by 1 liter of Pesticide named *Hostathion*, 15kg of milled maize, 20 liters of water, and 0.5kg of molasses. Mix all the material well and leave it for fermentation

few days, and then put it in the bottom of the furrow after the sunset and the irrigation.

### **Cutworm**

Cutworm attacks specifically the plants in the nursery. You can see the affected plants lying down on the ground and separated from its roots, even you cannot find the worm near the plant.

#### **Control :**

- Cleaning the field and removing the weeds.
- Collect all the worms that can be found under the plant, and burn it.
- Put the poisonous substance which is made by 1 liter of Pesticide named *Hostathion*, 20 kg of wheat bran, 20 liters of water, and 0.5kg of molasses. Mix all the material well and leave it for fermentation few days, and then put it in the bottom of the furrow after the sunset and the irrigation.

### **Aphids**

Aphids can be found on the lower surface of the leaves and buds which cause wrinkling of leaves and distortion the buds. In case of intensive attack, the blight starts to appear, and also some funguses grow up and transfer to the other plants. The infection will be increased in the Nile and summer seasons.

#### **Control:**

- Care about the nutritional balance and not apply an excessive amount of nitrogen fertilizers.
- Remove the weeds well.
- Spray the following pesticides with 400-600 liters of water per Feddan
  - Mospilan 20% 100 g/ Feddan
  - Sumithion 50% 1 liter/ Feddan
  - Admire 20% 500 cm<sup>3</sup>/ Feddan
  - Some mineral oils for summer season cultivation 4 liters/ Feddan

### **Whitefly**

Both larval and adult of whitefly feed the juice of the plant. The fly could be found on the lower surface of the leaves which cause wrinkling of the leaves. The attack of the Whitefly will be increased during the Nile season (Sep-Oct) and late summer season.

#### **Control :**

- Care about the nutritional balance.
- Remove the weeds well.
- Spray the following pesticides per Feddan
  - Mospilan 20 % 25g with 100 liters of water.
  - Admire 20% 120 cm<sup>3</sup> with 100 liters of water.
  - Actellic 5% 375cm<sup>3</sup> with 100 liter of water.



- Selecron 72% 187.5 cm<sup>3</sup> with 100 liters of water.
- Biosect 200 g with 100 liters of water.

### **Beet armyworm and Cotton leafworm**

It feeds on the leaves, buds, and fruits, so it makes some holes on these. The attacks by the worms increase from August to November.

#### **Control:**

- Remove the weeds well.
- Spray one of the pesticides as listed below:
  - \*Lannate 90% 75 g with 100 liter of water
  - \* Match 5% 40 cm<sup>3</sup> with 100 liter of water
  - \* Roldan 50% 250 cm<sup>3</sup> with 100 liter of water
  - \* Dipel 2% 200 gm for Feddan
  - \* Econik Pio 300 gm for Feddan

### **Red Spider (*Tetranychus urticae* Koch):**

It lives on the lower surface of the leaves and the symptoms appear in the form of yellow blotches on the leaves, and turn the color to Bronze color, and then brown color as time passed. After the infection becomes severe, the leaves start to wilt and fall and also you can see spider net among the leaves' veins. The infection appears during spring and summer seasons.

#### **Control:**

- Remove the weeds well.
- Shorten the days between irrigations during high temperature.
- Spray one of the following materials mixing with 400-600 liter of waters;
  - \* Mineral oil 4 liters.
  - \* Nutritional oil Natirlo 90% 1 kg for 1 Feddan
  - \* Micronized sulfur 1kg for 1 Feddan
  - \* Vertimec 1.6 % 160cm<sup>3</sup> for 1 Feddan.
  - \* linger starch 36% 180cm<sup>3</sup> for 1 Feddan.

#### ➤ **Disease**

### **Damping-off**

This is a kind of fungus disease. Some of the leaves of the infected plant will curl with a green color and the surface of the bottom of the stem will have a crack. The root of the infected plant is changed to dark color.

#### **Control :**

Immediately picking-up the infected plant and burn it outside of the farmland.

Apply fungicide to the seed with one of the followings:

Finafax/ Katpan Othiram: 1.5g for 1kg of seed.

Rizolex/ thiram: 3g for 1kg of seed.

Topsin M70: 1.5g for 1kg of seed.

Chagrin: 1g for 1kg of seed.

Also treat the soil which was infected plant should be applied fungicides e.g. Topsin 1.5g, Rizolex 3g and Proticior N 2.5cm<sup>3</sup>.

### **Powdery Mildew**

The appearance of white blotches upper surface of the leaves, and the blotches covered with white powder. The intense infection leaves become yellow color and blight.

### **Control:**

Spray micron sulfur 250g or Cooper Oxchloride 350g with 100 liters of water every 15 days for prevention purpose.



For controlling the infection, spray the listed fungicides below each 15days:

- Afugan 150cm<sup>3</sup> mixed with 100 liters of water.
- Rubigan 25cm<sup>3</sup> mixed with 100 liters of water.
- Somi (8) 50cm<sup>3</sup> mixed with 100 liters of water.
- Score 50cm<sup>3</sup> mixed with 100 liters of water.
- Topaz 15cm<sup>3</sup> mixed with 100 liters of water.

### **Blossom-end rot disease**

This is a non-infectious disease. Black rot on the bottom of the fruit (blossom-end) appears due to the deficiency of water by the irregular irrigation or lack of calcium in the soil by the excess phosphate fertilizer application. It is recommended to care with the regular irrigation and apply an appropriate amount of phosphate fertilizer to keep a proper calcium percentage.

## **Cabbage**

### • **Introduction**

Cabbage is one of the common vegetables in Egypt. The cabbage is originated in Europe. It can be cultivated in any season. Cabbage is cultivated more than 35,000 Feddan every year in Egypt.



### • **Cultivation Environment**

#### ➤ **Cultivation Season**

- Local Variety: (Nursery preparation time: March to middle of May)
- Foreign Variety: (Nursery preparation time: It can be cultivated the same as a local variety, but it is recommended to grow from the middle of July to early of November)

#### ➤ **Temperature**

- Normally, cabbage can be cultivated in all season, but it prefers the lower temperature, specifically foreign varieties. The optimal temperature for growth is 15 to 25°C.

#### ➤ **Soil Condition**

- The most suitable soil for Cabbage cultivation is heavy yellow color soil. Appropriate farmland should be fertile, good drainage and free of salinity problem.
- It is not recommended cultivating in sandy soil.
- The cabbage is injured by continues cultivation, so it should not cultivate the same place or after Brassicaceae crops field. The farmer should consider the crop rotation.
- The suitable soil pH for cucumber cultivation is from 5.5-6.5.

### • **Cultivation Type & Variety**

#### ➤ **Cultivation Type**

- Transplanting of seedling

#### ➤ **Variety**

- Local: the most widely spread in Egypt. The leaves are big and not wrinkled. Cabbage head is big, spherical and leaves are average integrated.
- Brunswick: the head consists of average leaf size and it is a round shape, and not wrinkled, small size, highly integrated and the stem is short.
- Golden Abkar: its head is small and round. Leaves are average integrated, and this variety is early matured.
- Danish Y Paul Head: its head is spherical, big and wrinkled. This variety of cabbage is late maturity, and it is good for storage and shipping.

### • **Amount of Seed**

- Local Variety: 6,000 to 7,000 seedlings/ Feddan, it needs 250 to 350 g of seeds.
- Improved Variety: 8,000 to 120,000 seedlings/ Feddan, it needs 350 to 450 g of seeds.

- **Cultivation in the Nursery**
  - The cultivation in the nursery should be started before 1 month of Transplanting.
  - Plow the land two to three times and level the land.
  - Apply 10m<sup>3</sup> of manure, 200kg of Superphosphate and 50kg of Ammonium sulfate for 1 Feddan field size.
  - Make 14 soil ridges in 7m and sow the seed on it, then cover the seed with soil.
  - After sowing, apply irrigation water.
  - Stop the irrigation before 7days of uprooting, but irrigate the nursery two hours with a short time before uprooting the seedlings.
- **Field Management**
  - **Land Preparation**
    - Before planting, land should be plowed two times.
    - At the plowing, apply 30m<sup>3</sup> of manure or 15m<sup>3</sup> of poultry manure and 200kg of superphosphate for one Feddan as basal fertilizer.
    - Make 9 to 10 planting rows in 7m and apply following fertilizers on the rows; 100kg ammonium sulfate, 25kg of potassium sulfate and 150kg of sulfur for one Feddan.
    - Following the fertilizer application, apply irrigation water.
  - **Planting Method**
    - The seedlings should be transplanted in the upper third of the planting ridge to avoid the covering of irrigation water.
    - The distances of between plants are 70 to 80 cm for local variety and 60 cm for improved variety.
  - **Replanting**

After 10 to 15 days from transplanting, the seedlings will be replanted for the miss planted place.
  - **Irrigation**
    - The first irrigation should be after transplanting, and then apply irrigation every 7 to 10 days depends on the soil condition and temperature.
    - In case of high temperature, it is one solution to spray water on the cabbage to decrease the temperature.
  - **Fertilization (Top-dressing) for 1 Feddan**
    - 1<sup>st</sup> top-dressing: after 3 weeks from transplanting: 45kg of Ammonium Sulfate, 125kg of Superphosphate, and 35kg of Potassium Sulfate.
    - 2<sup>nd</sup> top-dressing: after 4 to 6 weeks from 1<sup>st</sup> top-dressing: 45kg of Ammonium Sulfate, 125kg of Superphosphate, and 35kg of Potassium Sulfate.
    - 3<sup>rd</sup> top-dressing: it will be applied at the stage of head formation: 50kg of Ammonium Sulfate only.

➤ **Harvesting**

- Cabbage matures after 3.5 to 4 months from the transplanting for the local variety and 2.5 to 3 months for foreign varieties. Cabbage is harvested by cutting a small part from stem and removing some outside leaves. Harvesting is conducted every 3 days because all heads do not mature at the same time.
- The maturity signs of Cabbage are as follows:
  - Completion the head formation, and it has a hardness and reached the suitable size for marketing.
  - The upper leaves become tight and shiny.
  - One Feddan produces 8,000 to 10,000 cabbages for local variety and 12,000 to 18,000 heads for foreign varieties.

• **Storage**

Cabbage can be stored in a good condition for 3 to 4 months under 0 to 2oC with 90-95% of humidity and it is necessary to prevent the wilt of leaves. Polyethylene sheet can be used instead of boxes. In this case, good ventilation is required during storage.

• **Pest & Disease Control**

➤ **Pests**

**Aphids**

Aphids feed on the plant juice and that causes the leaves wrinkling, dropping down and wilting. Aphids also expand the disease.

**Control:**

- Fenitrothion 50% EC 250 cm<sup>3</sup> mixed with 100 liters of water.
- Mospilan 20% SP 25 g mixed with 100 liters of water.
- Carbosulfan 25% WP (Marshal) 150g mixed with 100 liters of water.
- Reldan 50% EC 250cm<sup>3</sup> mixed with 100 liters of water.



**Cotton leaf-worm and green worm**

These two kinds of worms feed on leaves and making holes, and we can see larva's feces in leaf's armpit. It appears from October to April.

**Control:**

- Neomyl 90% SP 75 g mixed with 100 liters of water.
- Proclaim 5% SG 60 g mixed with one liter of water.
- Pasha 1.9% EC 250cm<sup>3</sup> for one feddan.



- Prochem (Emamectin Benzoate) 50% SG 60gm for one feddan.
- Radiant 12% SC 35cm<sup>3</sup> for one feddan.

### **White-fly**

White-fly absorbs the plant juice leading plant to be weak and wilt.

#### **Pesticide:**

- Admiral 10% EC (Pyriproxyfen) 75 cm<sup>3</sup> mixed with 100 liters of water.
- Biovar 4% WP 200 g mixed with 100 liters of water.
- Actellic 50% EC 375 cm<sup>3</sup> mixed with 100 liters of water.
- Selecron 72% EC 187.5 cm<sup>3</sup> mixed with 100 liters of water.

### **Cabbage Flea Beetle (Phyllotreta)**

It makes holes on leaves.

#### **Pesticide:**

- Selecron 72% EC 187.5 cm<sup>3</sup> mixed with 100 liters of water.
- Carbosulfan 25% WP (Marshal) 187.5g mixed with 100 liters of water.
- Reldan 50% EC 250cm<sup>3</sup> mixed with 100 liters of water.
- Prothiofos 50% EC (Tokuthion) 250cm<sup>3</sup> mixed with 100 liters of water.

#### ➤ **Disease**

### **Seedling damping-off, Root rot and Wilt diseases**

These diseases are caused by funguses in the soil which leads to plant wilt, yellowish and plant rot and lack of seedlings point.

#### **Control:**

- Apply an appropriate amount of potassium and phosphorus fertilizing.
- Apply fungicide, e.g. Topsin M70, Rizolex or Vitavix Theram 2 g for 1 kg of seed.
- Sterilization of cultivation tools which is used in seedlings producing. It is better to treat seedlings with Topsin M70 fungicide solution with 2g mixed with a liter of water.
- Manage the irrigation and drainage process, well.

### **White rot**

The cold weather and high moisture condition is suitable for this disease. White rot infects all the growing phases of cabbage.

#### **Control:**

- Apply fertilizer Cyanamide 400 to 600 kg for one feddan.
- Fill the field with water in the summer season and remove all the previous crop remains.

- Apply a suitable cropping pattern.
- Apply fungicide, e.g. Topsin M70 or Rizolex 2 g for 1 kg of seed.
- Spray pennthiol (sulfur) 250 g mixed with 100 liters of water for prevention.
- Spray Ronilan or Topsin M70 100 g mixed with 100 liter of water for treatment.

### **Downy mildew**

This disease expands especially under low temperature and high moisture condition.

#### **Control:**

- Avoid intensive cultivation.
- Collect the remains of the previous crop and burn it.
- Use pesticides, e.g. Kocide 101 or Propinep 250g mixed with 100 liters of water for prevention purpose.
- When the infection starts to appear, spray fungicides, e.g. Previcur N 250g, ACROBAT COPPER 250g or Acogen pro 45g mixed with 100liters of water.



## **Chickpea**

- **Introduction**

Chickpea is one of the important crops for human in some countries. The dried chickpea contains 19% of protein and 35% of starch. Chickpea is eaten both young and matured one, and it has high nutritious. Chickpea is used not only for the food but for confectionery and medical purposes, and the remaining of the crop is used for brick manufacture or feeding for livestock. The important production areas of chickpea in the world are India, Pakistan, Mexico, Ethiopia, Turkey, Italy, and Egypt.

- **Cultivation Environment**

- **Cultivation Season**

- Winter Season: Middle of October to Early of November)

- **Temperature**

- The average cold weather is suitable for chickpea cultivation, and it doesn't stand the high moisture condition. In general, it is cultivated in the Mediterranean Sea region.

- **Soil Condition**

- Chickpea can be cultivated in any types of Egyptian land except the alkaline and poor drainage soil. Sandy soil with good drainage is very suitable for chickpea cultivation. In the case of cultivation in a very clayish land (especially for the big size of a chickpea), the germination rate will be decreased.

- **Cultivation Type & Variety**

- **Cultivation Type**

- Sowing the seed

- **Suitable Varieties in Upper Egypt**

- Giza 4: It is a newly released. It has a characteristic of high adaptability and high productivity. It can produce about 6 to 7 ardab per feddan.
- Giza 3: The size of the seed is smaller than other varieties, but it has good productivity. The demand of the Egyptian market is higher than Giza 2 variety. Giza 3 is a standing variety and the flowering period starts after 78 days from the sowing. The flowers are a white color and the fruits mature after 158 days from the planting. This variety has an average resistance for wilt disease and it can resist root rot and stem rot, but it can be infected with blight fungus.
- Giza 531: It is a good variety for Upper Egypt. It is characterized by high productivity and heat tolerant. The size of seed is big and it is preferred by the traders and consumers.
- Giza 88: It has high adaptability. It is characteristic of early maturing, can be harvested about 150 days from the planting, and high productivity, 6 to 7 ardab per feddan. Also, it has a tolerant of wilt and root rot disease.

- **Amount of Seed**

- 40 to 50 kg of seed for one Feddan.

- **Field Management**

- **Land Preparation**

- Plow the field well and level it to avoid the unequal water condition.
- Make 12 planting ridge in 7m.

- **Bacterial Application (El-Okadin)**

- Legumes have the ability to fix the nitrogen in the soil, and it requires ‘‘Rhizobium’’. Seeds of chickpea are treated with this kind of bacteria before the cultivation by using adhesive solution to fix the bacteria on the outer skin of seeds. It is very important to conduct the bacterial application because it helps to get a high production with good quality, specifically, if this is the first time to cultivate chickpea in the land. It is recommended to conduct this treatment before cultivation.

- **Sowing**

Sow the 2 to 3 seeds both side of the planting ridge. The distance between plants is 10cm.

- **Thinning**

After germination, one plant should be left in one place.

- **Irrigation**

Chickpea is a sensitive crop of irrigation water. Generally, it needs 3times of irrigation.

- The first irrigation is after sowing. The second time is during the flowering stage. The last irrigation time is during the growth stage of pods.
- In case of cultivation in sandy soil, it needs 8 irrigation times with regular intervals.

- **Weeding**

Because of slow-growing of Chickpea, it is important of weeding at the early growing stage. The first weeding should be done after 30 days from cultivation, and the second time should be conducted after 30 days from the previous one.

- **Fertilization**

Usually, chickpea fields don’t need much amount of fertilizers. In case of unfertile lands such as newly reclaimed land, apply fertilizers as follows;

- Ammonium Sulfate or Ammonium Nitrate: 15 to 20kg for one Feddan
- Superphosphate: 100 to 200kg for one Feddan
- Potassium Sulfate: 50kg for one Feddan

- **Harvesting**

Chickpea cultivation takes 3 to 3.5 months if it is for young crop consumption and plants is cut off before fruits become yellow and solid. In case of dried cereal consumption purpose, it takes 5.5 to 6 months for cultivation in field. The harvesting is conducting by hand pulling and after the plant drying it will be threshed. The yield of cereal Check pea is 450 to 750kg per one Feddan.

- **The Main Dangerous Disease of Chickpea Cultivation**

**Root rot & wilt**

**Symptoms:**

- The infection of root rot starts early stage, germination before the plant appears from the soil surface so that we can find some missing crop or seedlings' death.

**Control:**

- Apply fungicide for the seed.
- Fungicide named RIZO IN 4g mix with one liter of water and soak the seed in the solution.
- Apply moderate irrigation water.

## **Black Cumin**

### **• Introduction**

Black cumin is also known as black caraway, nigella, and kalonji. The origin is west Asia. Black cumin is cultivated in most parts of the world especially in India, Egypt, Middle East Asia, Yemen, Saudi Arabia, Maghreb, Iran, Pakistan, many parts of Asia and Mediterranean Sea area.

Black cumin seeds were found in Tutankhamun's tomb. It is an annual winter plant cultivated in average-weather areas and some hot-areas with low-humidity. Black cumin can survive under dry condition but cannot survive under high humidity or frost or salinity condition, so that it cannot be cultivated along the coast.



### **• Cultivation Environment**

#### ➤ **Cultivation Season**

- Winter Season: (Sowing time: October to November)

#### ➤ **Soil Condition**

- Black Cumin can be cultivated in any type of soil. The suitable soil is an average soil texture, contains high nutrition, has good drainage and free from salinity problem. The most suitable soil is light yellow soil and black soil in the reclaimed lands.



### **• Amount of Seed**

- 4 to 5 kg of seed for one Feddan.

### **• Field Management**

#### ➤ **Land Preparation**

- Plow the field twice and remove all weeds.
- Make 12 planting ridge in 7m.
- Apply 10 to 20 m<sup>3</sup> of decomposed manure, 200 kg of calcium superphosphate and 50kg of sulfur during plowing.

#### **In old lands**

- Sow the seed with the 25-30cm distance between plants and on the upper third of planting ridge.
- Seeds are cultivated on one side of the planting ridge.
- Sow 4-5 seeds for one place.
- Apply the irrigation directly after sowing seed.

#### **In new and reclaimed lands**

1. For furrow irrigation field:

- Same preparation can be applied as old lands. The amount of organic and chemical fertilizers should be increased as follows, 20 to 25 m<sup>3</sup> of decomposed manure, 300 kg of calcium superphosphate and 50kg of sulfur per fed.
2. For drip irrigation field:
- Make an irrigation network by the water hoses.
  - Spacing between hoses should be 80cm.
  - Spacing between dripping holes should be 30 to 40cm.
  - Seeds are cultivated besides the hoses.
  - Planting spacing between plants is 20cm.
  - Irrigation is applied directly after sowing.

➤ **Irrigation**

**In old lands**

- The first irrigation is after sowing.
- Second irrigation is applied after 7-10 days from the sowing date. This irrigation should be applied in a short time.
- After the second irrigation, following irrigation should be applied every 3-4 weeks usually according to the soil nature and temperature during the growing period.

**In new and reclaimed lands**

1. For furrow irrigation field:
- Irrigation frequency is every 5-7 days.
2. For drip irrigation field:
- Irrigation should be conducted after sowing for 4-6 hours in the first day, then 1-hour irrigation every day until germination.
  - After the germination, irrigation will be applied every 2 to 3 days.
  - Irrigation should be stopped before 10 days from harvesting.

➤ **Thinning**

- One or two plants should be left in the one place after three weeks from germination.
- Irrigation should be applied after thinning.

➤ **Weeding**

- Hoeing weeds will be conducted 3-4 times during the growing period.

➤ **Fertilization ( for 1 Feddan)**

**In old lands**

- 200 kg of ammonium sulfate and 50 kg of potassium sulfate will be applied as a top-dressing divided two times. The first top-dressing is applied one month later from sowing. The second time is during flowering period.

**In new lands**

- 400 kg of ammonium sulfate and 75 kg of potassium sulfate will be applied as a top-dressing divided two times. The first top-dressing is applied one month later from sowing. The second time is during the flowering period.

It is recommended to apply sulfuric microelements, e.g., Zinc, Manganese, and Iron because of these increase the amount of oil in the seed. Spray these fertilizers at the beginning of the flowering stage in the evening time.

➤ **Harvesting**

- In the case of early cultivation, harvesting will be done in April, when the fruits are matured, and its color becomes yellow and basal leaves become dry.
- In order to avoid the loss of seeds, plants are cut the 10 cm above the ground and collect it in the early morning before the temperature gets hot.
- Collected the harvested plants will be dried under the sunshine.
- After drying the plant, it will be threshed using the machine which is used for grains.
- The production is 750 to 800 kg per feddan.

• **Pest & Disease Control**

➤ **Pests**

**Mole cricket and biting worms**

**Control:**

When the infection sign of mole cricket starts to appear after cultivation, poison bait is effective. This poison material is made by 15kg of grinded maize, 20 liters of water and 1.25 liter of Hostathion 40% (Triazophos) or 600 gm of carbosulfan WP for one feddan. Apply this poison material after heavily and fast irrigation in the morning. The Bait is distributed between the planting ridges after sunset. Mole cricket doesn't prefer sandy or yellow soil, but the bait for biting worm should contain smooth bran with the previous ingredients with the same rates. This bait is applied under the plants.

**Borer (Aphid, Empoasca Lybica, Thrips)**

**Control:**

Boring insects can be controlled by spraying useful bacteria, "Beauveria bassiana" 100 cm<sup>3</sup> mixed with 100 liters of water twice every week, or using light mineral oil (KZ). For pesticide application, the below pesticides are effective.

- Akelic 375cc/ 100 liters of water
- Primor 125g/ 100 liters of water
- Marchal 150gm/ 100 liters of water
- Admir 50cc/ 100 liters of water
- Letches 120gm/ 100 liters of water

- Plasmet 100gm/ 100 liters of water
- Kotgbdor 75cc/ 100 liters of water
- Malathion 250cc/ 100 liters of water

The last application should be stopped at least before one week of harvesting.

### **Red spider**

#### **Control:**

Spray the pesticide below;

- Micron sulfur 250g mixed with 100 liters of water for one feddan.
- KZ Oil 95% EC 1.5 liter mixed with 100 liters of water for one feddan.
- Vertimec (Abamectin 1.8% EC) 40 cm<sup>3</sup> mixed with 100 liters of water for one feddan.

➤ **Desease**

### **Fusarium wilt**

The symptoms of the disease are partial dry of the plant, or gradual death for the plants and then, suddenly wilt of the plants.

#### **Control:**

Apply fungicide, called Topsin 3g for 1kg of seeds, as a seed treatment before planting.

It is recommended to remove the infected plants to burn them outside the field.

### **Powdery mildew**

This disease infects the leaves, fruits, and the inflorescences. It appears as white spots which hurt the plant growth and also cause wilting for the leaves.

#### **Control**

Apply micron sulfur 250 g mixed with 100 liters of water every 7-10 days.

Apply AQ10 (Bio) 60 mm mixed with 100 liters of water 2 to 3 times every 10 days according to the infection.

Stop the spraying before 1 month of harvesting.

### **Flowers blight**

Spray Dithane M 45 (Mancozeb 80%) 250g mixed with 100 liters of water for the infected area 2 times every 15days.

### **Sclerotinia rot**

The infected plants are collected and burned outside the field.

**Root rot**

Treat the seed with a fungicide called ISO with a rate of 4 ml for one kg of seeds.

Treat the seed with a fungicide called Plant Guard (*Tricoderma harzianum*) with a rate or 4 ml for one kg of seeds.



## **Fenugreek**

### **• Introduction**

Fenugreek is one of the important nutrition crops for humans and animals. We use the seed for food as a spice, and also for making medicines. Due to the expansion of land reclamation in Egypt nowadays, fenugreek can be used as a green fertilizer which increases the fertility of the newly reclaimed soil. It increases the amount of organic matters and nitrogen in the soil.

It is a kind of herbal plant. The plant height differs from 50cm to 80cm according to the varieties. The stem is hollow. Small branches get out of the stem. At the end of each branch, you could find 3 leaves. The flowers get out from the bottom of the stem. It has yellow flowers and it will make pods. The length of the pod is around 10 cm. Each pod contains the seeds.



### **• Cultivation Environment**

#### ➤ **Cultivation Season**

- Winter season: (Middle to End of October)

#### ➤ **Temperature**

- Although fenugreek could grow up under high-temperature condition, its growth is better under the cooler temperature condition, so it is considered as one of the winter crops.

#### ➤ **Soil Condition**

- Fenugreek could be cultivated in any lands but, it is better to cultivate in a sandy land which has good drainage and ventilation system. Fenugreek cannot be cultivated in the lands which have salinity problem.
- The suitable soil pH for Fenugreek cultivation is from 5.8-8.2

### **• Cultivation Type & Variety**

#### ➤ **Cultivation Type**

- Sowing the seed

#### ➤ **Suitable Varieties for Upper Egypt**

- Giza 2: it could be cultivated in upper Egypt
- Minia 39: it grows well in upper Egypt

### **• Amount of Seed**

- 40 to 50 kg of seed for one feddan.

### **• Field Management**

#### ➤ **Land Preparation**

- It is recommended to plow and level the land well before cultivation. It can reduce the number of weed and also prevent the stagnation of irrigation water, and it helps to avoid the disease of roots rot.
- Apply 150kg of Superphosphate for one feddan at the plowing.

➤ **Planting**

Firstly, plow and irrigate the land. After disappearing the standing water in the field, broadcast the seed mixed with microorganisms named "El-okadin" one bag for old land and 2 to 3 bags for new land specifically the first time of fenugreek cultivation. Then, plow the surface soil, level it and divide the land into basins.

➤ **Irrigation**

The 1st irrigation is after 1 month of the sowing. The 2nd time is before the inflorescences formation. The 3rd time is when the pod is full. It is necessary to take care of the amount of irrigation water, not to apply much water but also not make the plant thirsty. The land with a good drainage system, it needs 5 to 7 irrigation times. The interval between irrigation is 15 to 21 days according to the nature of the soil and the temperature.

➤ **Weeding**

- Weeding should be done in the early stage of cultivation.
- In the case of broadcasting cultivation, fenugreek plant can cover the land, so it is better to weeding by hand. For cultivation on furrows, it can be weeding by hoe.

➤ **Top-Dressing Fertilization ( for 1 Feddan)**

- As a top-dressing, apply 50kg of ammonium nitrate at the sowing time in the old-land and after 10 days of cultivation in the new land.

➤ **Harvesting**

The harvesting time will differ according to the purpose of the cultivation. If the purpose is for green fertilizer, the harvesting is after the flowering stage. If the purpose is to produce the seed, the harvesting should start when the pod color turns to yellow and then leave the plant under the sun lights for drying. The crop needs 4-5 months for maturing. The yield will be 620 to 930 kg per Feddan.

• **Pest & Disease Control**

➤ **Pests**

**Leaf Hopper**

It is the most dangerous insects of Fenugreek because it is the main transporter of Mycoplasma diseases. The infected plants will die, and the product does not be preferred at the market.

**Control:**

- Nomolot: 50cm<sup>3</sup> mixed with 100 liters of water for one feddan

**Japanese Beetles**

This insect becomes active from the end of June and starts feeding the fenugreek leaves for 2 months. At the time of the heavy attack by the beetle, the plant loses most of the leaves.

**Control:**

- Radiant: 100cm<sup>3</sup> mixed with 100 liters of water for one feddan
- Nomolt: 50cm<sup>3</sup> mixed with 100 liters of water for one feddan
- Mossbelan: 25 g mixed with 100 liters of water for one feddan

**Two-spotted spider mite**

This insect feeds on the surface of the lower leaves which make silver spots or thin lines on the leaves. The infected plants may not be able to form the pod.

**Control:**

- Super Ourts: 300cm<sup>3</sup> mixed with 100 liters of water for one feddan
- Nisoran: 40 cm mixed with 100 liters of water for one feddan

➤ **Disease**

**Powdery mildew**

It is one of the most dangerous diseases that causes big losses of the production.

It appears as white spots on the upper and lower sides of the leaves and spread out to the stem and pods.

**Control:**

Before the appearance of the infection, spray Comolos S (200 to 300 g / 100 liter of water)

After the appearance of the infection, spray Amistar (200 cm<sup>3</sup> / 100 liter of water)

**Cercospora Leaf Spot**

The infection starts from the seed which is infected. The yellow spots start to appear on the leaves, and then the infected tissues will die, and the color turns into brown.

**Control:**

- Kibriotube: 100 g mixed with 100 liters of water for one feddan
- Belize: 50 g mixed with 100 liters of water for one feddan
- Amistar Top: 50 cm<sup>3</sup> mixed with 100 liters of water for one feddan
- Poliram DF: 200 g mixed with 100 liters of water for one feddan

**Root Rot**

The infection weakens the growth of the plant. After that, the roots starts to rot and a brown area appears on the surface of the soil at the place of the seedling. And also the leaves color turn to yellow.

**Control:**

Apply Mon Cut material (500g/ acre) with the irrigation water and also improve the drainage system.

## **Irish Potato**

- **Introduction**

As Irish Potato is cultivated around 300,000 feddan annually, it is one of the most important vegetable crops in Egypt. Moreover, Irish Potato is the 1st place of the exporting crops in Egypt. It is exported about 200-250 thousand tons annually to the UK, west Europe, and Arab countries.



Irish Potato contains higher nutrition value compared with other grains, it contributes the nutrition improvement.

- **Cultivation Environment**

- **Cultivation Season (3 seasons)**

- Summer Season (Planting time: January, for seed production for Nile and Winter season)
- Nile Season (Planting time: Mid of August to Mid of September)
- Winter Season (Planting time: Mid of October to Mid of November)

- **Temperature**

- Irish Potato can be grown under 15 - 30°C.
- During vegetative growth, Irish Potato needs long day length with 20- 25°C.
- Tubers growing period needs short day length with 15-20°C.

- **Soil Condition**

- Irish Potato can be cultivated in any kinds of lands, however, it is not recommended to cultivate it in the lands which is infected by the brown rot disease or the salty lands.
- The suitable soil pH for Irish Potato cultivation is from 5.5-6.0.

- **Cultivation Type & Variety**

- **Cultivation Type**

- Tuber planting

- **Suitable Variety in Upper Egypt**

- Bern
- Eskanta
- Kara
- Espona
- Daiamont

- **Field Management**

- **Land Preparation**

- Before planting, plow the field twice and with a one-week interval for both old and new land.
- At the first plowing, apply basal fertilizer, e.g., Manure, Superphosphate, and Potassium

Sulfate.

- After second plowing, make a planting ridge in 10-12 lines per 7 meter.

➤ **Planting Method**

- Summer season: 750-800kg of the cut tuber for one feddan. The size of one tuber should be 45-60g with 2-3 eyes. It should be cut before 24-48 hours by a sharp knife with sterilizing using alcohol.
- Nile and winter season: 1,200-1,750kg of small size whole tuber for one feddan.
- The tuber seed should be planted on the planting ridge with 20-35 cm distance.



➤ **Irrigation**

- Potato is a very sensitive crop of the shortage of soil moisture especially during making the new tubers (namely after 5-7 weeks from cultivation) and increasing the volume of tubers, soil moisture should not be less than 60% because the shortage in moisture reduces the number of tubers and the sized. However, excess soil moisture also causes decreasing yield.
- Summer season needs approximately 10-12 times of irrigation, and the Nile or winter season needs about 6-8 times.
- First irrigation: After 15-20 days from cultivation.
- Other irrigation: After 10-15 days of previous irrigation. The duration between the irrigation will be changed by the temperature and the nature of the soil.
- The irrigation will be stopped before three weeks of harvesting.
- All irrigation should be done by the small amount of water.

➤ **Fertilization (Basal) for 1 Feddan**

- Manure: 20m<sup>3</sup>
- Chemical fertilizer: 400-500kg of Superphosphate, 100kg of Potassium Sulfate

➤ **Fertilization (Top-dressing) for 1 Feddan**

- 1<sup>st</sup> top-dressing: after 3 weeks from planting: 150kg of Ammonium nitrate.
- 2<sup>nd</sup> top-dressing: after 2 weeks from the 1<sup>st</sup> top-dressing: 200kg of Ammonium nitrate.
- 3<sup>rd</sup> top-dressing: after 2 weeks from the 2<sup>nd</sup> top-dressing: 200-250kg of Ammonium nitrate.

➤ **Harvesting**

- Irish Potato can be harvested after 95-120 days from planting, and the duration is changed depends on the variety and the growth of the plant.
- The production will be 12-18 tons depends on the variety, land preparation, temperature and field management.

- **Maturity signs and Harvesting**

Maturity signs of potato are the potato become big size, and it will be hard to scratch the surface of potato and also to peel the surface by the thumb, and the vegetative part turns into yellow color. Get rid of the vegetative growth before harvesting manually or mechanically. The best way is to remove it mechanically before one or two days from harvesting. Potatoes should be collected whether by local plow or harvesting machines and without causing cuts or bruises on tubers as possible. Potato should be exposed to the air for one or two hours after harvesting until drying then they are collected for sorting.

- **Post-harvesting**

The purpose of the post-harvesting treatment is to form a good cork layer on the tuber skin and losing excess humidity to protect the damage of scratching or disease infection. Harvested potatoes will be kept on a leveled place with 30cm height and covered with rice straw with 70-100cm height. Spray water on the ground and spray pesticide to the rice straw. Keeping the tubers for 10 – 15 days, the skin becomes hard and difficult to peel by the thumb. However, the disadvantage of this method is the pesticide will be remaining on the tubers.

When store Potato in the refrigerator, drying the tubers to prevent rot by blowing the warm air for several hours. Then keep the tubers for a week under 10-15°C and relative humidity 85-95%.

- **Storage**

There are two types of storage, hut (Al-Nwala) and fridge, for potato.

**First: store in Al-Nwala (a place like a hut)**

- It is a shaded place that allows air to pass through its sides and from the ceiling without being exposed to direct sunlight.
- Tubers are placed on piles with a width of 2m and a height of 1.5m.
- Then piles are covered by rice straw with a height 30-50cm.
- Spray the ground and rice straw with pesticide to avoid rats and insects.
- The disadvantage of this method is applying pesticide for the tubers.

**Second: store in the fridge**

- Firstly, the tubers are kept under 10-15°C and 85-95% of humidity for a week, and it decreases to 85%. Temperature is gradually decreased by several weeks until reaching the proper temperature (3-4°C).
- Tubers can be kept under this condition for 6 months or more.
- Avoid the increasing of temperature more than 4°C and decreasing less than 3°C.
- The increasing of temperature more than 4°C makes tubers loses its moisture.
- The decreasing of temperature less than 3°C exposes the tubers for damages of cold or freezing.

- **Physiological Disorder**

### **Greening**

Exposing tubers to the Sunlight, the skin becomes green color, and this is a physiological defect called the greening. It increases the "Solanine" in the tuber which is toxic for the human. The greening happens any time once tubers are exposed to the Sunlight, whether it is before or during harvesting or marketing or storage.

### **Growth Cracks**

Rapidly growth of tuber increase the inner tissues, and it causes the pressure inside of the tubers and then it causes the growth cracks. Because of the difference of growing between inside and the skin of tuber, the skin cannot cover all the tuber and makes crack. It happens when fertilization is excess or when providing soil humidity highly after drought. The growth cracks can be healed before harvesting, and it will be like scratches. It rarely causes rot disease.

### **Secondary Growth**

Secondary growth can be seen as an appearance of bud on the tuber. The growth of tuber will stop once the bud starts to appear.

The secondary growth will be affected by the following factors:

- Variety: The secondary growth differs by the variety.
- High temperature: High temperature breaks the standstill period of tubers.
- Humidity of soil: The shortage of soil humidity stops the growth of tubers, and if the humidity is provided suddenly, tubers continue to grow.

### **Black Heart**

Black heart happens that the inner tissues of tubers turn into black color according to the shortage of oxygen. Firstly, the infected tissues turn into rose color or grey color and then brown color, finally black color. Usually, there is a line between the infected tissues and healthy tissues. The infected tissue, black heart, is hard. The followings increase the black heart phenomenon:

- High temperature of storage: it increases the rate of oxygen consumption by breathing.
- Bad ventilation of the storage: it will happen when making piles without space for ventilation.
- In case of big size of tubers.

### **Hollow Heart**

Hollow heart started when the inside part of the tuber died, and it disappears and then it became empty. The shape of the hollow part is like a star, and it becomes bigger with the growth of tuber. It is pale grey color surrounding the tissues of it, but the tuber looks normal from the outside. The hollow heart will happen in the big tubers. The disorder will be increased with the rapid growth of the vegetative

part because of the high temperature and high soil humidity during the beginning of tuber formation. Moreover, it will be more increased with the excess application of nitrogen fertilizers. To reduce the number of hollow heart, it is recommended to cultivate the small-size variety with narrow distance between plants, and increase the amount of potassium fertilizers and avoid the excess nitrogen fertilizers.

### **Peeling**

It happens when the newly harvested tubers exposed to strong Sunlight which remove the skin of tuber and make scratches because of the non-formation of periderm layer of tubers. Exposing to high moisture makes the tuber loses its humidity from the peeled place and its color turns into dark brown or black and then it may become sticky by the growth of bacteria. These tubers cannot be stored and they get rotten quickly. This phenomenon is seen a lot in new-harvested potatoes. To reduce the phenomenon of peeling the following should be done:

- Never harvest the potatoes before they are fully mature.
- In the case of early harvesting to get better benefit from the high prices, drying should be done.
- If there is no time to carry out the drying, selling should be done very carefully after harvesting and never expose the potatoes to the strong Sunlight and high temperature after harvesting.

## • **Pest & Disease Control**

### ➤ **Pests**

#### **Aphids**

Aphids are one of the serious insects that infect the potato because they transfer the Virus to potato. Preventive control is necessary as the adult aphid is a main vector of "potato leaf roll virus" and "Y virus" for potato. It appears during February to April.



#### **Control:**

Apply the recommended pesticide below when finding an aphid on the plant. Both sides of leaves should be sprayed very well.

#### **Recommended pesticides:**

<b>Pesticide</b>	<b>Amount</b>
Agri-flex 18.56% SC	240 cm <sup>3</sup> /100 litres of water
Actara 25% WG	20 gm/ 100 litres of water
Actellic 50% EC	375 cm <sup>3</sup> / 100 litres of water
Imidazed 20% SC	50 cm <sup>3</sup> / 100 litres of water
Blanch 48% SC	30 cm <sup>3</sup> / 100 litres of water
Gaucho (Imidacloprid) 70% WS	150 gm/ ton of seeds
Reldan 22.5% EC	1 litre/ feddan



### **Potato Tuber worm**

Larva makes big tunnels inside the leaf, and it looks transparent. It attacks the uncovered tubers near to the soil surface. Larvae get into tubers and make tunnels. It appears from April to November. The attack increases in summer and late summer season.

#### **Control:**

Spray the recommended pesticides below before sunset.

#### **Recommended pesticides:**

<b>Pesticide</b>	<b>Amount</b>
Avanut 15% EC	25 cm <sup>3</sup> / 100 litres of water
Protecto 9.4% WP	300 gm/ feddan
Penny 9% SC	200 cm <sup>3</sup> / feddan
Tracer 24% SC	30 cm <sup>3</sup> / 100 litres of water
Runner 24% SC	37.5 cm <sup>3</sup> / 100 litres of water
Sumithion KZ 50% EC	1.5 litre/ feddan
Coragen 20% SC	60 cm <sup>3</sup> / feddan
Match 5% Ec	160 cm <sup>3</sup> / feddan

### **Red spider**

Yellow color plants appear in the cultivation field. Yellow or brown color spots increase the number and the size on the surface of the leaves. The yellowish leaves become rough surface. It increases during summer and Nile season.

#### **Control:**

Spray the recommended pesticides below when it appears more than 5 on one leaf.



#### **Recommended pesticides:**

<b>Pesticide</b>	<b>Amount</b>
Abalone 1.8% EC	40 cm <sup>3</sup> / 100 litres of water
Sniper 24% SC	60 cm <sup>3</sup> / 100 litres of water
Gold 1.8% EC	40 cm <sup>3</sup> / 100 litres of water
Challenger Super 24% SC	60 cm <sup>3</sup> / 100 litres of water
Vertimec (Abamectin 1.8%)	40 cm <sup>3</sup> / 100 litres of water

### **White Fly**

White-fly absorbs the plant juice leading plant to be weak and wilt.

#### **Control:**

- Remove the weeds properly.
- Use the yellow adhesives traps.
- Apply agricultural sulfur powder, and it is better to mix the sulfur with Diathin M by 1:1 ratio.
- Admiral 10% EC (Pyriproxyfen) 75 cm<sup>3</sup> mixed with 100



liters of water.

- Biovar 4% WP 200 g mixed with 100 liters of water.
- Actellic 50% EC 375 cm<sup>3</sup> mixed with 100 liters of water.
- Selecron 72% EC 187.5 cm<sup>3</sup> mixed with 100 liters of water.

**Cotton leafworm**

It feeds on the leaves, buds, and fruits, so it makes some holes on these. The attacks by the worms increase during August to November, Nile and winter season.



**Control:**

- Remove the weeds well.
- Apply the recommended pesticides below after irrigation.

**Recommended pesticides:**

Pesticide	Amount
Gaspar 3.4% ME	120 cm <sup>3</sup> / feddan
Reldan 50% EC	1 litre/ feddan
Quick 90% SP	300 gm/ feddan
Lannate 90% SP	300 gm/ feddan
Match 5% EC	160 cm <sup>3</sup> / feddan
Nomolt 15% SC	50 cm <sup>3</sup> / 100 litres of water

**Mole Cricket**

Both larval and adult of mole cricket feed the roots and the bottom of the stem under the soil surface and which leads wilting and death of the plant. The farmer can find some tunnels on the surface of the soil. The attack by Mole cricket increase summer and Nile season.



**Control:**

- Pesticides are used for making a poisonous material and it is prepared as follows:
- 15 kg of grinded maize + 20 liters of water + the recommended pesticide.
- Irrigate the field in the morning then add the poisonous between plating ridges after the sunset.

**Recommended pesticides**

Pesticide	Amount
Dursban 48% EC (Chlorpyrifos 48%)	1.25 litres / feddan
Pyriban A 48% EC	1 litre/ feddan
Chloro-plus 28% EC	1 litre/ feddan

### **Cutworm**

Cutworm attacks the seedlings in the nursery or transplanted field. You can see the affected plants lying down on the ground and separated from its roots, even you cannot find the worm near the plant.



### **Control :**

- Cleaning the field and removing the weeds.
- Collect all the worms that can be found under the plant, and burn it.
- Pesticide is used as a poisonous material and it is prepared as follows:
  - 25 kg of soft bran + 20 liters of water + recommended pesticides.
  - Field should be irrigated in the morning then adding the poisonous between planting ridge after the sunset.

### **Recommended pesticides**

<b>Pesticide</b>	<b>Amount</b>
Effect Power 5% EC	200 cm <sup>3</sup> / feddan
Ictafos 48% EC	1 litre/ feddan
Axon 5% EC	200 cm <sup>3</sup> / feddan
Egythrin 2.5% EC	400 cm <sup>3</sup> / feddan
Pestban (Chlorpyriphos) 48% EC	1 litre/ feddan
Petaphos (Chlorpyriphos) 48% EC	1 litre/ feddan
Sylian (Profenofos) 72% EC	500 cm <sup>3</sup> / feddan
Vantex 66% CS	100 cm <sup>3</sup> / feddan

### **Root-knot Nematode**

Neoplasm will appear with different shapes and volumes on the root system. Some neoplasms are full of warts and dark brown spots are inside tubers.



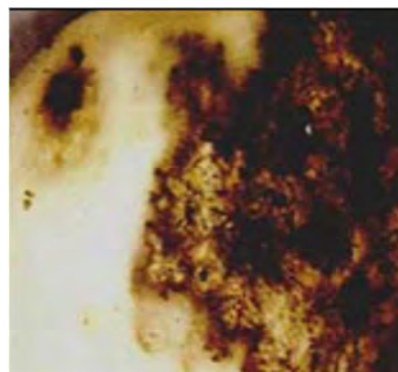
### **Recommended pesticides**

<b>Pesticide</b>	<b>Amount</b>
OXAMYL 24% (Carbamate)	3 litres/ feddan (twice)
Nimayuk 10% GR	30 kg/ feddan

### **Lesion Nematode**

After one month of cultivation, some ulcers appear on the second roots. Apply recommended pesticides.

### **Recommended pesticides**



Pesticide	Amount
Mocap 10% GR	30 kg/ feddan
NEMATHORIN 10% G	12.5 kg/ feddan

### ➤ **Fungal Disease**

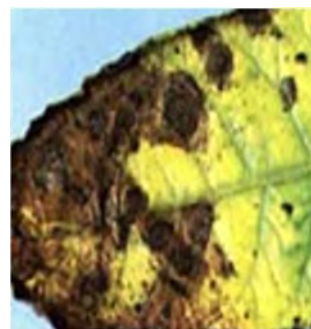
#### **Early Blight**

##### **Reasons:**

- Fungus: *Alternaria solani*

##### **Symptoms:**

- Black spots appear on the old leaves of small plants.
- Spots extend and circle loops start to appear around its center, these spots look like an eye.
- Tissues around spots turn into yellow color.
- The high temperature (25°C-30°C) and humidity condition expand the disease easily.
- Similar spots on leaves also appear on the stem, and it may cause crown rot.
- Spots appear on the connected part of fruits with neck and stem, and the infected fruits fall.



##### **Control:**

- Apply cropping pattern, without repeating of tomato or same crop family of tomato, e.g. Eggplant, Pepper and Irish Potato.
- Pick up the infected plants and burn it out of the field.
- Apply the potassium fertilizer.
- Spray the following recommended pesticides every 15 days:

### **Recommended pesticides**

Pesticide	Amount
Equation pro 52.5%	40 gm/ 100 litres of water
Anadol 80% WP	250 gm/ 100 litres of water
Index 77% WP	250 gm/ 100 litres of water
Optima 25% EC	50 cm <sup>3</sup> / 100 litres of water
Proxanil 45% SC	250 cm <sup>3</sup> / 100 litres of water
Profile NT 35% SC	500 cm <sup>3</sup> / 100 litres of water
Polyram DF 80%	200 gm/ 100 litres of water

Tazolen 72% WP	250 gm/ 100 litres of water
Toledo 43% SC	35 cm <sup>3</sup> / 100 litres of water
Gardens 25% EC	50 cm <sup>3</sup> / 100 litres of water

### **Late Blight**

Late blight is one of the most dangerous infects tomato and potato.

#### **Reason:**

- Fungus: *Phytophthora infestans*  
(Potato late blight fungus)



#### **Symptoms:**

- Late blight damage increase under the cold weather and high humidity condition.
- Fungus can infect all parts of the plant.
- Small watery-black spots appear on leaves.
- Spots spread fast, and white rot appears on the edges of the bottom surface of leaves.
- During 48 hours the color of leaves and stem change into brown.
- Big black spots cover the infected tissues on the fruit surface.

#### **Control:**

- Use the resistant variety and apply cropping pattern. Tomato and potato cannot be cultivated consecutive because of injury of continuous cropping.
- Spray the recommended pesticide both side on the leaf:

#### **Recommended pesticides**

Pesticide	Amount
Acrobat Mancozeb 69% WG	250 gm/ 100 litres of water
Acrobat Copper 73.2% WP	250 gm/ 100 litres of water
Equation pro 52.5%	40 gm/ 100 litres of water
Amistar 25% SC	50 cm <sup>3</sup> / 100 litres of water
Antracol 70% WP	250 gm/ 100 litres of water
Infito 68.75% SC	125 cm <sup>3</sup> / 100 litres of water
Orvego 52.5% SC	80 cm <sup>3</sup> / 100 litres/ feddan
Oxy Plus 28.5% WP	250 gm/ 100 litres of water
Brado 72% SC	875 cm <sup>3</sup> / feddan
Proplant 72.2% SL	250 cm <sup>3</sup> / 100 litres of water
Previcur N 72.2%	250 cm <sup>3</sup> / 100 liters of water
Plant Gard	250 cm <sup>3</sup> / 100 liters of water
Folio Gold 53.75% SC	300 cm <sup>3</sup> / 100 liters of water
King 64.61% SC	200 cm <sup>3</sup> / 100 liters of water
RIDOMIL Gold Plus 42.5% WP	200 gm/ 100 litres of water
RIDOMIL Gold MZ 68% WG	200 gm/ 100 litres of water

#### ➤ **Viral Disease**

It is the most dangerous diseases that infect the potato.

**Treatment:**

Spray the pesticide for Aphids because it is the transporter of the virus, especially in the summer season. And also it is important to remove the infected plants because it will be the source of infection for the other plants.

## **Onion**

### • **Introduction**

Onion is one of the important economic crops as it is profitable for the farmers and also high demand in both domestic and international markets. The onion is characterized by its ability to grow in different climate regions, but the main distinctive regions are Egypt, the USA, Spain, and Japan.



Onion is cultivated by the seeds. Onion has 2 growth periods, the 1st period the bulbous are produced. In the 2nd period, the seeds are produced. It also needs pollination by insects.

### • **Cultivation Environment**

#### ➤ **Cultivation Season**

- Winter Season (Transplanting time: Mid of Oct to Mid Nov., Sowing for Nursery: Mid of Aug. to End of Sept., Direct sowing: Beg of Oct.)

#### ➤ **Temperature**

- For germination: 15-20°C.
- For vegetative growth: 20-15°C.
- For growth of scale leaf: 15-20°C.

#### ➤ **Soil Condition**

- It is better to be cultivated in the old land, but also it could succeed in the new lands. Salinity percentage should be zero, and also calcium percentage should be lower than 10% to avoid its effects on the bulbous' shape. In addition, the soil should be free of any infection by white rot or purple rot diseases.
- The suitable soil pH for onion cultivation is from 6.0-7.0.

### • **Cultivation Type & Variety**

#### ➤ **Cultivation Type**

- Transplanting of Seedling
- Direct sowing

#### ➤ **Suitable Varieties in Upper Egypt**

- Giza 6: It is suitable for the cultivation condition in Upper Egypt, especially in the winter season. The color of the bulb of the variety is yellow. It has the ability to be stored long and suitable for export. However, this variety is not suitable in Lower Egypt.
- Giza 20: It can be cultivated in upper and lower Egypt in winter and early summer season. It has a characteristic of storage and high productivity. The color of the bulb is darker than the Giza 6.
- Shandweel 1: It is cultivated in Upper Egypt. It has a characteristic of early maturing, it mature



before 2 weeks than Giza 6.

- Elsabienny: That variety is cultivated in Upper Egypt governorates especially in Sohag governorate. This variety matures earlier than Shandaweel variety about 2 weeks. So, it is suitable for the early exportation.
  - White Giza: That variety is cultivated in upper and Lower Egypt governorates. The color of its outer crust is white, and its bulb is solid. It can be stored for 8-9 months. That variety is suitable for drying purposes because it contains a high percentage of the TDS (Total Dissolved Solids).
  - El Azhar: that variety is cultivated in Assiut governorate. It is characterized by different advantages such as big size of Bulb, rounded shape of the bulb, early maturing than Giza 6 and suitable for exportation.
  - Dronka: that variety is cultivated in Assuit and Sohag governorates and also El-Azhr University in the faculty of agriculture.
- **Field Management for Nursery**
    - **Cultivation Ways**
      - **Cultivation in Basins:** This way will be followed in the old lands after plowing and leveling it. The land is divided into a basin which is about 3 \*4 m<sup>2</sup>. The seeds is sowed over the soil and then covered with a few amounts of soil. Each Feddan needs around 40-45 kg of seeds.
      - **Cultivation on wide soil ridge:** This way is suitable for yellow-heavy soil. Prepare 8 wide soil ridges in 7m and sow the seeds in line on the ridges then cover it by few amounts of soil. In this way, it is easy to remove seedlings and carry out weeding. One feddan nursery requires 30 kg of onions seeds.
      - **Cultivation on lines:** This way is suitable for cultivation in large areas whether are yellow-light or sandy soil. The land should be leveled very well and planting should be done by using manual planting machine. The distance between lines is 10-15cm and one fed requires approximately 20kg of seeds. The advantage of this way is characterized by required a small number of seeds. In the case of sprinkler irrigation, the field is not necessary to divide into small basins. On the other hand, in the case of surface irrigation, the nursery should be divided into small size basins. Production of seedlings from one feddan of the nursery can cover 8-10 feddan in the planting field.
    - **Irrigation**
      - The first irrigation is just after sowing the seeds, it should be applied with a few amounts of water to avoid flowing the seeds. The second irrigation is after 3-4 days from the first one, and then the third irrigation is after 5-7 days from the previous one. As the germinated seed is small, it is important that the soil is always wet. Finally apply the irrigation every 7-10 days, continually. Stop the irrigation before 10 days of transplanting the seedlings. Generally, the frequency of the irrigation differs according to the plants need and the nature of the soil.



- **Fertilization Program for One Feddan (Old Land)**
  - At the preparation, apply 200kg of superphosphate.
  - After 20days from sowing, apply 150 kg of Ammonium Sulfate 20.6% or 100 kg of Ammonium Nitrate 33.5%.
  - After 15days from the last application: apply 150 kg of Ammonium Sulfate 20.6% or 100 kg of Ammonium Nitrate 33.5%.
- **Fertilization Program for One Feddan (New Land)**
  - At the preparation, apply 200kg of superphosphate.
  - At the sowing time, apply 100 kg of Ammonium Sulfate 20.6% or 50 kg of Ammonium Nitrate 33.5%.
  - From after 15 days of sowing, apply 100 kg of Ammonium Sulfate 20.6% or 50 kg of Ammonium Nitrate 33.5% every week until 4 times.
- **Weed control**
  - Controlling weeds in the nursery is essential. It can be controlled by hand, as long as you can avoid step on the crop. As for the chemical controlling, Spray the herbicide named "Gold 24%" with 1 cm<sup>3</sup> mixed with 1 liter of water after 3 weeks of sowing or called "Stomp 50%" with 1 cm<sup>3</sup> mixed with 1.7 liters of water before cultivation.
- **Pest Control**
  - If there are tunnels of the Mole Cricket, it is necessary to apply poisons things, e.g. 1.2 liters of Hostathion mixed with 15 kg of ground maize or broken rice, after first irrigation at the evening time.
  - Regarding Protective spraying, spray pesticide named "Aktlik 50%" of 500 cm<sup>3</sup> mixed with 100 to 200 liters ratio after 30-45 days to against onion fly or Trips.
- **Up-Rooting**
  - The seedling will be up-rooting after 50-60 days from the sowing in early cultivation season and more than 70 days from sowing in late cultivation season. The seedling must be a pencil size, and free from any diseases and damages. After sorting, the good seedlings cut its upper third of the vegetative growth and group the seedlings into small bundles and put it vertically in a dry shaded area. The bundles can be stored for 2-3 weeks until preparing the cultivation field.
- **Field Management for Transplanting**
  - **Planting Method**
    - **Planting in Lines:** This way of cultivation is suitable for Upper Egypt. The field should be leveled very well and divided into basins and made small water canals beside the basins as well. Planting lines should be prepared perpendicular direction of small water canals in the

field. In this cultivation method, 36 to 42 lines can be cultivated in 7m.

- **Planting on Rows:** Make 14 planting ridges in 7m in the cultivation field. The direction of the ridges should be from North to South to make an equal Sunshine and temperature. Transplant the seedlings with 7-10 cm distance between the plants in the upper third on both sides of the planting ridge. Transplanting is recommended to carry out when the soil is dry but it contains some humidity.
- **In case of transplanting in land infected with white rot disease:** although it is not recommended to cultivate in the land infected by white rot disease if it is necessary to plant it, should treat with the seedlings as the followings before transplanting:
  - Tie the seedlings into small bundles.
  - Dip each bundle in to the diluted fungicide e.g. “Somi 8” 20g with one liter of water, “Caramba (Metconazole 6%)” 17g with one liter of water, “Fenarimol (12%) 8.5g with one liter of water, “Topas (Penacona Zole 20%)” 5g with one liter of water, Flusilazole (40%) 2.5g with one liter of water. Dip the seedlings about 10-15 min in these diluted fungicides.
- **Irrigation**
  - Onion is one of the plants that are sensitive to irrigation, so the irrigation period should be organized well and also not let the plant dry. The irrigation periods depend on the soil type. In old land, it needs irrigation each month, meanwhile, in new lands, it will be shorter than this period. Stop irrigation before one month of harvest in old land and 2 weeks of it in a new land.
- **Fertilization (Basal) for 1 Feddan**
  - **For old land:** 300kg of Super Phosphate
  - **For new land:** 300-400kg of Super Phosphate and 50kg of Potassium sulfate 48% (NOT recommended to apply manure to avoid weed and pests)
- **Fertilization (Top-dressing) for 1 Feddan**
  - **For old land:** 300kg of Ammonium Nitrate after one month and two months from transplanting.
  - **For new land:** 150 kg of ammonium nitrate with the first irrigation and third irrigation. It is not recommended to delay the nitrogen fertilizer application because it causes a delay of maturing.
- **Harvesting**
  - One of the maturing signs is 50% of the leaves down. Before the sign appears, onion is not manured and the bulb has a green color with a thick neck and easy to affect by fungus diseases.
  - After harvesting, put the bulbous together in a shaded area with a vertical direction to protect it from the sun lights. The purpose of this process is to dry of the necks to avoid any infections. This process takes 2-3 weeks according to the temperature.

- **Field Management for Direct Sowing**

- **Planting Date**

- Sow the seed directly to the farmland at the Beg. of October.

- **Suitable Variety for Direct Sowing**

- In early planting season, an improved variety named “Giza 6” is suitable, meanwhile, “Giza 20” variety is suitable for late planting season.

- **Suitable land for Direct Sowing**

- Old land is suitable. It is better to avoid the land has more than 10% of calcium percentage and infected disease and weeds.

- **Amount of Seed**

- One Feddan needs 1.0 kg of seeds which should have a higher germination rate more than 90%. It should be cultivated by planting machine after treated with proper fungicide.

- **Land Preparation**

- Plow the land well and level it.
- For the basin irrigation field, divide the land in long shape with the same or double of a width of planting machine so that it can make rows for the cultivation.
- For sprinkler irrigation field, it is not necessary to divide the field.

- **Planting Method**

- Planting by cultivation machine with 20 cm distance between rows.

- **Irrigation**

- The sprinkler or drip irrigation systems are suitable for new lands. It's very important to take care of irrigation, especially during the growing period. Irrigation should apply every 2 days regularly. The irregular irrigation causes increasing the rate of doubled bulbs and also the bulbs without the peel. Stop the irrigation before 2 weeks from harvesting in the new land.

- **Fertilization**

- Apply 200-300 kg of Super Phosphate and 50-100kg of Potassium and 100kg of Sulfur at the plowing.
- Apply 100-150kg of ammonium sulfate during first irrigation.
- After 30 days of previous fertilizer application, apply 100-150kg of ammonium sulfate or ammonium nitrate.

- **Harvesting period and Maturity signs**

- Onion takes 5-7 months from sowing to harvesting and 3-5 month from transplanting.
- The maturing period depends on the variety as well as the effects from the environmental factors such as soil type and temperature. Maturing period becomes long under much water condition or excessive of using nitrogen fertilizer. In usual, onion matures from December to June and the production of one feddan in 8 to 12 tons in Egypt.

- Maturity signs of Onion are;
  - Leafs become soft,
  - Leafs become dry,
  - Bulbs become dry.

- **Post-harvest process**

Harvested onions should be dried. This process removes the excess humidity of onion by drying the neck of onion and the outer peel. Drying is a necessary process of onion for marketing, e.g. storage or sending far away, or even preparing for the local market by decreasing the infection of diseases especially neck-rot disease. Drying is carried out after harvesting weather in the field or in another shaded place with good ventilation. After drying, onions should be sorted. Sorting is one of the most important processes for onion marketing. Defected, damaged or infected by the disease onions should be removed. After the sorting, the following procedures are applied:

- Cut the leaf of onion with leaving 1.5-2.5 cm of leaf from the above of bulb by a knife to prevent the infection of rot disease.
- Root part should be cut.
- After that onions will be sorted again to exclude the onions with defects and infection.

- **Storage**

Only undamaged and uninfected onions can be stored for a long time. Onion can be stored under high temperature and moderate humidity condition but the period of storage will be shorter than the suitable condition such as under 0oC and 65% of humidity. Onion can be stored for 2-8 months according to the variety.

- **Physiological Disorder**

**Early Flowering**

Sometimes onions form the flowers before forming bulb which reduces its economic value. Factors affected the early flowering are follows:

- **Variety:** early flowering is a genetic trait differs by the varieties.
- **Temperature:** The percentage of early flowering will be higher when the seeds stored under 10oC than it was stored under 0oC or more than 10oC temperature.
- **The size of seed bulb:** usually the big bulbs has a high percentage of early flowering so that it is not recommended to use bulbs with a diameter greater than 2.5 cm.
- **Seedling size:** late transplanting with the large size seedling causes early flowering.
- **Season of cultivation and the temperature:** early flowering increases in the winter season than the summer season. The Onion in the winter season is exposed to low temperatures from the early stage of growth and it causes the early flowering.

**Thick Neck**

Thick neck means the neck of onion become big diameter around 1.5-2.5 cm. It is one of the important physiological disorder which reduces the economic value of onion produce, reduces its storage ability and increases the infection with store's diseases. This disorder appears by the following things:

- **Excess application of nitrogen fertilizers at the end of growth season:** it encourages the vegetative growth before harvesting.
- **Death of leaves in the early stage of growth:** infection with diseases or attack by pests lead the continuous forming of new leaves which do not shrink at the harvesting.
- **Un-suitable varieties:** Varieties which need a long-day period to form the bulb cultivate in short-day areas.

### **Bulb Splitting**

Bulb Splitting will happen by genetic difference of variety mainly, but it also affected by many other factors. Bulb Splitting is caused by the growing of side-buds beside the main bulb, it makes another bulb. Factors affected on the Bulb Splitting are follows:

- Use over growing seedlings for cultivation.
- Apply the excessive amount of nitrogen fertilizers.
- Apply non-regular irrigation.
- Exposed the unstable temperature. The percentage of bulb splitting will be increased when the onion is exposed to moderate temperature and then cold temperature.
- Damage of the top of vegetative growth of the plant.

### **Sun Blight**

The tissues of bulbs are died by exposing strong sunlight, and these tissues become soft and lose humidity due to the evaporation. It usually happens after harvesting when the bulbs exposes under high-temperature condition.

#### • **Weed, Pest & Disease Control**

##### ➤ **Weed**

- Onion has to be planted in a free field from weeds, especially perennial plant like scotch grass and when weeds start to appear, the field should be weeding by hoes and remove all weeds. In general onion field needs 2 or 3 times of weeding.
- In case of the field has a lot of weeds, chemical control by herbicide is recommended. The herbicide is as follows;  
“Top Star 80%” 250g for one feddan by spraying after 7-10 days of transplanting.  
“Gole 24%” 750cm<sup>3</sup> for one feddan by spraying after 21 days of transplanting.  
“Stomp 50%” 1.7litter for one feddan by spraying for a nursery or before the first irrigation of the field.

“Triflix 48%” 950cm<sup>3</sup> for one feddan by spraying for soil before cultivation.

➤ Pests

**Mole Cricket**

Mole cricket cut the roots of onion seedling especially in the nursery, and the affected seedlings are yellowing the leaves. For the transplanted seedlings, because of the damage to the neck of a plant, the leaves will be wilting and death. Therefore, the farmers have to check the tunnels of the mole cricket in the field.



**Control:**

- Expose the soil to the sun well during the preparation period
- Remove the weeds well
- Not apply the undecomposed manure.
- Use the poisonous substance as a trap for mole cricket (e.g., 1.25 liters of Holathin 40%, 15-20 kg of crushed maize, 20-30 liters of water and, 1 kg of molasses). Leave it at the bottom of the planting ridges after irrigation in the evening.

**Cutting Worm**

The worms attack the plant leaves during February and March, it starts cutting the leaves not only the leaves above but it under the soil.



**Control:**

- Conduct weeding frequently.
- Use the poisonous substance (e.g. 1.25 litter of Hostathion 40% or Dursban 48%, 20-25kg of crushed maize, 20-30 liter of water and 1 kg of molasses). After mixing all the materials well and ferment it and then put it around the root in the evening.

**Cotton leaf Worm or Green Worm**

This worm infects seedlings and leaves of onion plant, especially in the nursery. It causes big damage to the crop because the worms get into the leaves for feeding.

It makes dried leaves and becomes low yield by the effect of it.



**Control:**

- The location of the nursery or the cultivation field should not be beside of Cotton or Bersium farmland.
- Not intercropping onion and cotton. If cultivated it, take care of controlling cotton worm.

- If cotton worm or green worm appeared, use one of the following pesticides;
- 300g of Lanit 90% for one feddan.
- 1 liter of Rildan 50% for one feddan.
- 160 cm<sup>3</sup> of Match 5% for one feddan
- 750 cm<sup>3</sup> of Selikron 72% for one feddan.

**Onion Thrips**

Thrips infects many plants like cotton, Bersium, wheat, barley, fava bean, lentils as it feeds on the nutritional elements from the leaves. The symptoms of the infection appear as white spots on the leaves, and also it can be seen the pest on the leave. The attack appears from October until April, and then the number of the pests starts to decrease gradually.



**Control:**

- To minimize the damage by the pest, grow up the crop with enough amounts of nutrition and microelements.
- Replanting the heavily damaged plants.
- In case of the number of insect increase more than 10 in one leaf, spraying one of the following pesticides.
- The treatment starts after one month after transplanting and repeats every 15 days.

**Recommended pesticides**

Pesticide	Amount
Pleo 50% EC (Pyridalyl)	50 cm <sup>3</sup> / 100 litres of water
Radiant SC 12%	120 cm <sup>3</sup> / feddan
Marshal 20% WP (Carbosulfan)	200 cm <sup>3</sup> / feddan
Marshal 25% WP (Carbosulfan)	150 gm/ 100 litres of water

**Small Onion Maggot**

The fly infects the small seedlings in the nursery and causes drying up and die for the leaves from the top to till the bottom of the leaf.

The fly feeds on the nutritional elements in the plants' leaves and damages them.

If the farmer pulls the infected plant up, the stem will separate from the bulb of onion and it throws off bad smell from the bottom the leaves.

The infection appears intensively during from November to March.



**Control:**

- Start cultivation early in September.
- Cultivate the plant in line or rows in the nursery instead of broadcast sowing.
- Exclude the infected seedlings during the transplanting.
- When the nursery become empty, starts weeding it and expose it to the sun lights to kill the young pests.
- Spray pesticides 3-4 times when the percentage of infection reaches 5 %. It is the same program as Thrips.

**Big Onion Maggot**

That pest damages the onion in the planting field, not in the nursery, in March and April. The infection causes a yellow color on leaves, ruining the bulbs. The fly put the eggs on the leaf, and then larvae go into the bulbs, so the infection also continues in the storage.

**Control:**

- Gathering the infected plants and burning it.
- During the harvesting, check the bulbous carefully and exclude the infected ones.
- Keep clean the storage
- Spraying pesticides when the percentage of infection reaches 5 % with the same program of Thrips and Small Onion Maggot.

**➤ Disease****Smut Disease**

This smut disease caused by a fungus which lives in the soil or with roots, it attacks the seed after germination and in case of severe infection, then the seedling will die. One of its symptoms is the distortions of young plants and appears a large number of black germs on the leaf. The crack of the infected plants leads to expand the germs through air and irrigation water.

**Control:**

- Not cultivating the land which is infected by the disease for at least 5 years.
- Gathering the infected plants and burning it.
- Applying the appropriate amount of chemical fertilizers of Phosphates and Nitrogen.
- Treating the seeds with a fungicide, like 5g of "Vitavax" with 5% concentration of Arabica Gum for 1kg of seed, before cultivation.



### **Pink Rot Disease**

This disease is caused by a fungus which lives in the soil, it attacks the roots and stem, and it appears until removing the seedling. The infection of this fungus causes the pink color roots, and it causes drying and death of roots. After that, the plant will form new roots but it is infected by the disease and because of the weak plant, it forms small bulbs.

#### **Control:**

- To kill the fungus, covering the soil for one month with a plastic sheet during the highest temperature season.
- Cultivation the lands which are not infected the disease before.
- During the transplanting, Checking the seedlings well to exclude the infected ones.

### **Fusarium Rot and Seedlings death**

The intensive infection of the disease causes the death of the seedling before its appearance over the soil surface and also causes roots rot and the seedlings death after its appearance over the soil surface. The infected seedlings transfer the disease to the transplanted land and that cause stem's bottom rot disease which lead to the yellow color for leaves and wilt, and it will be ease to taking off the plants from the soil. The farmer can see a white fungus growth on the bottom of onion without the existence of stony masses and that is different symptoms from the white rot disease.

#### **Control:**

- Applying an appropriate amount of Phosphates, Nitrogen and Potassium fertilizers.
- Sorting of seedlings very well before planting it in the field, and eliminating the infected plants and burning it.
- Treating the seeds with “Topsin” pesticides before cultivation. The seed should be treated with 2g “Topsin” mixed with 1 liter of water solution.

### **White Rot**

This disease is caused by fungus and it forms stony bodies which live in the soil for many years. This disease spreads out under low temperature and high humidity condition.

#### **Symptoms:**



- Yellowing and wilting of the leaves.
- It is easy to remove the infected plants from the soil as a result of roots decay and death. When up-root the seedling from the nursery, it can be seen a white color fungus and a black stony masses.



**Control:**

- Avoiding cultivation of garlic or onion in the infected farmland.
- Not transplanting the seedlings or bulbous that cultivated in the infected farmland.
- Burning the infected plants and not throwing the plants in the water canals or drainage or using for livestock fodder, because it may help the disease to spread out in clean lands.
- Stop cultivation in the infected lands during the summer season and cover the soil with a plastic sheet for 40 days after 3 days of plowing and irrigation to kill the fungus by the high temperature.

**Control by Chemicals:**

- Treat the seed with "Trichoderma Harzianum" water solution which is mixed 60 cm<sup>3</sup> of "Trichoderma Harzianum" and one liter of water for one feddan.
- Soak the seedling in the pesticide water solution named "Folkor", and the ratio of mixing is 25cm<sup>3</sup> of it and one liter of water. Also spraying water solution mixed with "Folkor" 187.5 cm<sup>3</sup> and 100 liters of water.
- Spraying fungicide water solutions as follows;
- Spraying fungicide "Somi 8 (5%)" 20 gm mixed with one liter of water.
- Splaying fungicide "Caramba (Metconazole)" 8.5 gm mixed with one liter of water.
- Splaying fungicide "Topas (20%)" 5 g mixed with one liter of water.
- Splaying fungicide "Flusilazole (40%)" 2.5 g mixed with one liter of water.

**Downy Mildew and purple blotch diseases**

This disease is one of the most dangerous diseases on the vegetative growth.

**Symptoms:**

- As an early symptom a pale yellow color appears on the leaves, and then the leaves wilt and appear a grey downy and round-white spots. Inside of the circles has purple color spots. The severe infection of the disease makes leaves completely dry.



- The infection by purple blotch disease is often accompanied by the infection of Downey Mildew. The Downey Mildew infected firstly, and then the purple blotch disease appears during the beginning of the high-temperature season in February and March.

**Control:**

- Pick up and burn it the infected crop.
- Cultivate in the land which has a proper drainage system and applies the proper amount of fertilizers and irrigation water.
- Follow the suitable agricultural rotation.
- Spray with one of the following recommended fungicides.

**Recommended fungicide**

<b>Pesticide</b>	<b>Amount</b>
Acrobat Mancozeb 69% WG	250 gm/ 100 litres of water
Antracol 70% WG	200 gm/ 100 litres/ feddan
Amistar Top 32.5% SC	300 cm <sup>3</sup> / feddan
Tazolen 72% WP	250 gm/ 100 litres of water
Delcup 23.5% (liquid)	1 litre/ feddan
Ridomil Gold Plus 71.5% WP	200 gm/ 100 litres of water
Folio Gold 53.75% SC	1 litre/ feddan

**Neck Rot Disease**

This is a kind of fungal disease, this infection happens from the nursery stage until the end of the season. The symptoms of the disease will not be discovered until the high humidity season, and usually, the infection is discovered in the storage or during shipping for exporting.

**Control:**

- Reducing the number of irrigation times, in fact, applying maximum 4 times of irrigation including the 1st irrigation after planting during cultivation period.
- Controlling the weeds with pesticides because the hand weeding may injure the bulbous.
- Stop irrigation before 1 month of harvesting.
- Start harvesting after laying off 50% of leaves.
- Cut the necks on a distance of 2-3 cm and leave it for drying for 48-72 hour to close the necks.
- Care about sorting the harvest before packing and exclude any broken or injured one.
- Storing the bulbous in dry and cool storage.

### **Purple Blotch**

#### **Symptoms:**

Infection appears on leaves like an oval or round spots with ulcers, and its color is purple or black. Infected tissues will dry, and its color will turn from purple to brown. The infection appears from the end of February to beginning of March. Usually, this infection happens with downy mildew disease. Spray after 45 to 60 days from transplanting.



#### **Control:**

Apply fungicide named “Luna Experience 40% SC” 100cm<sup>3</sup> mixed with 100 liters of water.

## **Garlic**

### • **Introduction**

Garlic is one of the important crops which has good exportation potential. The Egyptian garlic is ripened firstly all over the world, so it has a high demand in the international markets for both ripened and non-ripened garlic.



Garlic is cultivated approximately 30,000-35,000

feddan every year in Egypt. Minia and Bany Sweaf governorates are the main production site of garlic cultivation in terms of area and the production amount. In addition, garlic cultivation period in these two governorates is shorter than Lower Egypt governorates by 2 weeks.

### • **Cultivation Environment**

#### ➤ **Cultivation Season (Iseason)**

- Winter Season only (Planting for Local Variety: 1<sup>st</sup> to 15<sup>th</sup> of September, for Sods Variety: 1<sup>st</sup> to 15<sup>th</sup> of October)

#### ➤ **Temperature**

- Suitable temperature: 10-22°C

#### ➤ **Soil Condition**

- Garlic can be cultivated in both old and new land in Egypt, and it is highly recommended to avoid cultivation in an infected land with white rot for garlic and onion or salty lands which is more than 3.2 EC of a salty percent.
- According to the previous experiment in Minia and Banyswef governorate, the yield of local variety in the new land was lower than that in the old land. However, the yield of Sods 40 variety, Chinese variety, was no difference between the two cultivation lands.
- The suitable soil pH for garlic cultivation is from 5.5-6.5

### • **Cultivation Type & Variety**

#### ➤ **Variety**

- Local Variety
- Sods 40

### • **Field Management**

#### ➤ **Land Preparation**

- The planting land is recommended free from white rot disease of garlic and onion. Apply 10-15 m<sup>3</sup> of manure and 500kg of superphosphate as a basal fertilizer, and then plow the land twice.
- Make 12 planting ridges north and south direction in 7m. Spray herbicide named "Estomp" 1.5 liters mix with 300 liters of water for one feddan, before irrigation. 3 days before planting,

irrigate the land.

➤ **Planting Method**

- Before planting, the seed lobes should be prepared correctly. The preparation is as follows;
- Before two days of planting, select the big size of lobes and taking off the lobes. Remove the small or empty or damaged one. Also, remove the residue of stems and leaves.
- Put the selected lobes in a net bag and soak it in water for 24 hours to accelerate germination. Moreover, to decrease the disease, soak the lobes in the micron sulfur solution which is 5g micron sulfur for one liter of water for half an hour.
- Plant the lobes on both sides of planting ridge with the 7-10cm distance between the plants. To avoid the water level, it should be cultivated in about one-third parts from the top of the ridge.
- Irrigation should be done on the cultivation day or the next day.

➤ **Irrigation**

- After planting, the irrigation times depend on the temperature and character of the soil. The soil around planted lobe must be moist, especially in the early stage of transplanting. The irrigation will be applied every 7-10 days. Then from November to December, the temperature is down and increases the interval of irrigation around three weeks.
- The irrigation must be stopped three weeks before harvesting, so the last irrigation is around 10th of March. Some farmers applied irrigation just before harvesting in order to increase the fresh weight and the yield, however, it has many disadvantages as follows;
  - \*The head of the garlic becomes black color.
  - \*The garlic will be affected base rot disease.
  - \*Increase the percentage of loss.
  - \*The garlic contains high moisture is not good for exportation.
  - \*The outer crust will break away.

➤ **Fertilization (Basal) for 1 Feddan**

- For old land:  
Manure: 10-15m<sup>3</sup>  
Chemical fertilizer: 500kg of Superphosphate 15.5%, 100-150kg of ammonium nitrate, 100kg of sulfur and 50kg of potassium sulfate.
- For new land:  
Manure 40-50m<sup>3</sup> or Organic fertilizer 20-22m<sup>3</sup>, and poultry manure 5m<sup>3</sup>  
Chemical fertilizer: 150-200kg of superphosphate, 100kg of ammonium sulfate, 50kg of potassium sulfate.

➤ **Fertilization (Top-dressing) for 1 Feddan**

- 1<sup>st</sup> top-dressing: apply 100-150kg of ammonium nitrate after three weeks from planting
- 2<sup>nd</sup> top-dressing: apply 100-150kg of ammonium nitrate after three weeks from 1<sup>st</sup> to-dressing.

- 3<sup>rd</sup> top-dressing: apply 100-150kg of ammonium nitrate after three weeks from 2<sup>nd</sup> top-dressing.
- **Harvesting**
- In all cultivation types, the harvesting time is from March to May because of the climate. Early planting causes photosynthesis process with high efficiency by strong vegetative growth so that the crop will be high quality and quantity. Meanwhile, late cultivation time causes weak vegetative growth and low photosynthesis efficiency so that the crop will be low quality.
- Sign of maturing is about 50% of leaves lay down and become yellow color, and also the outer crust becomes hard. Harvesting the plant must be careful in order not to damage the garlic heads. Local variety can produce about 15 tons of fresh weight for one feddan, and Sods 40 variety can produce about 10-12 tons of it for one feddan.
- **Other treatment**
- Harvested garlic bind with each about 2-3 kg and put in the dried field for drying with covering rice or wheat straw to protect it from the direct sunlight and leave it about 3 weeks. During the period 2 or 3 times rotate it for drying it completely. Then make grading and put in net bags for export or sell it in the local market.

- **Post-harvest process**

After drying the harvested garlic, the following process should be done as a post-harvest process;

- Sorting: Remove the damaged or infected by disease garlic.
- Grading: Garlic is classified into 3 grades according to the decree from General Organization for Export & Import Control as follows:
  - Special grade: the commercial defects are not more than 10%.
  - Commercial grade: the commercial defects are less than 20%.
  - Last grade: its commercial defects is more than 20% and less than 50%. This grade is not for exporting except in some markets.

- **Storage**

Garlic can be stored under the normal temperature but the period of storing is longer under the lower temperature. In order to prevent the rot, storage should dry and have a good ventilation system. The well-matured garlic can be stored for a long period. To store garlic for a long time, put them in sacks then put the sacks in a wooden box but the length of the box should not be more than 1.5 m because the position of the box will be changed from time to while. It is better to make a space about 50cm between the box for the good ventilation and handling. The temperature of the storage should be 20-25°C. Local variety loses 35-40% of its weight during the first month from the harvesting and this loss increases up to 48% after 5 months. In the case of the cold storage, the temperature should be 0oC with humidity of 65-70% for 6-7 months in order to prevent the germination and empty garlic. Rapid

germination happens when garlic is stored under 4-18°C. Humidity will help to grow; hence it should be kept lower level. Garlic heads (seeds) should be stored under 5-10°C. Empty garlic happens under a not suitable condition such as high temperature and very low humidity.

- **Pest & Disease Control**

- Pests

- Pests

- **Mole Cricket**

Mole cricket cut the roots of onion seedling especially in the nursery, and the affected seedlings are yellowing the leaves. For the transplanted seedlings, because of the damage to the neck of a plant, the leaves will be wilting and death. Therefore, the farmers have to check the tunnels of the mole cricket in the field.

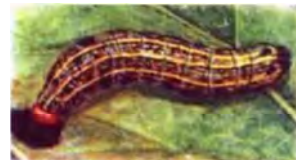


- **Control:**

- Expose the soil to the sun well during the preparation period
- Remove the weeds well
- Not apply the undecomposed manure.
- Use the poisonous substance as a trap for mole cricket (e.g., 1.25 liters of Holathin 40%, 15-20 kg of crushed maize, 20-30 liters of water and, 1 kg of molasses). Leave it at the bottom of the planting ridges after irrigation in the evening.

- **Cutting Worm**

The worms attack the plant leaves during February and March, it starts cutting the leaves not only the leaves above but it under the soil.



- **Control:**

- Conduct weeding frequently.
- Use the poisonous substance (e.g., 1.25 liter of Hostathion 40% or Dursban 48%, 20-25kg of crushed maize, 20-30 liter of water and 1 kg of molasses). After mixing all the materials well and ferment it and then put it around the root in the evening.



### **Cotton leaf Worm or Green Worm**

This worm infects seedlings and leaves of onion plant, especially in the nursery. It causes a big damage to the crop because the worms get into the leaves for feeding.

It makes dried leaves and becomes low yield by the effect of it.



#### **Control:**

- The location of the nursery or the cultivation field should not be beside Cotton or Bersium farmland.
- Not intercropping onion and cotton. If cultivated it, take care of controlling the cotton worm.
- If the cotton worm or green worm appeared, use one of the following pesticides;
- 300g of Lanit 90% for one feddan.
- 1 liter of Rildan 50% for one feddan.
- 160 cm<sup>3</sup> of Match 5% for one feddan
- 750 cm<sup>3</sup> of Selikron 72% for one feddan.

### **Onion Thrips**

Thrips infects many plants like cotton, Bersium, wheat, barley, fava bean, lentils as it feeds on the nutritional elements from the leaves. The symptoms of the infection appear as white spots on the leaves, and also it can be seen the pest on the leaf.

The attack appears from October until April, and then the number of the pests starts to decrease gradually.



#### **Control:**

- To minimize the damage by the pest, grow up the crop with enough amounts of nutrition and microelements.
- Replanting the heavily damaged plants.
- In case of the number of insect increase more than 10 in one leaf, spraying one of the following pesticides.
- The treatment starts after one month after transplanting and repeats every 15 days.



### **Recommended pesticides**

<b>Pesticide</b>	<b>Amount</b>
Pleo 50% EC (Pyridalyl)	50 cm <sup>3</sup> / 100 litres of water
Radiant SC 12%	120 cm <sup>3</sup> / feddan
Marshal 20% WP (Carbosulfan)	200 cm <sup>3</sup> / feddan
Marshal 25% WP (Carbosulfan)	150 gm/ 100 litres of water

### **Small Onion Maggot**

The fly infects the small seedlings in the nursery and causes drying up and die for the leaves from the top to till the bottom of the leaf.

The fly feeds on the nutritional elements in the plants' leaves and damages them.

If the farmer pulls the infected plant up, the stem will separate from the bulb of onion and it throws off bad smell from the bottom the leaves.

The infection appears intensively during from November to March.

#### **Control:**

- Start cultivation early in September.
- Cultivate the plant in line or rows in the nursery instead of broadcast sowing.
- Exclude the infected seedlings during the transplanting.
- When the nursery become empty, starts weeding it and expose it to the sun lights to kill the young pests.
- Spray pesticides 3-4 times when the percentage of infection reaches 5 %. It is the same program as Thrips.



### **Big Onion Maggot**

That pest damages the onion in the planting field, not in the nursery, in March and April. The infection causes a yellow color on leaves, ruining the bulbs. The fly put the eggs on the leaf, and then larvae go into the bulbs, so the infection also continues in the storage.

#### **Control:**

- Gathering the infected plants and burning it.
- During the harvesting, check the bulbous carefully and exclude the infected ones.
- Keep clean the storage
- Spraying pesticides when the percentage of infection reaches 5 % with the same program of Thrips and Small Onion Maggot.

#### ➤ **Disease**

### **Smut Disease**

This smut disease caused by a fungus which lives in the soil or with roots, it attacks the seed after germination and in case of severe infection, then the seedling will die. One of its symptoms is the distortions of young plants and appears a large number of black germs on the leaf. The crack of the infected plants leads to expand the germs through air and irrigation water.



#### **Control:**

- Not cultivating the land which is infected by the disease for at least 5 years.
- Gathering the infected plants and burning it.
- Applying the appropriate amount of chemical fertilizers of Phosphates and Nitrogen.
- Treating the seeds with a fungicide, like 5g of "Vitavax" with 5% concentration of Arabica Gum for 1kg of seed, before cultivation.

### **Pink Rot Disease**

This disease is caused by a fungus which lives in the soil, it attacks the roots and stem, and it appears until removing the seedling. The infection of this fungus causes the pink color roots, and it causes drying and death of roots. After that, the plant will form new roots but it is infected by the disease and because of the weak plant, it forms small bulbs.

#### **Control:**

- To kill the fungus, covering the soil for one month with a plastic sheet during the highest temperature season.
- Cultivation the lands which are not infected the disease before.
- During the transplanting, Checking the seedlings well to exclude the infected ones.

### **Fusarium Rot and Seedlings death**

The intensive infection of the disease causes the death of the seedling before its appearance over the soil surface and also causes roots rot and the seedlings death after its appearance over the soil surface. The infected seedlings transfer the disease to the transplanted land and that cause stem's bottom rot disease which lead to the yellow color for leaves and wilt, and it will be ease to taking off the plants from the soil. The farmer can see a white fungus growth on the bottom of onion without the existence of stony masses and that is different symptoms from the white rot disease.

#### **Control:**

- Applying an appropriate amount of Phosphates, Nitrogen and Potassium fertilizers.
- Sorting of seedlings very well before planting it in the field, and eliminating the infected

plants and burning it.

- Treating the seeds with “Topsin” pesticides before cultivation. The seed should be treated with 2g “Topsin” mixed with 1 liter of water solution.

### **White Rot**

This disease is caused by fungus and it forms stony bodies which live in the soil for many years. This disease spreads out under low temperature and high humidity condition.

#### **Symptoms:**



- It is from the



- Yellowing and wilting of the leaves.  
easy to remove the infected plants the soil as a result of roots decay and death. When up-root the seedling from nursery, it can be seen a white color fungus and a black stony masses.

#### **Control:**

- Avoiding cultivation of garlic or onion in the infected farmland.
- Not transplanting the seedlings or bulbous that cultivated in the infected farmland.
- Burning the infected plants and not throwing the plants in the water canals or drainage or using for livestock fodder, because it may help the disease to spread out in clean lands.
- Stop cultivation in the infected lands during the summer season and cover the soil with a plastic sheet for 40 days after 3 days of plowing and irrigation to kill the fungus by the high temperature.

#### **Control by Chemicals:**

- Treat the seed with "Trichoderma Harzianum" water solution which is mixed 60 cm<sup>3</sup> of "Trichoderma Harzianum" and one liter of water for one feddan.
- Soak the seedling in the pesticide water solution named "Folkor", and the ratio of mixing is 25cm<sup>3</sup> of it and one liter of water. Also spraying water solution mixed with "Folkor" 187.5 cm<sup>3</sup> and 100 liters of water.
- Spraying fungicide water solutions as follows;
- Spraying fungicide "Somi 8 (5%)" 20 gm mixed with one liter of water.
- Spraying fungicide "Caramba (Metconazole)" 8.5 gm mixed with one liter of water.

- Splaying fungicide "Topas (20%)" 5 g mixed with one liter of water.
- Splaying fungicide "Flusilazole (40%)" 2.5 g mixed with one liter of water.

### **Downy Mildew and purple blotch diseases**

This disease is one of the most dangerous diseases on the vegetative growth.

#### **Symptoms:**

- As an early symptom a pale yellow color appears on the leaves, and then the leaves wilt and appear a grey downy and round-white spots. Inside of the circles has purple color spots. The severe infection of the disease makes leaves completely dry.
- The infection by purple blotch disease is often accompanied by the infection of Downey Mildew. The Downey Mildew infected firstly, and then the purple blotch disease appears during the beginning of the high-temperature season in February and March.



#### **Control:**

- Pick up and burn it the infected crop.
- Cultivate in the land which has a proper drainage system and applies the proper amount of fertilizers and irrigation water.
- Follow the suitable agricultural rotation.
- Spray with one of the following recommended fungicides.

#### **Recommended fungicide**

<b>Pesticide</b>	<b>Amount</b>
Acrobat Mancozeb 69% WG	250 gm/ 100 litres of water
Antracol 70% WG	200 gm/ 100 litres/ feddan
Amistar Top 32.5% SC	300 cm <sup>3</sup> / feddan
Tazolen 72% WP	250 gm/ 100 litres of water
Delcup 23.5% (liquid)	1 litre/ feddan
Ridomil Gold Plus 71.5% WP	200 gm/ 100 litres of water
Folio Gold 53.75% SC	1 litre/ feddan

### **Neck Rot Disease**

This is a kind of fungal disease, this infection happens from the nursery stage until the end of the season. The symptoms of the disease will not be discovered until the high humidity season, and usually, the infection is discovered in the storage or during shipping for exporting.

#### **Control:**

- Reducing the number of irrigation times, in fact, applying a maximum 4 times of irrigation including the 1st irrigation after planting during the cultivation period.

- Controlling the weeds with pesticides because the hand weeding may injure the bulbous.
- Stop irrigation before 1 month of harvesting.
- Start harvesting after laying off 50% of leaves.
- Cut the necks on a distance of 2-3 cm and leave it for drying for 48-72 hour to close the necks.
- Care about sorting the harvest before packing and exclude any broken or injured one.
- Storing the bulbous in dry and cool storage.

### **Purple Blotch**

#### **Symptoms:**

Infection appears on leaves like an oval or round spots with ulcers, and its color is purple or black. Infected tissues will dry, and its color will turn from purple to brown. The infection appears from the end of February to beginning of March. Usually, this infection happens with downy mildew disease. Spray after 45 to 60 days from transplanting.



#### **Control:**

Apply fungicide named “Luna Experience 40% SC” 100cm<sup>3</sup> mixed with 100 liters of water.

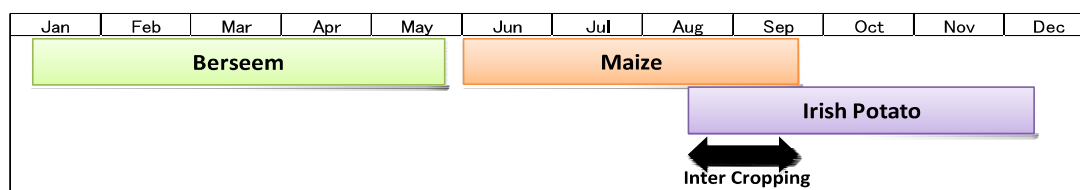
## Agriculture Intensification System

### Introduction:

The intercropping systems of horticulture crops with traditional crops can be a solution to increase the income of small-scale farmers. Most of the small-scale farmers in the Upper Egypt use a crop rotation system with traditional crops such as wheat, berseem, maize, and sorghum. Although the income of horticulture crop has a possibility to get much higher than the traditional crops, farmers prefer to cultivate traditional crops continuously because of the sustainability.

Various types of the intercropping systems were verified in the Agricultural Production Intensification Project (APIP) from 1995 to 2005. In the course of many trials made in Fayoum, Beni Suef, and Minia, five cultivation systems with a one-year pattern were highly recommended, as a result. Based on the result of the project, ISMAP recommended following two cultivation systems which were most suitable in the current situation of Upper Egypt.

### Agriculture System Model 1 (Berseem ⇒ Maize & Irish Potato)



### Advantage of the System

- It includes traditional crops and cash crops.
- There is a partial intercropping system between potato and maize (35-40 days before harvesting maize).
- The farmer can earn a good profit because of the three crops cultivation in a year.
- It provides green fodder for a long period in a year, i.e. Berseem in the winter season and wastes of Maize in the summer season.
- Saving the costs of Irish Potato cultivation, e.g. plowing, leveling, and lining.
- Early harvesting time of Irish Potato due to early cultivation can sell the produce at a higher price.
- Saving the amount of irrigation water by around 1,000 m<sup>3</sup> per feddan.
- Cultivating Irish Potato under Maize can protect Irish Potato from the high temperature.
- The early harvesting of Irish Potato gives can be able to cultivate winter crops such as Wheat.

### First Crop: Berseem (from 1<sup>st</sup> Oct. to 20<sup>th</sup> May)

- Apply 150kg of superphosphate fertilizer per feddan at land preparation.
- Cultivate 20 kg of berseem seed per feddan.

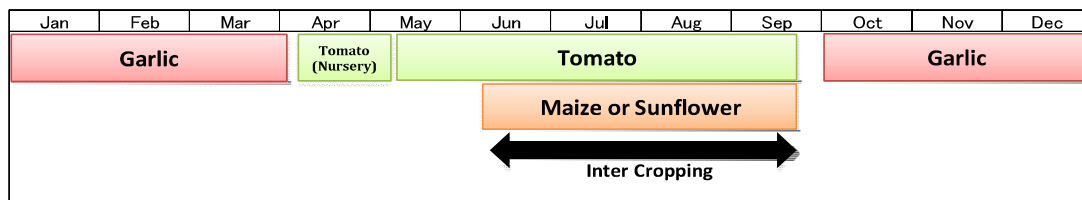


- Irrigate land, regularly.
- Harvest the first crop up to 20<sup>th</sup> May.

**Second Crop: Maize (from 1<sup>st</sup> June to 20<sup>th</sup> Sep.) and Irish Potato (from 15<sup>th</sup> Aug. to 1<sup>st</sup> Dec.)**

- Apply 400 kg of superphosphate fertilizer per feddan at land preparation.
- At the beginning of June, starts cultivation of the early maturing variety of Maize with line planting on 10 lines per 7m.
- Before 2 weeks of starting potato cultivation, 1st week of August, remove the dried lower leaves of maize plant and weeds and then irrigate the land as a preparation for Irish Potato cultivation.
- In the middle of August, after plowing the land, start planting of Irish Potato under the maize on the western side of same soil ridge with 25cm distance and 10-15 cm depth of hall.
- After one week of Irish Potato planting, irrigate the land with a suitable amount, and then next irrigation will be operated after 3 weeks of the first one and also apply 100 kg of ammonium nitrates per feddan.
- Start harvesting of maize in the middle of September.
- Start harvesting of Irish Potato in the beginning of December.

**Agriculture System Model 2 (Garlic ⇒ Tomato & Maize or Sunflower)**



**Advantage of the System**

- Maize can provide a food for house consumption.
- Maize wastes can be a fodder.
- Sunflower can be sold as an oil crop.
- Tomato can provide high cash income for the farmer.
- Garlic is a profitable crop for local market and export.
- This system can be introduced in the area where it was suitable for cotton cultivation.
- Saving the cost of land preparation, e.g. plowing, leveling, and lining.
- Maize or Sunflower can absorb the fertilizer for Tomato cultivation so that it can decrease the total amount of fertilizers.
- Saving the costs of weeding and irrigation water around 1,000 m<sup>3</sup> per feddan.



- Use Maize or Sunflower for covering the Tomato plant can decrease the sunburn effects and be able to make a high yield during the summer season.
- Tomato can be sold during high price season.
- This system can produce 100% of Tomato and 50-70% of Maize or Sunflower produce compared with each mono-crop cultivation.

**• First Crop: Garlic (from 1<sup>st</sup> Oct. to 1<sup>st</sup> Apr.)**

- The land should be free of white rot disease.
- Apply 10m<sup>3</sup> of manure and 400kg of superphosphate fertilizer per feddan during land preparation.
- Make a planting ridge with 12 lines per 7m.
- Irrigate the land well 3-4 days before cultivation.
- Garlic seed should be treated with
- Seeds should be treated with specific substances (e.g. micron sulfur) before cultivation and that should be according to the technical recommendations of the agriculture extension service.
- Cultivate the garlic on both sides of the planting ridge in line with 7-10 cm distance.
- Harvest the garlic at the beginning of April.

**• Second Crop: Tomato (from 10<sup>th</sup> Apr. to 20<sup>th</sup> Aug.) & Maize or Sunflower (from 25<sup>th</sup> May to 20<sup>th</sup> Sep.)**

- Prepare the seedling of Tomato from early of April.
- At the plowing middle of May, apply 20-30 m<sup>3</sup> of Manure, 400kg of superphosphate, 150kg of ammonium sulfate, 50kg of potassium sulfate for one feddan, and make a wide planting ridges, 6-7 lines per 7m.
- Irrigate the land before transplanting of the seedlings. To avoid the high temperature, transplanting should be done in the evening time.
- Select the Tomato variety which has heat tolerant and high yield characteristics.
- After 35-40 days of Tomato transplanting, sow the Maize seed on the other side of the planting ridge on the line with 20-25 cm distance, and also plant the Maize seed between the Tomato plants on the same line.
- Start harvesting Tomato from 20<sup>th</sup> Aug to the winter season.
- Harvest Maize or Sunflower 20<sup>th</sup> Sep.

**Other Agriculture System Models**

- Soybean and Maize

Maize is one of the most common crops for intercropping in Upper Egypt. Sorghum also can be cultivated instead of Maize for intercropping. This method can rationalize the amount of irrigation

water and fertilizers and preserve the fertility of the land.

- Cotton and Onion
- Cotton and Fava bean
- Cotton and Wheat
- Fava bean and Tomato in the winter season
- Lupine and Tomato in the winter season

## Seasons of Horticulture Crop Cultivation in Minia and Assiut

Crop	Season	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec
<b>Tomato</b>	Early Summer	Nursery	Nursery	Cultivation	Cultivation		Harvest	Harvest					Nursery
	Summer	Nursery	Nursery	Nursery	Nursery	Cultivation	Cultivation		Harvest	Harvest			
	Nile	Harvest					Nursery	Nursery	Nursery	Cultivation	Cultivation		Harvest
	Winter	Harvest	Harvest					Nursery	Nursery	Nursery	Nursery	Cultivation	
<b>Cucumber</b>	Summer		Cultivation	Cultivation	Harvest	Harvest							
	Nile								Cultivation	Cultivation	Harvest	Harvest	
	Winter	Harvest									Cultivation	Cultivation	Harvest
<b>Pepper</b>	Early Summer	Nursery	Cultivation	Cultivation	Harvest	Harvest							Nursery
	Summer	Nursery	Nursery	Nursery	Cultivation	Cultivation	Harvest	Harvest					
	Nile					Nursery	Nursery	Cultivation	Cultivation	Harvest	Harvest		
<b>Eggplant</b>	Early Summer	Nursery	Nursery	Cultivation	Cultivation	Harvest							Nursery
	Summer			Nursery	Nursery	Cultivation	Cultivation	Harvest	Harvest				
	Nile					Nursery	Harvest	Cultivation	Cultivation	Harvest	Harvest		
<b>Cabbage</b>	Local variety			Nursery	Nursery		Cultivation				Harvest		
	Foreign variety	Harvest						Nursery	Nursery	Cultivation			
<b>Chickpea</b>	Winter		Harvest									Cultivation	
<b>Black Cumin</b>	Winter				Harvest						Cultivation	Cultivation	
	Winter				Harvest								
<b>Fenugreek</b>	Winter				Harvest							Cultivation	
	Summer		Cultivation			Harvest							
<b>Potato</b>	Nile								Cultivation				
	Winter			Harvest								Cultivation	
<b>Onion</b>	Winter			Harvest						Nursery		Cultivation	
	Winter			Harvest							Cultivation		
<b>Garlic</b>	Winter			Harvest							Cultivation		



# Potato Cultivation



## Cultivation Season:

Summer Season (Planting time: January, for seed production)

Nile Season (Planting time from Mid-August to Mid-September)

Winter Season (Planting time: Mid-October to Mid-November)

Season	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Summer	○	-----	-----	-----	-----△							
Nile	-----	-----△							○	-----	-----	-----
Winter	-----	-----	-----△								○	-----

Note: ○: Planting, △Harvesting

## Planting Method:

**Summer Season:** 750-800kg of the cut tuber is needed for one feddan. The size of one tuber should be 45-60g with 2-3 eyes. It should be cut before 24-48 hours by a sharp knife with sterilizing using alcohol.

**Nile and Winter Season:** 1,200-1,750kg of small size whole tuber is needed for one feddan. The tuber seed should be planted on the planting ridge with 20-35 cm distance.

## Fertilization Program (One Feddan):

**Land Preparation:** 20m<sup>3</sup> of Manure, 400-500kg of Superphosphate and 100kg of Potassium Sulfate

**1<sup>st</sup> Top-dressing:** after 3 weeks of planting, 150kg of Ammonium nitrate

**2<sup>nd</sup> Top-dressing:** after 2 weeks of 1<sup>st</sup> top-dressing, 200kg of Ammonium nitrate

**3<sup>rd</sup> Top-dressing:** after 2 weeks of 2<sup>nd</sup> top-dressing, 200-250kg of Ammonium nitrate

## Pest & Disease Control

### Pests:

**Mole Cricket:** 15 kg of grinded maize + 20 liters of water + Pesticide (Dursban 48%EC 1.25L, Pyriban A 48% EC 1L or Chloro-puls 28% EC1L)

**White Fly:** Agriculture Sulfur powder, Admiral 10% EC (Pyriproxyfen), Biovar 4% WP, Actellic 50% EC and Selecron 72% EC

**Cut Worm:** 25 kg of soft bran + 20 liters of water +Pesticide (Effect Power 5% EC, Ictafos 48% EC, Axon 5% EC, Eyrthrin 2.5% EC, Psetban 48% EC)

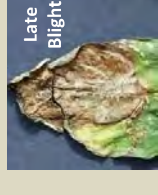
### Disease:

#### Early Blight: Fungus Disease

Apply Fungicide every 15 days: (Equation pro 52.5%, Anadol 80% WP, Index 77% WP, Optima 25% EC, Proxanil 45% SC, Profile NT 35% SC)

#### Late Blight: Fungus Disease

Spray Fungicide: (Acrobat Mancozeb 69% WG, Acrobat Copper 73.2% WP, Equation pro 52.5%, Amistar 25% SC, Antracol 70% WP, Infinito 68, 75% SC, Orvego 52.5%, Oxy Plus 28.5% WP)





# Tomato Cultivation



## Cultivation Season:

Early Summer Season (Transplanting: March & April)

Summer Season (Transplanting: May & June)

Nile Season (Transplanting: September & October)

Winter Season (Planting time: November)



Season	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Early Summer	□	□	○	○	-----	--△	△					□
Summer		□	□	□	○	○	-----	--△	△			
Nile	△								○	○	-----	--△
Winter	--△	△						□	□	□	○	-----

**Note:** □: Nursery, ○: Transplanting, △Harvesting

## Planting Method:

Make 6 to 8 planting ridges in 7m and transplant the seedlings with 20-40cm distance between it. Transplant the seedlings in the late afternoon or in the early morning to avoid the high temperature. Irrigation should be applied one day before transplanting. Appropriate seedling size is 12 to 15cm height. Irrigate water after transplanting to avoid drying the seedling especially summer season. After transplanting, irrigate water in 2-3 days repeatedly in the summer season, and 4-5 days in the winter season.

## Fertilization Program (One Feddan Old Land):

**Land Preparation:** 40m<sup>3</sup> manure or 20m<sup>3</sup> poultry manure or 10 tons of compost + 200kg of Superphosphate + 50kg of Potassium sulfate + 100kg of Ammonium sulfate + 150kg of Agriculture sulfur  
**1<sup>st</sup> Top-dressing:** after 15-20days from planting, 150kg of Ammonium sulfate + 50kg of Potassium sulfate  
**2<sup>nd</sup> Top-dressing:** after 45-60 days from planting, 200kg of Ammonium sulfate + 100kg of Potassium sulfate  
**3<sup>rd</sup> Top-dressing:** after 70-75 days from planting 200kg of Calcium nitrate or 100kg of Ammonium nitrate

## Pest & Disease Control

### Pests:

**Aphid:** Confidate 35% SC, Confident 35% SC, Malet 35% SC

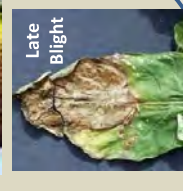
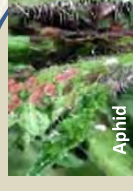
**Tomato White Fly:** Agriflex 18.5% SC, Acetagrow 20% SP, Acetamore 20% SP, Achook 0.15%, Actellic 50% EC, Actara (THIAMETHOXAM 25%)

**Red Spider:** Agrimec Gold 8.4% SC, Acramite 48% SC, Excellent 1.9% EC, Overload 25% WP, Biomectin 5% EC, Gold 1.8% EC, Delta Care 10% EC, Diva 1.8% EW, Zoro 3.6%, ECSolfan 70% SC

### Disease:

**Early Blight:** Azo Star 25% SC, Atlas 25% EC, Acrozil 69% WP, Antracol 70% WP, Oxy Plus 47.89 WP, Open 72% SC (Chlorothalonil)

**Late Blight:** Aracur 72.2% SL, Previcur Energy 84% SL, Pink S 30% SL, Vitavax (200) 75% WP, Moon Cut 25% WP, Uniform 39% SE







# Cucumber Cultivation



## Cultivation Season:

Summer Season (Planting time: February to April)

Nile Season (Planting time: June to August)

Winter Season (Planting time: August to September)

Season	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Summer		○		△								
Nile			○					○	○	△	△	
Winter										○	○	△

**Note:** ○: Planting, △:Harvesting

## Planting Method:

For one feddan farmland cultivation, 400-600g of seeds is required, and it produces approximately 8,000-12,000 plants. The seed should be sown on the planting ridge. Planting spacing should be changed by variety, and it is approximately 30-50cm between plants. The seed should be sown 2-3 seeds per place in order to avoid lack of plant. And then, conduct the thinning for a seedling to cultivate one plant per place at second true leaf stage.

## Fertilization Program (One feddan):

**Land Preparation:** 20-30m<sup>3</sup> of Manure + 200-300kg of Superphosphate + 30-45kg of Sulfur+ 30-45kg of Ammonium sulfate + 60-90kg of Potassium sulfate  
**1<sup>st</sup> Top-dressing:** after 45 days of planting, 100kg of Ammonium sulfate + 100kg of Potassium sulfate  
**2<sup>nd</sup> Top-dressing:** after 15 days of 1<sup>st</sup> top-dressing, 50kg of Ammonium nitrate + 50kg of Potassium sulfate  
**3<sup>rd</sup> Top-dressing:** after 15 days of 2<sup>nd</sup> top-dressing, 50kg of Ammonium nitrate + 50kg of Potassium sulfate

## Pest & Disease Control

### Pests:

**Aphid:** Aceta 20% SP, Efdal Afitrid 20% SP, Imidor 35% SC, Pyrethrins 5% EC, Cetam (Acetamiprid) 20% SL, Confident 35% SC

**White Fly:** Admiral 10% WP, Oberon 24% SC

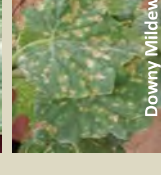
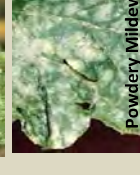
**Leaf Miner:** Romectin 1.8% EC, Lex 25% WG

**Red Spider:** Abalone 1.8% EC, Abamex 1.8% EC, Abantin 1.8% EC, Abazeen 1.8% EC, Samcotin 1.8% EC, Vertimec 1.8% EC, KZ Oil 95% EC,

### Disease:

**Powdery Mildew:** Pandel 8% SC, Penazole 10% EC, Biozeid 2.5% (10 million cell/gm) WP, Talendo (Proquinazid) 20% EC, Ritreap 5% EW

**Downy Mildew:** Addis 69% WG, Aracur 72.2% SL, Astro 25% SC, Amistar 25% SC, Amisto 25% SC, Infinito 68.75% SC







# Pepper Cultivation



## Cultivation Season:

Early Summer Season (Transplanting: February and March)

Summer Season (Transplanting: April and May)

Nile Season (Transplanting: August to September)



Season	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Early Summer	□	○	○	△	△							□
Nile		□	□	○	○	△	△					
Winter						□	□	○	○	△	△	

**Note:** □: Nursery, ○: Transplanting, △Harvesting

### Planting Method (Old Land):

Irrigate the nursery with few amount of water before transplanting to prevent the damage from the uprooting. Soak the roots of seedlings into a fungicide to protect it from the fungus rots. Select the location of the transplanting land, it should be away from the Potato Family farmland. Make 10 planting ridges in 7m for transplanting. Cultivate the seedlings in the northern side of the line with 30 to 40 cm of distance between plants and cover the roots well with the soil. Irrigate the land after the transplanting.

### Fertilization Program (One feddan):

**Land Preparation:** 30m<sup>3</sup> of Manure, 150kg of Calcium Superphosphate, 50kg of Potassium Sulfates and 50kg of Ammonium Sulfates  
**1<sup>st</sup> Top-dressing:** after 1 month of planting, 200kg of Ammonium Sulfates or 100kg of Urea 46%  
**2<sup>nd</sup> Top-dressing:** after 2 months of planting, 200kg of Ammonium Sulfates or 100kg of Urea 46%  
**After the appearance of 60% of flowers:** 150 kg of Calcium Superphosphate, 200kg of Ammonium Sulfates and 150kg of Potassium Sulfates

### Pest & Disease Control

#### Pests:

**Mole Cricket:** 15 kg of grinded maize + 20 liters of water + Pesticide (Dursban 48%EC 1.25L, Pyriban A 48% EC 1L or Chloro-puls 28% EC1L)

**Aphids:** Aceta 20% SP, Efdal Afitrid 20% SP, Imidor 35% SC, Pyrethrins 5% EC, Cetam (Acetamiprid) 20% SL, Confident 35% SC

**White Fly:** Agriculture Sulfur powder, Admiral 10% EC (Pyriproxyfen), Biovar 4% WP, Actellic 50% EC and Selectron 72% EC

**Cutworm:** 25 kg of soft bran + 20 liters of water +Pesticide (Effect Power 5% EC, Ictafos 48% EC, Axon 5% EC, Eythrin 2.5% EC, Psetban 48% EC)

#### Disease:

**Powdery Mildew:** Micron sulfur 250g or Cooper Oxychloride 350g, Afugan, Rubigan, Somi (8)



# Cabbage Cultivation



## Cultivation Season:

Local Variety (Nursery: March to Mid-May)

(Transplanting: May to July)

Foreign Variety (Nursery: July to August)

(Planting time: September to October)

Season	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Local Var.			□	□	□	○	○			△	△	
Foreign Var.	△	△					□	□	○	○		

**Note:** □: Nursery, ○: Transplanting, △Harvesting

## Planting Method:

**Nursery:** it should be started before 1 month of Transplanting.

Apply 10m<sup>3</sup> of manure, 200kg of Superphosphate and 50kg of Ammonium sulfate for 1 Feddan field size. Make 14 soil ridges in 7m and sow the seed on it, then cover the seed with soil. Stop the irrigation before 7days of uprooting.

**Planting Field:** Make 9 to 10 planting ridges in 7m. The seedlings should be transplanted in the upper third of the planting ridge. The distances of between plants should be 70 to 80 cm for local variety and 60 cm for improved variety.

## Fertilization Program (One Feddan):

**Land Preparation (plowing):** 30m<sup>3</sup> of Manure or 15m<sup>3</sup> of poultry manure and 200kg of Superphosphates.

**Basal Fertilizer (planting row):** 100kg of Ammonium Sulfates, 25kg of Potassium Sulfates and 150kg of Sulfur.

**1<sup>st</sup> Top-dressing:** after 3 weeks of transplanting, 45kg of Ammonium Sulfate, 125kg of Superphosphates and 35kg of Potassium Sulfates.

**2<sup>nd</sup> Top-dressing:** after 4 to 6 weeks from 1<sup>st</sup> top-dressing, 45kg of Ammonium Sulfate, 125kg of Superphosphates and 35kg of Potassium Sulfates.

**3<sup>rd</sup> Top-dressing:** at head formulation stage, 50kg of Ammonium Sulfate.

## Pest & Disease Control

### Pests:

**Aphid:** Fenitrothion 50% EC, Mospilan 20% SP, Carbosulfan 25% WP, Reldan 50% EC

**White Fly:** Admiral 10% EC(Pyriproxyfen), Biovar 4% WP, Actellic 50% EC, Selecron 72% EC

**Cotton Leaf- Worm and Green Worm:** Neomyl 90% SP, Proclaim 5% SG, Pasha 1.9% EC, Prochem 50% SG, Radiant 12% SC

### Disease:

**White rot:** Apply fertilizer Cyanamide 400-600kg for one feddan. Apply fungicide e.g. Topsin M70 or Rizolex 2 g for 1 kg of seed. Spray Pennthiol (sulfur) 250 g mixed with 100 liters of water for prevention. Spray Ronilan or Topsin M70 100 g mixed with 100 liter of water for treatment.

**Downy mildew:** Avoid intensive cultivation. Use pesticides e.g. Kocide 101 or Propinep 250g for 100 liters of water for prevention purpose. When the infection starts to appear, spray fungicides e.g. Previcur N 250g, ACROBAT COPPER 250g or Acogen pro 45g for 100liters of water.



Aphid



White Fly



Cotton Leaf-Worm





# Onion & Garlic Cultivation



## Cultivation Season:

Onion (Nursery: Mid-August to End-September)

(Transplanting time: Mid-October to Mid-November)

Garlic (Planting time: September to October)

Season	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Onion			△								○	
Garlic				△					○	○		

Note: □: Nursery, ○: Transplanting/Planting, △Harvesting

## Planting Method and Fertilization Program for Onion:

**Planting in Lines:** planting lines should be prepared 36 to 42 lines in 7m.

**Planting on Ridges:** make 14 planting ridges are prepared in 7m.

Transplant the seedlings with 7-10 cm distance between the plants in the upper third on both sides of the planting ridge.

**Basal Fertilizer:** 300kg of Super Phosphate

**1<sup>st</sup> and 2<sup>nd</sup> Top-dressing:** after 1 month and 2 months of transplanting, 300kg of Ammonium Nitrate

## Planting Method and Fertilization Program for Garlic:

**Land Preparation:** make 12 planting ridges in 7m.

**Seed Lobes Preparation:** put the selected seed lobes in a net bag and soak it in water for 24 hours to accelerate germination and soak it in the micron sulfur solution which is 5g micron sulfur for one liter of water for half an hour. Plant the lobes on both sides of planting ridge with the 7-10cm distance between the plants.

**Basal Fertilizer:** 10-15 m<sup>3</sup> of manure and 500kg of superphosphate, 100-150kg of ammonium nitrate, 100kg of sulfur and 50kg of potassium sulfate

**Top-dressings:** after 3, 6 and 9 weeks from planting: 100-150kg of Ammonium Nitrate

## Pest & Disease Control

### Pests:

**Mole Cricket:** 15 kg of grinded maize + 20 liters of water + Pesticide (Dursban 48%EC 1.25L, Pyriban A 48% EC 1L or Chloro-puls 28% EC1L)

**Thrips and Onion Maggots:** Pelo 50% EC (Pyridalyl), Radiant SC 12%, Marshal 20% WP (Carbosulfan), Marshal 25% WP

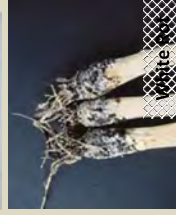
### Disease:

**Smut Disease:** Treating the seeds with a fungicide, like 5g of "Vitavax" with 5% concentration of Arabica Gum for 1kg of seed, before cultivation.

**White Rot:** treat the seed with "Trichoderma Harzianum" water solution. Soak the seedling in the pesticide water solution named "Folkor".

Apply fungicide: Somi 8 (5%), Caramba (Metconazole), Topas (20%), Flusilazole (40%)

**Downy Mildew and Purple Blotch Disease:** Acrobat Mancozeb 69% WG, Antracol 70% WG, Amistar Top 32.5% SC, Tazolen 72% WP, Delcup 23.5%, Rido, il Gold Plus 71.5% WP, Folio Gold 53.75% SC





**Improving Small-scale Farmers' Market-oriented Agriculture Project (ISMAP)  
Technical Cooperation Project**



**Central Administration of Agricultural Cooperation (CAAC)**



**Ministry of Agriculture and Land Reclamation (MALR)  
The Arab Republic of Egypt**



**Japan International Cooperation Agency (JICA)**

**Manual for  
Women Empowerment Activities  
in  
Improving Small-Scale Farmers'  
Market-Oriented Agriculture Project  
(ISMAP)**

**For Officers**



**March 2019**





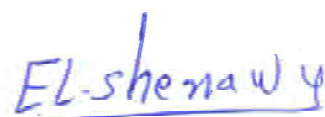
**In the Name of God, most gracious, most merciful**

The Government of Egypt aims at achieving economic welfare for agricultural communities in governorates. Great attention is paid to the poorest areas to improve the living conditions of rural inhabitants. Strategic goals were formulated in the Sustainable Agriculture Development Strategy 2030 to realize that purpose. Technical cooperation with foreign countries is utilized, and the 'Improving Small-Scale Farmers' Market-Oriented Agriculture Project (ISMAP)' in cooperation with Japan International Cooperation Agency (JICA) represents one example of this type of partnership.

ISMAP focused on increasing income of the small-scale farmers. Participation and supervision of agricultural cooperatives in Minia and Assuit assisted project implementation. In ISMAP, farming as business based on market needs was promoted in order to reach high productivity and income increase to realize farmers' welfare.

A series of activities was conducted by the technical cooperation of JICA to achieve these strategic goals and to empower both farmers and women. Farmers were guided to know the market needs. ISMAP, which has been implemented in villages of Minia and Assuit since 2014, ends in May 2019. During the project period, it achieved positive and desired results. It helped to increase the incomes of small scale farmers as well as empowering women.

I congratulate the officers and experts of the implementation team to have achieved the objective of the project and express sincere appreciation to JICA for cooperating with the Ministry for this implementation. As an output of the project, ISMAP has developed manuals and guidelines presented herewith. I sincerely hope these documents would be fully utilized to extend the ISMAP approach throughout rural Egypt.



Dr. Abbas El Shenawy  
Project Director of ISMAP  
Head of Agricultural Services and Follow-up Sector  
March 2019







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# 1 Introduction

## 1.1 Purpose of Manual

This manual has been prepared for officers at any level, who are to carry out the ISMAP gender mainstreaming activities / women empowerment activities. Its purpose is to acquaint them with the concept and approach, and guide them in undertaking the activities.

## 1.2 Why Gender & Women's empowerment?

**Gender equality and women's empowerment are vital for poverty reduction and economic development**

**Gender** is defined as the cultural and social norms for accepted behaviors of men and women. Looking at activities from a **gender point of view** helps achieve inclusive and dynamic development for all. A gender point of view usually focused on "**gender equality**" and "**women's empowerment**".

At the United Nations Fourth World Conference on Women in 1995, the international community in attendance (including Egypt) endorsed the Beijing Declaration and Platform for Action that stated:

"We are convinced that **women's empowerment** and their full participation on the basis of **equality** in all spheres of society, including participation in the decision-making process and access to power, are fundamental for the achievement of equality, development and peace" (Beijing Declaration, paragraph 13).

In support of this declaration, the following organizations and governments have articulated and incorporated the following strategies:

**JICA, Gender Equality and Women's Empowerment Strategies and Actions:** "promoting gender equality and women's empowerment is a key to achieving sustainable and equitable development. .... Evidence vigorously suggests that gender equality and women's empowerment are vital for improving economic, social, and political conditions and fostering poverty reduction and economic development."

**The Government of Egypt, Sustainable Development Strategy 2030:** "the strategy was reviewed to be gender sensitive and focused on the importance of economic and social empowerment of women and youth in all strategic pillars."

**The Ministry of Agriculture and Land Reclamation of Egypt, Sustainable Agriculture Development Strategy 2030:** Improving the living conditions of rural families and rural inhabitants involves: "promoting the role of women in the different fields of rural development," and "improving the living conditions of rural women and enabling them to participate positively and actively in the different activities."

**United Nations Sustainable Development Goals (SDGs)** Goal 5: “Achieve gender equality and empower all women and girls.”

### 1.3 Gender Equality, Women’s Empowerment, and Gender Mainstreaming

Activities at all levels must be looked at through the lens of gender equality and women’s empowerment to clearly see their challenges, needs, and impacts. **Gender mainstreaming** is the process of clarifying and measuring these challenges, needs, and impacts in order to tackle them.

**Gender point of view:** Looking at policies, programs, and projects with an eye toward “gender equality” and “women’s empowerment” This involves an awareness of the roles of men and women, and the differences in their access to and control of resources.



**Gender equality:** A state in which men and women in a society have equal access to opportunities.  
**Women’s empowerment:** Expanding women’s participation and their decision-making powers over resources.



**Gender mainstreaming:** A strategy to achieve gender equality and women’s empowerment. It is the process of clarifying challenges, needs, and impacts at all levels (policymaking, program and project planning, design, implementation, monitoring, and evaluation) from a gender perspective.

## 1.4 Gender Mainstreaming in ISMAP and its Goal

**To support activities in which women are main actors rather than in supportive positions to men**

ISMAP promotes farming as a business (market-oriented agriculture). However, most women in the villages of Upper Egypt participate less in farming than men do, and have much less decision-making power in crop production and marketing. Gender segregation and female exclusion are strong in Upper Egypt, although the extent varies from village to village.

Given these circumstances, if the project only supported crop production and marketing activities, women would be excluded from most supporting activities. Therefore, ISMAP decided to support rural women by offering activities in which they could engage as main actors, rather than seeking to create a co-working environment for both men and women in the area of crop production.

**ISMAP's gender mainstreaming strategy:**

**Women's empowerment** through supporting business activities in which women can be main actors.

The contributions of women to the household income will encourage men to respect the economic role of women. This can be achieved through reducing barriers and creating more opportunities for women to engage in economic activities.

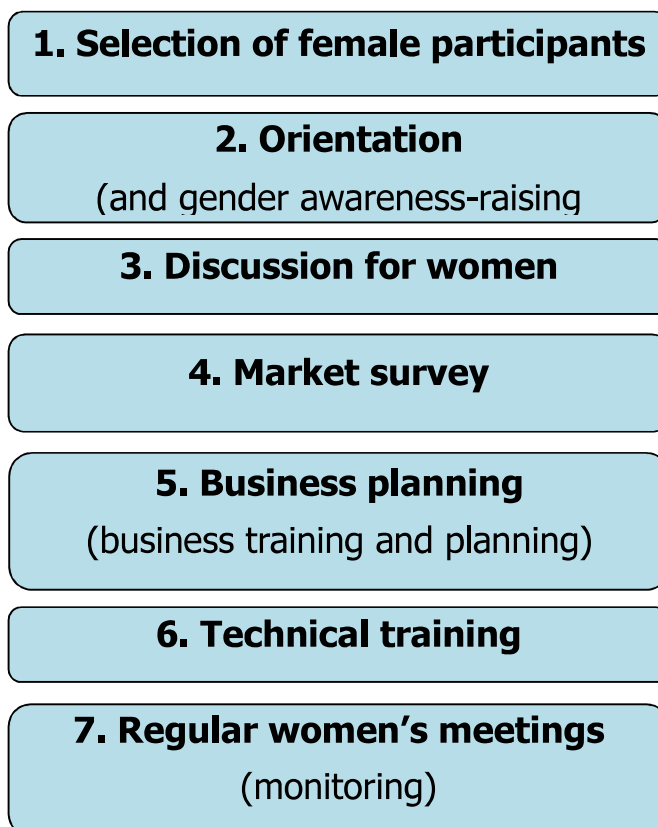
**⇒ Mitigating a potential negative impact of the project; the exclusion of women.**

The existence of active women in the village can contribute to the promotion of farming as a business (moving towards market-oriented agriculture) for members of rural society.

**⇒ A potential positive impact of the project.**

## 1.5 Flow of Gender Mainstreaming Activities in ISMAP

The activities take place in 7 stages as shown below. First, female participants are selected from the selected village using set criteria. Then, a project orientation is organized; this includes an explanation session and a gender awareness-raising session. After the orientation, a discussion is coordinated amongst the female participants around the business activities. Next, a market survey is conducted to educate participants on types of businesses and inspire them with market examples. After narrowing down the activities, a business planning session is organized for the women to learn business techniques. Once the participants decide on their business activities (e.g. raising ducks, growing mushrooms, etc.), a technical training session is arranged around these activities. After this session, participants start their own individual businesses. Regular meetings are then organized to monitor the activities.



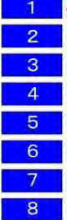
**Flow of Gender Mainstreaming Activities in ISMAP**

## 2 Details of Activities

This chapter introduces each activity. Officers are to follow the explanations below and use them as a manual for facilitating each activity.

### 2.1 Selection of women to participate in the project

STEP



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#### Purpose of this session

The extension officers need to find women who can successfully participate in the project. Women who are financially challenged may be invited to improve their situation, but it is important to also invite women who have potential, and are likely to handle their business successfully.

#### Features of targeted women

1. Women willing to start their own business,
2. Women who want more technical information through training,
3. Women who can start a business with their own money,
4. Women with a male family member who has joined ISMAP may be preferentially selected.

In Upper Egypt, more than 10,000 persons live in each village, which makes the selection of women quite difficult. In order to spread the project technique widely, it is better to select women from different areas in the village and to avoid multiple selections from within extended families.



## 2.2 Orientation

There are two ways to arrange the orientation for the women's activities. One is to orient the women along with the men in one mixed group, and the other is to hold separate sessions for women. ISMAP (2014-18) organized orientations for men and women together until the 3<sup>rd</sup> cycle. In the 4<sup>th</sup> cycle, the orientations were held separately, even though the villagers in the 4<sup>th</sup> cycle had been selected from those who had already participated in the 2<sup>nd</sup> and 3<sup>rd</sup> cycle, and most participants had already experienced mixed orientations.

If the villagers (both men and women) are comfortable attending a mixed orientation, you can organize session for men and women together. The agenda for the orientation will be as follows:

### Purpose of the session

The orientation is the entry point to the project; in order to make the female participants know the project well, it must be explained very clearly. A gender awareness-raising session is important to understand the gender situation of each village.

### AGENDA

1. Presentation explaining ISMAP including the business concept (40 minutes)
2. Gender awareness-raising session (90 minutes)

## 2.2.1 Presentation to Explain ISMAP

(Attachment 1)

### Purpose of this session

The orientation is the entry point to the project; it is therefore important to clearly explain the purpose of the project and its activities using a PowerPoint presentation. This should explain ISMAP and the basic business concepts that the women need to know.

**1. Agenda for the orientation:** At the beginning of the session, it is better to clarify the agenda for the day so that the women are aware of what they will be learning.

**2. The purpose of the project:** This can be simplified, but it should clarify to the women that their activities promote the development of the village.

**3. An explanation of the project:** A simplified explanation of 'what we will be doing' that conveys the following core points:

*Core point #1: We will provide technical training for the promotion of business activities, not for domestic consumption.*

The village women tend to consume their produce at home and sell any excess to neighbors or vendors. However, the project aims to engage women in successful business activities and increase their income. The women may nevertheless be permitted to consume their produce at home if this proves to be more profitable than buying produce from the market.

*Core point #2: We will not provide any financial or material input.*

The project provides only technical training, not financial support. We understand that extension officers feel that projects for the poor ought to support them financially, however in order for the poor to be able to depend on themselves rather than wait for support, they must be taught to fish rather than be given a fish. Under the same logic, we will provide a training series to women who express a desire to generate/increase their income.

*Core point #3: We expect women to disseminate their experiences and demonstrate their activities to others (neighbors/relatives).*

We would like to disseminate the project skills widely to other women who are not part of the project. While we understand that some women would rather keep their skills and activities a secret to guard against the jealousies of other women, it is important to persuade them to disseminate their experiences and demonstrate their activities.

*Core point #4: We will follow up on your business activities.*

After the technical training, participating women will start their businesses with their own money. It is important to follow up on their activities in order to ensure their success. Monthly meeting may be organized for these purposes, as well as veterinary services for women who are keeping animals as part of their business, depending on the office budget.



### **Explanation of Activity Flow:**

There are 6 sessions where participants gather as part of the project activity. The details of each session are explained next in this manual. A simple explanation of the activities is as follows:

#### **1<sup>st</sup> session: Orientation**

Explain project guidelines activity flow to the participants.

#### **2<sup>nd</sup> session: Women's discussion**

Conduct a group discussion to learn about the participants' experiences at home and outside the home, and what businesses they are interested in and would like to start.

#### **3<sup>rd</sup> session: Market survey**

A market survey is important for the women to learn about price patterns, optimum selling time, feed information, required medications, and so on. This needs to be planned and prepared before the women are invited to this session.

#### **4<sup>th</sup> session: Business planning**

Based on what the women learnt in 2<sup>nd</sup> session, all the participants will begin to formulate their own business plans using a format prepared by the project. The participants will then begin their business activities based on this format.

#### **5<sup>th</sup> session: Technical training**

This is the technical training required for the participants' chosen activities. If the women choose several business activities, several relevant training activities can be prepared, e.g. Muscovy duck-raising training, jam making training and so on.

#### **6<sup>th</sup> session: Regular meetings**

Regular meetings are good opportunities for the women to discuss any problems they are experiencing in their business activities. Records of these discussions should be maintained.

### **4. The explanation of the business concept**

The business concept can be illustrated using a symbol from the environment; the tree.

- **Seed** is the business idea they come up with,
- **Water** is money to grow their business,
- **Branches** are the business activities,
- **Roots** are the resources of the business,
- **Heat** means it is a bad time for business,
- **Flowers** are the marketing activities,
- **Fruits** are the profits,
- **Soil** is the market.

Participants need to understand that there are times of profit and times of loss. Losses can be

minimized by acquiring technical knowledge and seeking the advice of seasoned veterans in the business area (e.g.: in raising poultry).

## 2.2.2 Gender Awareness-Raising

(Attachment 2)

### Purpose of this session

This workshop is designed to help both male and female participants understand the roles of women and men in daily life. What expected is that male participants realize that women also dedicate a great deal of their time to domestic work and some agricultural work such as milk-based processing. In this session, the project team can also learn about the gender balance situation in the village.

The exercises are composed of four parts:

1. Roles and responsibilities of men and women in agriculture
2. Decision-making in your family
3. Access and control in your family
4. Daily schedule of men and women in your family

### **1. Roles and Responsibilities of Men and Women in Agriculture**

Explanation: The project team asks participants to select two kinds of agricultural work. It is recommended that they choose one type of work normally performed by men and another normally performed by women. The participants in Bany Mor village chose alfalfa cultivation (normally performed by men) and cow breeding (normally performed by women). Some of the activities in both types of work are shared by both women and men. In Bany Mor village, the work of harvesting alfalfa is shared by both men and women, as is the job of moving cows from the house to the field. Before the exercise, the participants had strong notions that alfalfa cultivation was men's work and that cow breeding was women's work. After the exercise, they saw that men and women shared work and supported each other in fulfilling tasks.

### **2. Decision-making**

The decision-making exercise aims to clarify who has the right to make decisions. Before the exercise, the project team chooses an area related to agriculture and daily life, then they facilitate a workshop where the participants are prompted to share who makes decisions in that area.

**1. Roles and Responsibilities of Men and Women in Agriculture**

The participants selected two items for analysis of roles and responsibilities of men and women; namely, Alfalfa and breeding Cow

Crop: Alfalfa	Male	Female	breeding Cow	Male	Female
1- preparation	<input checked="" type="radio"/>	<input type="radio"/>	1- feeding	<input type="radio"/>	<input checked="" type="radio"/>
2- Fertilizer	<input checked="" type="radio"/>	<input type="radio"/>	2- cleaning	<input type="radio"/>	<input checked="" type="radio"/>
3- Irrigation	<input checked="" type="radio"/>	<input type="radio"/>	3- Milking cows	<input type="radio"/>	<input checked="" type="radio"/>
4- Fertilizer	<input checked="" type="radio"/>	<input type="radio"/>	4- processing	<input type="radio"/>	<input checked="" type="radio"/>
4- Irrigation	<input checked="" type="radio"/>	<input type="radio"/>	5- Market information	<input type="radio"/>	<input checked="" type="radio"/>
5- Harvesting	<input checked="" type="radio"/>	<input type="radio"/>	6- Selling dairy products	<input type="radio"/>	<input checked="" type="radio"/>
			7- health care	<input checked="" type="radio"/>	<input type="radio"/>
			8- moving the cow	<input type="radio"/>	<input type="radio"/>

**2. Decision Making**

Subjects	Decision makers	Remarks
1- Crop selection	Both men and women	Men and women discuss and decide crops
2- Buying inputs	Men	Only men decide
3- Selling	Both men and women	Men and women discuss
4- Where to sell	men	Only men decide
5- Selling dairy products	Both men and women	Men and women discuss
6- Selling chickens	Women	Only women decide
7- Children's education	Both men and women	Men and women discuss and decide

Both men and women harvest alfalfa.

Men also support cow breeding

### **3. Access and control in your family**

This exercise aims to allow the participants to understand who has access and control over family assets/resources.

The project team asks participants who can access and who controls various items. "Access" means permission to use an item, and "control" means who determines the use of that item.

For example; Mr. Ahmed and Mrs. Gamila have one mobile phone. Mrs Gamila can take the mobile phone with her when she is going out, but to do so she needs Mr. Ahmed's permission. Therefore, she has access to it but he has control over it.

Subjects	Access ( who can use it)	Control ( who decide what to do)
Land	Male	Male
Farm tools	Male	Male
Income from farming	Both	male
Dairy products' income	Both	Both
Income from poultry	Female	Female

#### 4. Daily schedule of men and women in your family

This exercise helps participants to realize the significant amount of work that both men and women undertake in the family. The project team prepares a list of daily activities (in the left column of the chart below). In this exercise, male and female participants specify the time of each activity and add any new items they suggest.

**4. Daily Calendar**

	Male		Female
wake up	8:00 am	wake up	5:00am
breakfast	6 to 7am	Prepare breakfast	5:30 to 6 am
go to field	7:00 am	breakfast	6 to 7 am
go back home	1:00 pm	prepare food and do home needs	7 am to 1 pm
lunch	1 to 2 pm	lunch	1-2 pm
Rest	2 to 4 pm	continue work at home	2-3 pm
go to field again	4 to 7 pm	rest	3 to 4 pm
dinner	7 pm	Cleaning house & take care of children	4 to 6 pm
sleep	11 pm	Prepare dinner	6 to 7 pm
-----	-----	dinner	7 pm
-----	-----	sleeping	12 pm - 1 am

#### Activity Tip

In this exercise, the project team needs to pay close attention to the voices of female participants, as most women from Minia and Assiut hesitate to speak out loudly in front of male participants.

## 2.3 Women's Discussion

(Attachment 3)

- STEP 1
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### Purpose of this session

This session is scheduled after the orientation. The purpose of the session is:

1. To understand the back-grounds and interests of female participants.
2. To discuss market needs, the work they perform at home, and their household's agricultural activities.
3. To decide which participants will contact shops and traders they could sell produce to.

The format below is provided to the project team. The project team will ask the questions one-by-one to the participants as a group. Women usually have very limited time for the project so interviewing them individually is not a good idea.

Name (age)	Discussion
EXA MPL E.1. Yasmeen XXX (27)	work : -raising chicken ; -raising buffalo, processing cheese for home consumption, and if there is surplus, she sells it ; -working as an assistant at Karitas ; Husband's work : -farmer, cultivating wheat, maize, beans for selling few okra, morichaya for home consumption ; -painter ; Land : 2.5 feddan (husband's land)
1.	work : Husband's work : Land :
2.	work : Husband's work : Land :
3.	work : Husband's work : Land :
4.	work : Husband's work : Land :

2. Format for the activities which female participants interested in :-  
 Memo the name of activities and its contents :-  
 EX1. Dairy products :  
 EX2. Meat products :  
 EX3. Weaving, knit :  
 Next action :-  
 Memo who will be in charge of next action :-  
 Activities :  
 Name who will be in charge of :-  
 EX1. Mushrooms :-  
 EX2. Mushrooms :-  
 EX3. Mushrooms :-

- **Participant information:** The project team asks for the names of the participants, their

1. Format for Participant's information +7

Name (age)	Discussion
EXA MPL E.1. Yasmeen XXX (27)	work : -raising chicken ; -raising buffalo, processing cheese for home consumption, and if there is surplus, she sells it ; -working as an assistant at Karitas ; Husband's work : -farmer, cultivating wheat, maize, beans for selling few okra, morichaya for home consumption ; -painter ; Land : 2.5 feddan (husband's land)
1.	work : Husband's work : Land :
2.	work : Husband's work : Land :
3.	work : Husband's work : Land :
4.	work : Husband's work : Land :

ages, the work they are engaged in, the work their husbands are engaged in, and the size of their agricultural land.

- **Activities participants are interested in:** As part of the group discussion, the project team asks what the participants are interested in. The team needs to guide participants to choose a market-oriented agricultural activity.

2. Format for the activities which female participants interested in.  
 Memo the name of activities and its contents<sup>o)</sup>

EX1. Dairy product.	Including milk, cheese and yoghurt. Almost all participants are interested in..
EX2. Mushroom.	They don't know what mushroom is. But all of them are interested in starting mushroom cultivation because they can cultivate inside of house.
EX3. Raising rabbit.	According to the participants, there is a high demand of rabbit in their neighborhoods.
..	..
..	..
..	..
..	..
..	..
..	..

- **Next action:** Using the format below, the project team decides who will be in charge of contacting the business stakeholders relevant to the activities.

3. Format for the next action.  
 Memo who will be in charge of next action.....<sup>o)</sup>

Activities <sup>o)</sup>	Name who will be in charge of <sup>o)</sup>
EX 1. Mushroom <sup>o)</sup>	Ms.Maruwa fromMARL <sup>o)</sup>
o)	o)
o)	o)
o)	o)
o)	o)
o)	o)



## Information on the following session: The market survey

### Purpose of this session

Towards the end of the women's discussion, it is important to convey the value of obtaining information through a market survey. Since the following session is on market surveys, understanding what market surveys are will help participants to conduct them in the following session. Using photos, participants can be asked to consider who they might want to interview before going to the market.

### Introduction to Market Surveys

It is important to explain to the women what they may learn from a survey. They can be shown several photos of traders and asked to consider what they might like to ask them. The photos can be used to brainstorm the following questions:

1. What are they selling? Where?
2. How are they selling it? As a single product? As multiple products? Packed or loose?
3. What does the customer want? Which trader fulfills the customer demands the most?
4. Do you see any businesses which you feel you can start yourself? etc...





## 2.4 Market Survey

(Attachment 4)

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### Purpose of the market survey

The market survey is important for the women to acquire selling skills. In the SHEP approach, the market survey is the core activity. Some may say that participants will not learn anything new from it because of how often they visit the market anyway. This is untrue, because the market survey brings new perspectives on the market that are key to success.

### What women learn from the market survey

Women can learn various things from the three steps of the market survey:

**Step 1.** There are many businesses at the market.

⇒ Women may find an opportunity to start their own business.

**Step 2.** Interviews with particular traders.

⇒ Women will learn about price, seasonal price fluctuations, and fluctuations in the customers' demand.

**Step 3.** End of the market survey.

⇒ Women can decide what kind of business to start.

### Preparations for the market survey

In order for the activity to be fruitful, officers need to prepare the following before the market survey:

#### 1. Find and contact traders which participants are interested in.

Since traders at the market are very busy and have no time for anyone who is not a paying customer, it will be very difficult for our participants to conduct interviews with traders. Therefore, officers will contact traders beforehand and convince them to accept to be interviewed before the market survey session.

Contact trader engaged in any businesses which the participants are interested in. If the participants are interested in raising ducks and making cheese, you can contact the duck trader and the cheese trader at the market.

You can also contact other traders which participants did not show an interest in, for example, the egg trader. It is important to broaden the participants' minds to considering other businesses as well.

## **2. Ask the trader to accept visitors who will ask them several questions**

The trader must be told that the participant will ask 3 to 4 questions during a 10 to 15 minute interview. The participant must be allowed to ask questions freely.

The basic questions are:

1. What is the average price of your product?
2. When does the price of your product rise and fall and why?
3. What size/shape/type of your product is in high customer demand?

### **On the day of the market survey**

Before visiting the market, participants are divided into several groups. They are reminded of the purpose of the activity, they then go off with other members of their group to conduct the market survey.



### **After the market survey**

After the market survey, they are asked to decide what kind of business they would like to start before the next session.

## 2.5 Business Planning

(Attachment 5)

STEP

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Purpose of this session








In order to run a business successfully, women need to plan effectively before starting the business. In this session, they are taught how to make a business plan using the training materials below.

### 2.5.1 Business Planning

At the beginning of this session, simple planning should be explained using the chart below. Participants can be asked to fill in the empty column in the chart.

Planning questions are:

- What product or service will your business provide?
- Who will your customers be?
- Where do you want to sell?
- Can you start the business with your own money?
- How can you get the capital needed?
- How much of the product or service do you wish to sell?

Product to sell		
Where to sell		
Cycle (Period) until selling the first product		
Where to get capital		
Expected risk		

Well, I want to start raising ducks!

I want to sell at the local market!

I want to continue for at least 3 years!

I can use my pocket money to start a small

I may lose 2 ducks because it is my first time.

## 2.5.2 Expected Costs

In the session, you will encourage participants think about the costs involved in their business. The following example pertains to the business of raising ducks:

The participant is asked to think about how many baby ducks they can start raising, and is then asked to enter the price of each baby duck into the table below. Feed is another large cost in raising ducks. Additionally, there are the necessary costs of medicines, veterinary care, additional feed, and cages. The prices can be discussed and the participants can be asked to enter the costs, and then calculate the total cost.

**2-1. Expected cost (Variable Cost)**




Variable Cost: items consumed within one cycle

Item	Number	Price	Total
<b>TOTAL</b>			

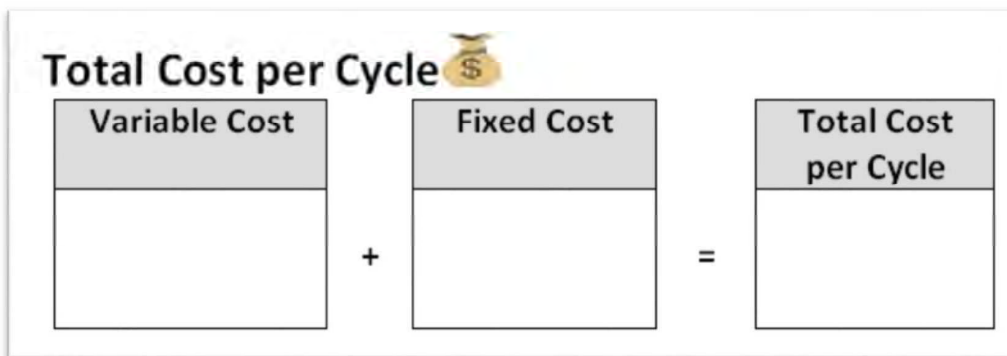
Fixed costs are for items which last for more than one cycle, such as the cage. The women should be asked to calculate these separately from the variable costs. The price of a fixed cost item must be divided by the expected number of cycles it will be used to arrive at the cost of that item for one cycle.

### 2-2. Expected cost (Fixed Cost)

Fixed Cost: items which can last more than one cycle

Item	Price  (1)	How many cycles can you use?  (2)	Cost per cycle  (1)/(2)
<b>Total</b>	/	/	

Then, the total cost per cycle is calculated as below:






Then, the 'expected income' (2-3 in manual) and the 'expected profit' (2-4 in manual) can be calculated.

### 2-3. Expected Income

Expected Income		
		
No. of items to sell	Price	Total




### 2-4. Expected Profit

	-		=	
Income		Cost		Profit

#### 2.5.3 Keeping records of costs



### 3-2-2. Net Income

	-		=	
<b>Gross Income</b>		<b>Actual Cost</b>		<b>Profit</b>
	-		=	



## 2.6 Technical Training

### Purpose of this session

Technical training aims to teach women how to produce their product.  
 Officers will prepare technical trainings relevant to the participants' business activities.

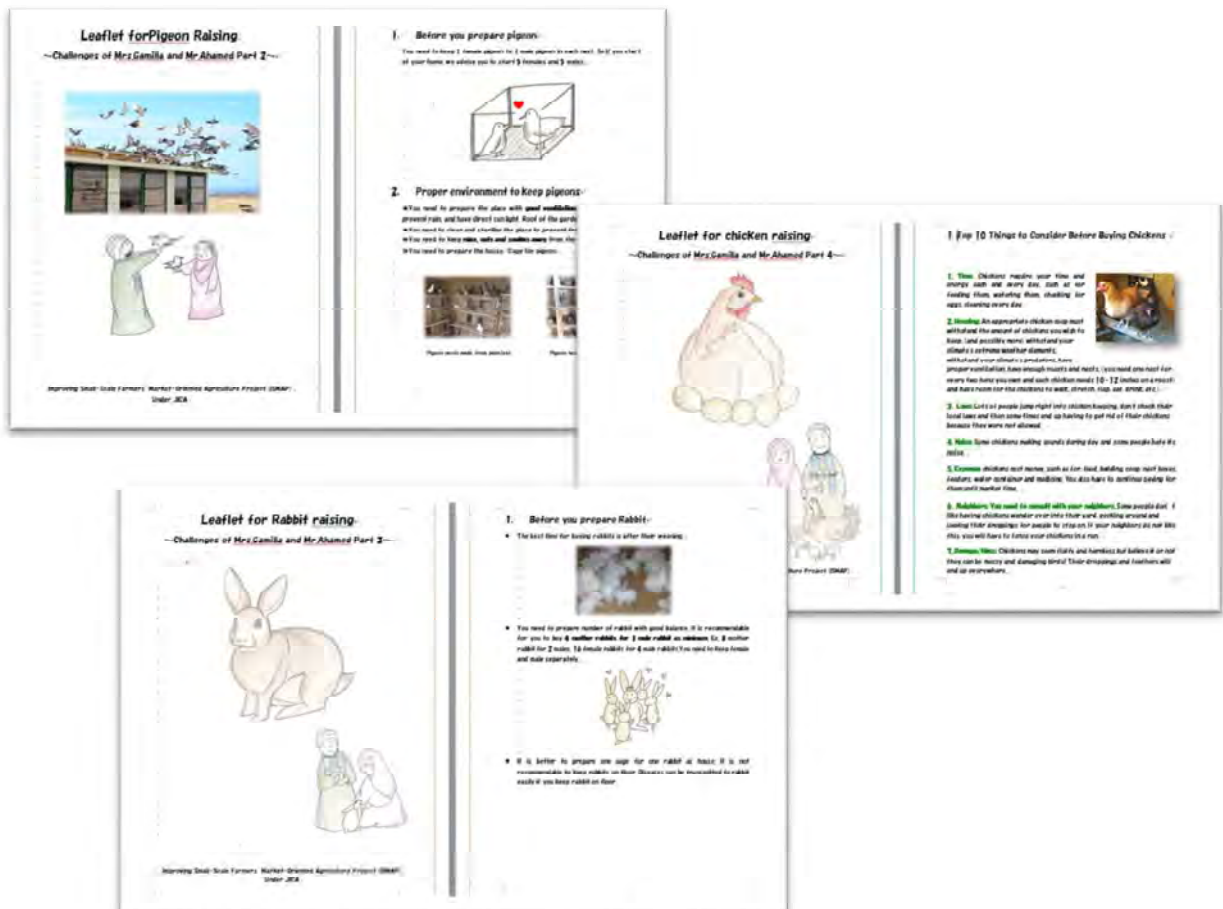
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In ISMAP, we organized 5 kinds of activities, namely **cultivating mushrooms**, **raising rabbits**, **raising pigeons**, **raising chicken**, and **raising duck**. We invited a lecturer from ARC, lecturers from Minia and Assiut Universities, and a mushroom trader.

If there is a budget to invite such lecturers, that is fine. However, if the budget is too small, perhaps a practical expert, such as a farmer who is experienced in raising ducks, can be invited to teach the women some relevant skills.

It is better to prepare material that the participants can easily understand, as some participants may not be able to read or write. ISMAP has prepared material that is full of illustrations that can be used to prepare even simpler material. Materials from previous cycles can certainly also be used for these purposes.



**Materials (text book) from previous activities**

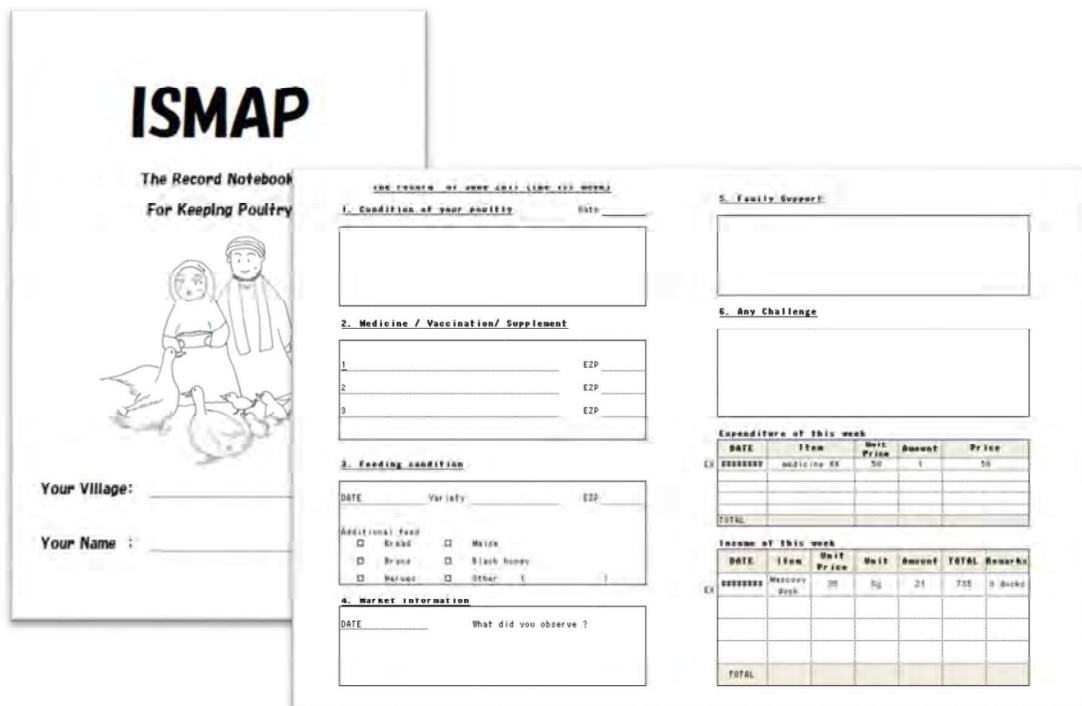
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**2.7 Regular Women’s Meetings (Monitoring)**

(Attachment 6)

After the technical training, women will start operating their individual businesses. In order to support their activities, ISMAP recommends holding monthly meetings at the cooperative office. Once business activities begin, participants will certainly encounter several difficulties. For instance, if an animal breeder encounters an animal disease, she must be advised to seek a consultation from the local veterinary.

In these monthly meeting, record books can be provided to the participants, so that they may record their costs and profits as they learnt to do at the business plan training session.



Every weekend, the participants will enter records of both business and technical matters.

**Contents recorded by the participants**

Using the example of poultry raising, the following may be recorded:

1. **Condition of poultry:** the health conditions of the poultry is recorded each week.
2. **Medicines/vaccinations/supplements:** records of any vaccination or medical service the poultry has had.
3. **Feeding conditions:** The records of feed purchases; each entry should list the price paid and the date of purchase. If there is any additional feed consumed by the poultry, this must be recorded too.
4. **Market information:** If the participant visited the market and obtained useful information,

this should be recorded as well.

**5. Family support:** If the participant has received any kind support from her family (especially from male family members), this must be recorded.

**6. Weekly expenditure:** Participant must enter what was purchased in the appropriate slot in the table.

**7. Income of this week:** Participant must enter what was sold in the appropriate slot in the table.

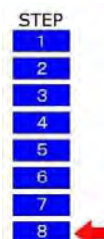
Participants may share the information in their record books at monthly meetings. If participants are not happy to share information about income with others, they may refrain from doing so but it is important that officers check that they do not have a deficit at the end of the month.

## Evaluation

After a certain period, it is strongly recommended that the results of the women's businesses are evaluated. Their record books must be checked and their profits calculated.

If a participant does not make enough of a profit, it is important to ask them to consider what the problem might be. It may be a problem of over feeding, the loss of an animal to disease, and so on. This is an opportunity to be a good mentor and to work with the participant to solve the problem together and encourage her to improve her business.

If a participant notices that her business does not make enough of a profit, she may choose to start another business. However, it is possible to remind her of the number of cycles she had initially committed to.



### 3 Additional Project Ideas to Attract Participants

ISMAP team has been working on several ideas to attract women to the project, here are some of them:

#### 3.1 The Participant Passport

When faced with the problem of participation discontinuity, we prepared passports with:

**1. The participant's photo and full name on the first page:**

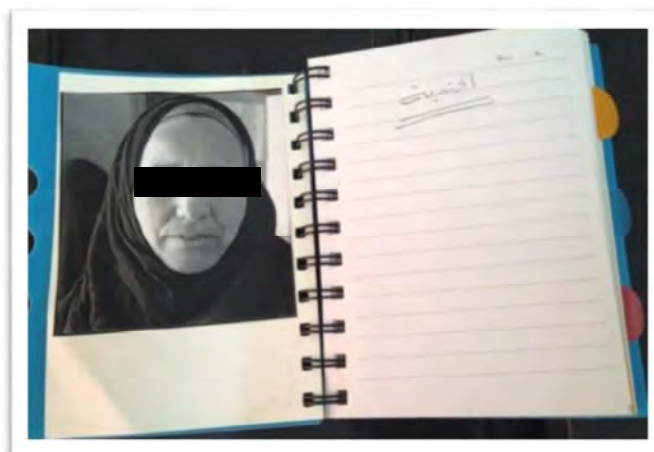
The intention of this idea is that participants recognize themselves as members of the project, encouraging them to participate regularly in all sessions.

**2. Participation stamps:**

Every time they participate in a session, they are given a stamp as evidence of participation.

**3. Memos:**

Participants may use this notebook to record any information they obtain from the sessions.



## 3.2 Certification

(Attachment 7)

We provided certificates to those who attended the business plan training session.

This had been a difficult lecture and to encourage them to participate in the following activities, certificates of attendance of this session were prepared and distributed to attendees.



Participating women were very pleased to receive these certificates.

## 4 Testimonies from Participating Women

Here are testimonies from women who learned from ISMAP gender mainstreaming activities; these may be used as a reference.

### Testimonies from the market survey session:

“Initially, I had the idea of selling homemade spices. ISMAP taught us that it was necessary to check the requirements of our product before we started selling. Therefore, I visited a small shop in my village and asked some vendors if they would sell my homemade spices. Unfortunately, they did not respond positively. The turning point came when ISMAP took us to Panda Hypermarket. There I found food products that were packaged nicely and arranged in order and I became so excited! I was encouraged to sell these products because I knew exactly how to cook them.”

(Mrs.Hanan, Bany Mor village)

“From the market survey, I learned how to sell and how to negotiate with customers. The tips from the vendors helped me when I began to sell my own product.”

(Mrs.Shadya Allam, Awlad Elias)

### Testimonies from the business planning session:

“I was raising poultries even before joining ISMAP activity, but I did not pay enough attention not to lose ducks by disease. After making a business plan at the session, I started considering “profits” and changing my behavior to become more careful with the poultry.”

(Mrs.Doaa, Tala village)

“After learning how to make a business plan, I started calculating my domestic expenses as well as that of my business.”

(Mrs.Amal, Awlad Elias village)

“I feel more secure in planning for business before selling.”

(Mrs.Hanan, Bany Mor village)

### Testimonies from the technical training:

“I learned the signs of poultry disease so now I notice them before the symptoms become serious. I also received information on good medicines and the proper balance of ingredients for the feed mixture. Now I am able to raise poultry that weighs over 4 kilograms.”

(Mrs.Hayam, Man fload village)

“I had not used commercial fodder previously but I started buying it after the tips I heard at the lecture. Thanks to this fodder, my ducks grew very fast and I am now able to sell a duck after only 2 months of breeding.

(Mrs.Sabreen, Man fload village)

## Attachments

Attached are materials that have been used by ISMAP. These may be used where and if necessary, and modified as required by the situation.

Attachment 1 Presentation to explain ISMAP

Attachment 2 Gender awareness-raising

Attachment 3 Format for participant information

Attachment 4 Format for market survey

Attachment 5 Exercise for business planning

Attachment 6 Record book

Attachment 7 Format for certificates





**Improving Small-scale Farmers' Market-oriented Agriculture Project (ISMAP)  
Technical Cooperation Project**



**Central Administration of Agricultural Cooperation (CAAC)**



**Ministry of Agriculture and Land Reclamation (MALR)  
The Arab Republic of Egypt**



**Japan International Cooperation Agency (JICA)**

Manual for  
Women Empowerment Activities in  
ISMAP  
For female participants



January 2019



## What is Gender?

Gender is about differences between men and women in social role. It is not same as sexual differences. Sexual differences are from biological differences.

For example,

- Gender difference between Ms.Gamilla and Mr.Ahamed is;

Mr.Ahamed does **farming outside** but Ms.Gamilla **work inside** of house.

- Biological difference between Ms.Gamilla and Mr.Ahamed is.....

Ms.Gamilla can be pregnant but Mr.Ahamed cannot be pregnant.



## Gender equality

Gender Equality and promoting the empowerment of women are crucial to achieve the "inclusive development". At the same time, creating an environment in which women, accounting for about half the population, can fully exercise their ability, will contribute to the improvement of productivity and vitalization of overall society, and can be expected to become a big growth engine. From the standpoint of "improving development effects," gender equality and the empowerment of women are essential.

(JICA: Japan International Cooperation Agency)



## Purpose of this manual

We provide the series of activities to the participants in order to empower business skill. This manual was prepared for the female participants who can learn at home more than what you learned at activities. Therefore, the order of the manual is same as the flow of project activities as below.

Ms.Gamilla who is appeared in this manual is a lady from the village in Assiut governorate. She wishes to increase her income as you wish. So you can learn how to conduct your business with reading her story. Mr.Ahamed, husband of Ms.Gamilla, is also another important character who support Ms. Gamilla' s activity. Husband's cooperation (or any male family member's cooperation) is very important for women to continue their business successfully. You can also let your husband/male family member read this manual and think about your new business together.

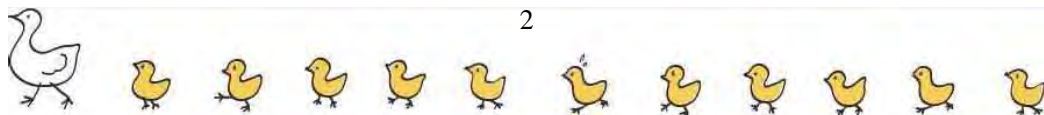
### **1. Orientation**

(& Gender Awareness Creation)

### **2. Market Survey**

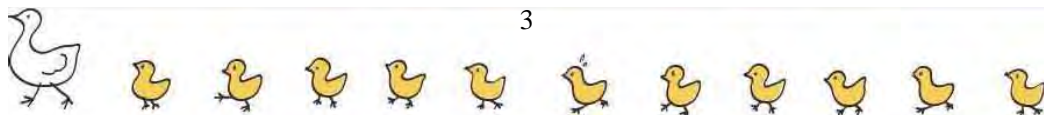
### **3. Business Planning**

(Business Training & Planning)



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## 1 Let's start your business

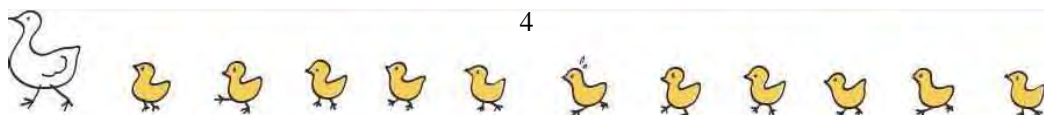
Ms.Gamilla wants to increase her income to support her husband.

Her husband, Mr. Ahamed, is a farmer but income in the previous season was not enough to support family because of the market price change. Therefore, Ms.Gamilla and Mr.Ahamed discussed to find another income source.



You also want to start business?

Let's discuss with your family about new business.



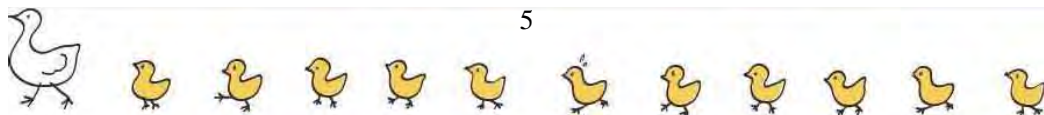


## 2 Let's go to market survey

Ms.Gamilla and Mr.Ahamed visited market to look for any good business to start. There are many businesses, such as pickles seller, cheese seller, poultry trader, and so on. Can you tell what they are selling ?



5



● **Differences in each retailer**

**Mr.Ahamed:** Do you think any business you can start? You are good at making cheese and pickles at home.

They found retailer who sells cheese. And they notice they are not same in selling.

The cheese seller Ms.A is selling only cheese.

The cheese seller Ms.B is selling 3 kinds of cheese.



Gamilla asked Ms.A and Ms.B about how they are doing business.

- A answered

"I am selling the remaining of home consumption. I just need a small money when we have remaining"

- B answered

"I am preparing cheese for selling mainly, not for own consumption."

If you are Ms.Gamilla, do you follow Ms.A or Ms.B?  
Or do you have another idea?







3

### Let's make business plan



After market survey, Ms. Gamilla decided to sell cheese because she has been making cheese for family ever since she got married to Mr.Ahamed.

**Ms.Gamilla** "Darling, I think I can start small business selling cheese."

**Mr.Ahamed** "That is a good idea! Your cheese is very tasty and we keep buffalo at home. So no need for the cost of milk!

After deciding the business, she called to Mr.Hata, professional of small farmer's business.

**Ms.Gamilla** " Hello, Mr.Hata. I decided to sell cheese after seeing market with my husband. And my husband is also happy to start it! What should I do next?"

**Mr.Hata** "That's good ! So I recommend you to prepare **Business Plan.**"

**Ms.Gamilla** "What is the Business Plan ??? It sounds very difficult ! "

**Mr.Hata** "It is not difficult but it is very important to make business successful, I give you the exercise book for you"

Product to sell		
Where to sell		
Cycle (Period) until selling the first product		
Where to get capital		
Expected risk		

Well, I want to start duck Raising !

I want to sell at local market !

I want to continue at least 3 year !

I can use my pocket money for small business !

I may lose 4 pigeon because it is first time for me.....



## 4 Let's keep record



Mr.Hata recommended to keep record for business activities.

**Mr.Hata:** " Ms.Gamilla, this is the record book that we used in our project. You can use this record book for your activity as well.

**Ms.Gamilla:** "Why is it so important to keep record? I think I can remember what I bought and what I sold.... I don't think it is necessary.

**Mr.Hata:** "I know you have good memory, Ms.Gamilla. But, If you keep record each time, you can get more accurate number of cost and profit after selling product. It will be your confidence!"

**Ms.Gamilla:** "Ok, If you say so, I follow your direction"

**ISMAR**  
The Record Notebook  
For Keeping Poultry

Your Village: \_\_\_\_\_  
Your Name : \_\_\_\_\_

### Recording Notebook

the record of your own farm and your business

**1. Condition of your poultry**      Date \_\_\_\_\_

**2. Medicine / Vaccination/ Supplement**

1		E2P
2		E2P
3		E2P

**3. Feeding condition**

DATE \_\_\_\_\_ Variety \_\_\_\_\_ E2P \_\_\_\_\_

ADDITIONAL FEED

Bread     Mirec

Brans     Black Honey

Herbes     Other ( )

**4. Market information**

DATE \_\_\_\_\_ What did you observe ? \_\_\_\_\_

**5. Family Support**

**6. Any Challenge**

**Expenditure of this week**

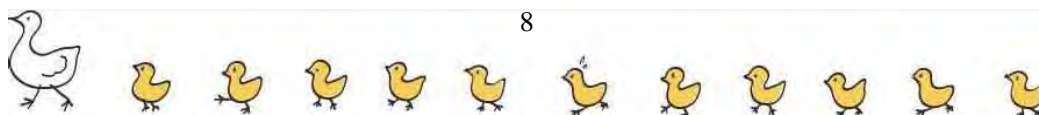
DATE	Item	Unit	Price	Amount	Price
#####	Medicine #0	kg	1		
TOTAL					

**Income of this week**

DATE	Item	Unit	Price	Unit	Amount	TOTAL	Remarks
#####	Masoviy duck	25	Rp	21	725		1 duck
TOTAL							

What do you think?

I know you have good memory but let's try!!



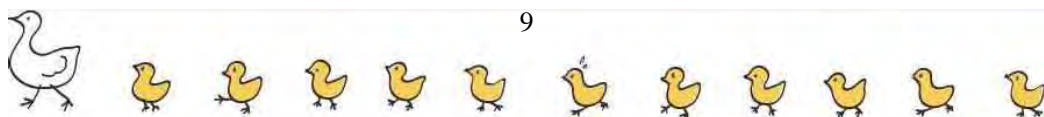
● **How to keep record**

**Ms.Gamilla:** “Should I keep every day ?”

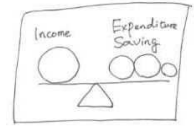
**Mr.Hata:** “You can keep record every end of the week. But try to keep record every time when you purchased or sold even with small paper or something. And the end of week you can write down in the recording notebook.

**Ms.Gamilla:** “OK, I will try”

1. **Condition of Poultry:** keep record the health condition of this week
2. **Medicine/Vaccination/Supplement:** If the poultry had vaccination or any medical service, keep this record.
3. **Feeding Condition:** The record of purchase of feeder. The price should be recorded with the purchase date. If there are any **additional foods** except for the main feeder, please let them to keep record as well.
4. **Market Information:** If the lady visited the market and get any useful information, please let them keep record.
5. **Family Support:** If the participant received any kind support from her family (especially male family), please let them write about it.
6. **Expenditure of this week:** Fill the gap of table with what they purchased.
7. **Income of this week:** Fill the gap of table with what they sold.



## 5 Any Change after starting business?



After calculating the profit, Ms.Gamilla informed the profit to Mr.Ahamed.

**Ms.Gamilla:** “ Look, I gained 200 L.E.”. It was not as much as I expected...”

**Mr.Ahamed:** “ Gamilla, It is the first step for you to start business. You can increase more after several experiences.”

Ms.Gamilla appreciated his encouragement. She noticed Mr.Ahamed became more cooperative for domestic work of which Ms.Gamilla used to be in charge.

Even her first son became very cooperative for taking care of younger sister and brothers. And He seems to be proud of Ms.Gamilla after starting business.



Did you find any change in your family?



## 6 Voice from participated women

Here are the voices from women who learned from ISMAP gender mainstreaming activities.

### Experience from Market Survey:

“I had an idea to sell home-made spices initially. ISMAP taught us that it is necessary to check the demands of your product before start selling. So I visited small shop in my village and also asked some venders if they can sell my home-made spices.

Unfortunately, they did not respond well. It was turning point when ISMAP took us to Hyper Panda Market. I found the food products which were packed nicely and arranged in order. I was so excited! I was encouraged that I could also sell this product because I know how to cook these.”  
(Mrs.Hanan, Bany Mor village)

“In the market survey, I learned how to sell and how to negotiate to customers. The tips from vender helped me when I started selling my product.”

(Mrs.Shadya Allm, Awlad Elias)

### Experience from Business planning:

“I was raising poultries even before joining ISMAP activity but I did not care so much about losing ducks by disease. After making business plan in the session, I started considering “profit” and changed my behavior to be more careful to raise poultries.”  
(Mrs.Doaa, Tala village)

“After learning how to make business plan, I started calculating for my domestic works as well as for my business.”  
(Mrs.Amal, Awlad Elias village)

“I feel more secured by planning for business before selling.”

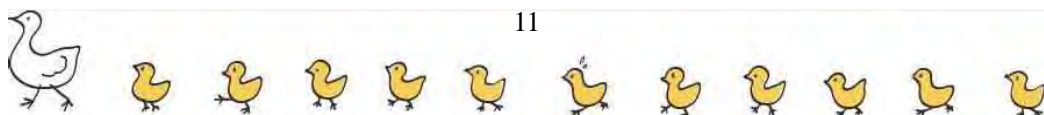
(Mrs.Hanan, Bany Mor village)

### Experience from Technical Training:

“I leaned the sign of disease of poultry. So, now I can notice the disease of poultries before the symptom became serious. And I got information of good medicine and good balance of mixture for fodder. Now I am able to raise poultry which has even more than 4 kg.”  
(Mrs.Hayam, ManFlood village)

“I did not use commercial fodder previously but I started buying commercial fodder after I got tips from the lecture. Thanks for the fodder, ducks grow very fast and I can now sell the ducks in 2 months.

(Mrs.Sabreen,ManFlood village)





## 7 Attachment

These are the formats which we used in ISMAP. You can also utilize this format for your successful business.

Attachment 1 : Exercise for business planning

Attachment 2 : Recording Book

Attachment 3 : Technical Training Material

Mushroom Cultivation

Rabbit Raising

Pigeon Raising

Chicken Raising



**Improving Small-scale Farmers' Market-oriented Agriculture Project  
(ISMAP)**

**Technical Cooperation Project**



**Central Administration of Agricultural Cooperation (CAAC)**



**Ministry of Agriculture and Land Reclamation (MALR)**

**The Arab Republic of Egypt**



**Japan International Cooperation Agency (JICA)**

# Leaflet for Pigeon Raising

~Challenges of Ms.Gamilla and Mr.Ahamed Part 3~



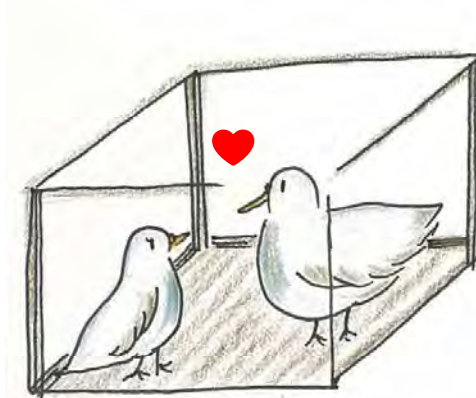
Improving Small-Scale Farmers' Market-Oriented Agriculture Project (ISMAP)





## 1. Before you prepare pigeon

You need to keep 1 female pigeon to 1 male pigeon in each nest. So If you start at your home, we advise you to start 5 females and 5 males.



## 2. Proper environment to keep pigeons

- ★You need to prepare the place with **good ventilation**, covered by roof to prevent rain, and have direct sun light. Roof of the garden is suitable
- ★You need to clean and sterilize the place to prevent from infection
- ★You need to keep mice, cats and snakes away from the place
- ★You need to prepare the house/Cage for pigeon



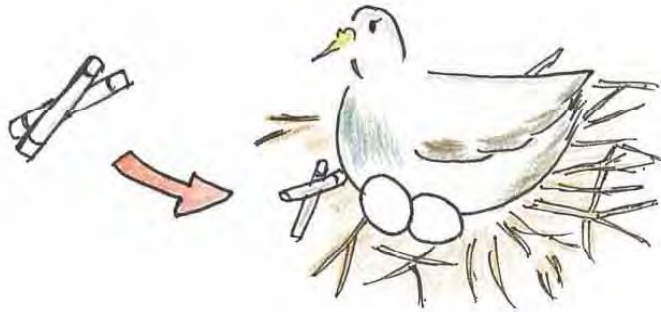
Pigeon nests made from palm leaf



Pigeon nests made from wood

★ **Pigeons need to make their nest by their self in a cage:**

**It is recommended to let the pigeons build their own nests because this activity makes them love the nest more and will help during races. Some of the best materials for pigeon nests are rice straw, corn sticks and clover hay. Drop a pile of sticks on the floor of the loft or outside. Pigeons will arrange them for making nest.**



### **3. Water and Food for pigeon**

**★You need to keep potable water and diet all the time**



Food Container (left) and Water container (right)



Food Container



Water Container

**★Regarding the diet, you need to give good quality with many kinds of nutrition, such as vitamins, proteins, energy and minerals. This is important for healthy growth. You can mix several kinds of grains and seeds such as corn, wheat, sorghum, oats, barley, rye and rice. Buckwheat, legume seeds, peas, soybeans, vetch groundnuts and Sunflower seed can be mixed too .**



**★It is recommendable to give “heavy” grain in morning and “light” grain in evening. Heavy grain is wheat, corn, grain, sorghum, rye and soybeans. Light grain is barley or oats**

**★Pigeon eat more in winter than summer.**

**★Regarding the protein, it is recommendable to give more protein in summer than winter. Soybean meal includes more protein than all grains.**

**★Regarding the carbohydrate, it is recommendable to give more carbohydrate in winter than summer. (Many grains such as wheat, corn, grain sorghums, rye, barley and oats include more carbohydrate.)**

**★You should be careful for the pigeons which could not eat enough because of the crowding of pigeons. Check these pigeons carefully and give them chance to eat grains.**

### **More information from your Professor**

#### **What does my pigeon naturally eat?**

Pigeons eat a variety of grains, seeds, greens, berries, fruits, and will occasionally eat insects, snails and earthworms in the wild. What should I feed my pigeon? A well balanced diet must be maintained at all times. Consult your veterinarian if encountering any problems with diet or the health of the bird.

#### **Seeds**

Formulated pigeon seed diets are available. A commercial diet contains mixed seeds and grains, vegetables and some are enriched with brewer's yeast plus vitamins and minerals. Different diet formulations exist for performance birds, resting birds and breeding birds. Pigeons are susceptible to calcium deficiency from eating only seeds. Seeds should only be 50% of a balanced diet, never the entire diet. "Different diet formulations exist for performance birds, resting birds and breeding birds."

#### **Pelleted Diets**

"Pellets should ideally represent approximately 50% of a pigeon's diet." Pellets have been developed to meet all your bird's nutritional needs. Hand raised babies are the easiest to start on a pelleted diet. **Pellets are the ideal diet**, therefore you are encouraged to slowly wean *seed eating* birds onto a pelleted diet. Pellets should ideally represent approximately 50% of a pigeon's diet. There are many good brands of pelleted foods in the market place.

#### **Fruits and Vegetables**

Finely chopped vegetables and greens plus some fruit should be offered as part of the daily diet. Pale vegetables, with a high water composition (i.e. iceberg or head lettuce, celery) offer very little nutritional value. **Avocado is reported to be potentially toxic.**

Fruits and vegetables must be washed thoroughly to remove chemicals. Cut them into manageable pieces depending on the size of the bird. It is not necessary to take the skin off. Offer fruits and vegetables in a separate dish. If your bird appears to develop a particular fancy for one food item, reduce its volume or stop feeding it temporarily to promote the eating of other foods.

#### **Water**

Fresh clean water must be available at all times. Depending on the quality of your tap water, you might consider the use of bottled water. Dishes must be cleaned thoroughly every day with soap and water.

#### **Does my pigeon or dove need extra vitamins, minerals or amino acids?**

Your veterinarian can help you assess your bird's diet and its particular needs. One expert suggests that a pigeon eating 50% of its diet in the form of pelleted food may not need supplements. Specific vitamins or minerals may be more important at various times during a pigeon or dove's life (e.g., calcium supplements during egg laying). Calcium supplements are available if your pigeon is determined to be deficient.

#### **Does my pigeon need gravel or grit?**

Controversy exists over the need for gravel. It was believed that grit was necessary for the mechanical breakdown of food in the gizzard as an aid to digestion. Birds seem to do fine without grit. Most pigeons are offered a small amount of grit, crushed eggshell or oyster shell. Some birds will in fact have problems if grit is over eaten.

## 4. From hatching to be adult pigeon

- ★ Female pigeon gives 2 eggs.
- ★ It takes 16 to 19 days to hatch.
- ★ After hatching from egg, mother pigeon keeps the baby pigeon in their nest. If there is no nest which parents made or parents died, you need to keep baby pigeon in warm place such as box with straw or hay, maybe some paper.

★ Baby pigeons cannot digest food in the cold temperature, and will die if not kept warm. Parents feed baby pigeons and will pump food inside the mouth. Baby pigeons will receive what is known as “Crop Milk” or “Pigeon Milk”, it is not like real milk, it is paste-like crop produced inside of the body of mother and father pigeon.



### ♠ If mother pigeon does not feed babies.....

You can soak biscuit into water and make it soft. You can give this paste one to baby pigeon for a while. You can use baby's bottle or syringe to feed this paste to baby pigeons. About baby's bottle, cut the tip of the nipple half way down from the baby bottle, so that pigeon can slide the beak inside. This way pigeon can eat like the parents are feeding him. And he will do it naturally as in the nest.



It will look like a small balloon and will hang on the bird's chest when you look at it. At that time stop the feeding, leave the bird alone to digest the food. The next time to feed the birds is when you see the crop flatten all the way, it will take hours for this, and you can feed in the morning and then one more time in the day.

***This leaflet was prepared by ISMAP team under Japan International Cooperation Agency (JICA) with Directed by Prof. Shaker Abd EL-Tawab abd EL-Latif, Department of Animal Production, Faculty of Agriculture, Minia University, Egypt***

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# Leaflet for chicken raising

~Challenges of Ms.Gamilla and Mr.Ahamed Part 4~



**Improving Small-Scale Farmers' Market-Oriented Agriculture Project (ISMAP)**



## **1. Top 10 Things to Consider Before Buying Chickens**

**1. Time:** Chickens require your time and energy each and every day, such as for feeding them, watering them, checking for eggs, cleaning every day.



**2. Housing:** An appropriate chicken coop must withstand the amount of chickens you wish to keep, (and possibly more) withstand your climate's extreme weather elements, withstand your climate's predators, have proper ventilation, have enough roosts and nests, (you need one nest for every two hens you own and each chicken needs 10-12 inches on a roost) and have room for the chickens to walk, stretch, flap, eat, drink, etc.)

**3. Laws:** Lots of people jump right into chicken keeping, don't check their local laws and then some times end up having to get rid of their chickens because they were not allowed.

**4. Noise:** Some chickens making sounds during day and some people hate its noise.

**5. Expense:** chickens cost money, such as for, food, bedding, coop, nest boxes, feeders, water container and medicine. You also have to continue paying for them until market time.

**6. Neighbors:** You need to consult with your neighbors. Some people don't like having chickens wander over into their yard, pecking around and leaving their droppings for people to step on. If your neighbors do not like this, you will have to fence your chickens in a run.

**7. Damage/Mess:** Chickens may seem fluffy and harmless but believe it or not they can be messy and damaging birds! Their droppings and feathers will end up everywhere.

**8. Quarantining/Introducing:** When you want to add more chickens to your flock you will have to quarantine the new members and introduce the new members properly.

**9. Heartbreak/Loss:** Chickens are an animal that you will bond with. Their passing will be extremely hard! If you have children then you have to be prepared to help them through this rough time.

**10. Addiction:** Finally, chicken raising is addicting! You will never stop once you have begun!



**Chickens are a joy that will bring you great pleasure and enjoyment. If you do it right and consider all that is involved you won't have regrets. Have fun with this adventure!**



## **2. 11 Tips for Keeping Healthy, Stress-Free Chickens**

### **1. Choose the right breed for your needs and healthy one.**

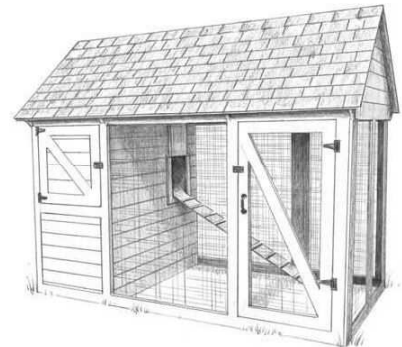
**Not all breeds of chickens will perform equally well under the conditions you can provide for them and in your environment. First, decide what you want chickens for — laying eggs, providing meat, showing, or just for enjoying. Then, carefully study the breed characteristics and choose a breed that seems to fit your needs.**

**You need to check the health of chicks and its mother if the mother has not got salmonella or not and vaccinated or not.**



### **2. Set up suitable housing.**

**Having the right housing is not only better for the chickens but also better for you, so be sure to plan your chicken housing, and get it set up before you buy the birds. Plan the size of the housing, how you'll access it to care for the birds and collect eggs, how it will fit into your yard, and how it will be lighted. Make sure the housing accommodates your needs as well as the chickens'. The housing doesn't have to be elaborate, but it needs to be clean and functional.**



### **3. Supplement lighting when needed.**

**A chicken's life cycle revolves around the amount of daylight or artificial light it receives. Chickens are prompted to lay eggs and mate when the days are long, and they molt when the days start getting shorter. Molting is the process by which all a**





chicken's feathers are replaced, and it's energy-intensive. When chickens molt, they usually stop laying.

#### **4. Control pests.**

**Pests are those creatures like wild birds, rats, mice, and flies that may hang around poultry housing. Wild birds like starlings and sparrows or wild geese or ducks can carry many diseases to your chickens, as do rats and mice.**



**Controlling pests means keeping the coop clean, good storing of feed so that pests can't access it, putting out poison bait or traps when you notice signs of pests, and having secure housing that limits pests' access.**



#### **5. Protect against predators.**

**Predators are a big concern for chicken-keepers. Predator protection works best if you can anticipate problems and protect the chickens with sturdy pens or restricted areas to roam.**

#### **6. Control parasites.**

**Parasites not only make birds uncomfortable, they can carry disease and lower a chicken's immune system response to disease. Birds carrying a heavy load of internal or external parasites produce fewer eggs, grow more slowly, and eat more feed. Keeping your birds well-fed and stress and disease free helps their bodies**



**repel parasites and makes them better able to tolerate any they may still contract.**

### **7. Vaccinate your chickens.**

**Preventing problems is always better than trying to fix them. When you buy young chicks, you're often offered the opportunity to have them vaccinated for a small additional fee. Vaccines can be given at various life stages of chickens.**

**Vaccines can be given by mouth, in the eyes, in the nose, or by injection, depending on the disease they are meant to prevent. Some vaccines prevent disease in one dose: others require several doses.**

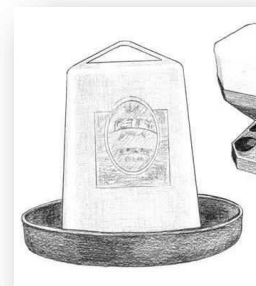
### **8. Feed a well-balanced diet.**

**Well-fed chickens lay more eggs, grow faster, produce better meat, and have good immune systems to fight off disease. Even if they have a large area of land to forage on, they need at least part of their diet to come from commercial feed so they get all the nutrients they need.**

**Birds eat seeds (maize, barley, wheat, wheat bran, and sorghum), plant protein sources (soybean meal, cotton seed meal, sunflower meal, ground nuts meal, sesame meal, flaxseed meal), Animal protein sources (fish meal, shrimp meal, meat meal, butchery wastes meal)**

**When they change their feather, you need to increase the amount of nutrition.**

**Today's commercial feeds are well-balanced, with the correct ratios of protein, energy, minerals, and vitamins, and so on for the type of bird they are labeled for. Chickens diet takes many forms such as pellets, crumbles and mash. If you want organic commercial feeds, these are now available on the market in many areas.**



**9. Make sure you provide enough clean water.**

**Having clean water available at all times is one of the best ways to keep your chickens healthy and productive. Making sure water is available, even in winter, is essential to their health. Chickens can be a bit fussy about water. They don't like water that is too warm or flavored strongly. If they don't drink freely, they won't eat as much, and that starts affecting their production and health.**



**10. Beware disease-transmitting dangers.**

**Many chicken diseases are carried on clothing, shoes, and hands. When you visit other people's chickens or go to a show, you should change your shoes and clothes and wash your hands before tending your flock. Also think twice about inviting visitors who have chickens of their own to visit your flock. If you have rare or very valuable birds, you may want to limit visits. The more visits, the greater the chance that a disease will be carried into your flock. All borrowed equipment, such as carriers, should be disinfected before and after use.**



**11. Use quarantines whenever necessary.**

**One of the easiest but least practiced things a home flock owner can do to maintain healthy chickens is to quarantine all new birds and all chickens that come back home from a show or sale for two weeks, well away from the rest of the flock.**



***If you have sick chickens, they should be moved away from the rest of the flock and quarantined to try and prevent disease spread. Injured birds need to be quarantined also, so the others don't pick on them.***

### 3. More Information

#### ■ Trimming beak head

**It is better to trim the beak of chickens. Don't cut too much. You trim only the head of beak. If you cut too long, it will be difficult for them to feed. When their beak is trimmed, chickens eat food properly and they will not hurt other chickens with pecking strongly.**



"The top beak should be cut back 1/2 to 2/3 for layers and 1/3 for meat chickens while the bottom beak should be cut 1/4 to 1/3 for layers and not at all for meat birds. Birds on an open range should be debeaked only if a problem with cannibalism occurs. In this case, it is very important to debeak both top and bottom beaks equally."

Practical Poultry Raising  
Peace Corps Manual M11



Scaly, chipping and small thin overgrowth are part of the normal beak renewal process.

#### ■ Details about food

① **If the chicken is healthy, it increases the weight and amount of food through the year as show in the table.**

Increase of weight and amount of food

Age (week)	Weight	Amount of food
1 week		10 gram
2 weeks		18 gram
3 weeks		26 gram
4 weeks	260 gram	33 gram
5 weeks		40 gram
6 weeks	460 gram	47 gram
7 weeks		52 gram
8 weeks	640 gram	57 gram

9 weeks		61 gram
10 weeks	800 gram	64 gram
11 weeks		66 gram
12 weeks	940 gram	67 gram
13 weeks		68 gram
14 weeks	1060 gram	68 gram
15 weeks		69 gram
16 weeks	1150 gram	70 gram
17 weeks		71 gram
18 weeks	1230 gram	72 gram
19 weeks		73 gram
20 weeks	1310 gram	75 gram

## ② Proper food for each stage

**Each stage of age has proper food to eat as shown in the table below.**

### Stage of age and proper food for each stage

Stage	Kinds of food
1st stage (1 day~6 weeks)	Food with full energy and protein 24% protein and 2700KK/kg diet
2 <sup>nd</sup> stage (7 weeks~16 weeks)	Less energy and Less protein 16% protein and 2700KK/kg diet
3 <sup>rd</sup> stage (17 weeks ~before production stage)	More nutrition to prepare for production stage. 15 % protein and 2700KK/kg diet
4 <sup>th</sup> stage (production stage)	The kind of food affects the number of eggs to be produced. And when they lay an egg, they eat more. 18% protein and 2700KK/kg diet

## ③ Laying Hen Pellets

**Commercial laying hen pellets (or crumbles which are the same thing but smaller) are designed for today' s productive hens. The pellets have the right proportion of all nutrients such as protein, minerals and energy for the chickens. These pellets should make up the bulk of your flock' s diet. Your chickens should have access to the pellets all day long. They should go to bed with full crops (the crop is the pouch in their throat where the food is first stored after it is swallowed.) It takes over 25 hours to create one egg. During the night, as the hen is sleeping, she is still building that egg. She gets the materials for making that egg from digesting food. If her digestive tract is empty she can' t make the egg. So, let your hen eat what she wants from sunup to sundown.**



**④ Oyster Shell and Grit**

**Even though the commercial feed contains calcium, it is good to provide another source. Coarsely broken up oyster shell is the most easily absorbed form (even better than finely-ground), which keeps it tidy and prevents waste. Chickens also need grit – tiny rocks – that the hens need so that their gizzards can grind up food. Without grit, digestion is slowed and the hens are less efficient at extracting nutrients from feed. Grit should be offered free choice.**

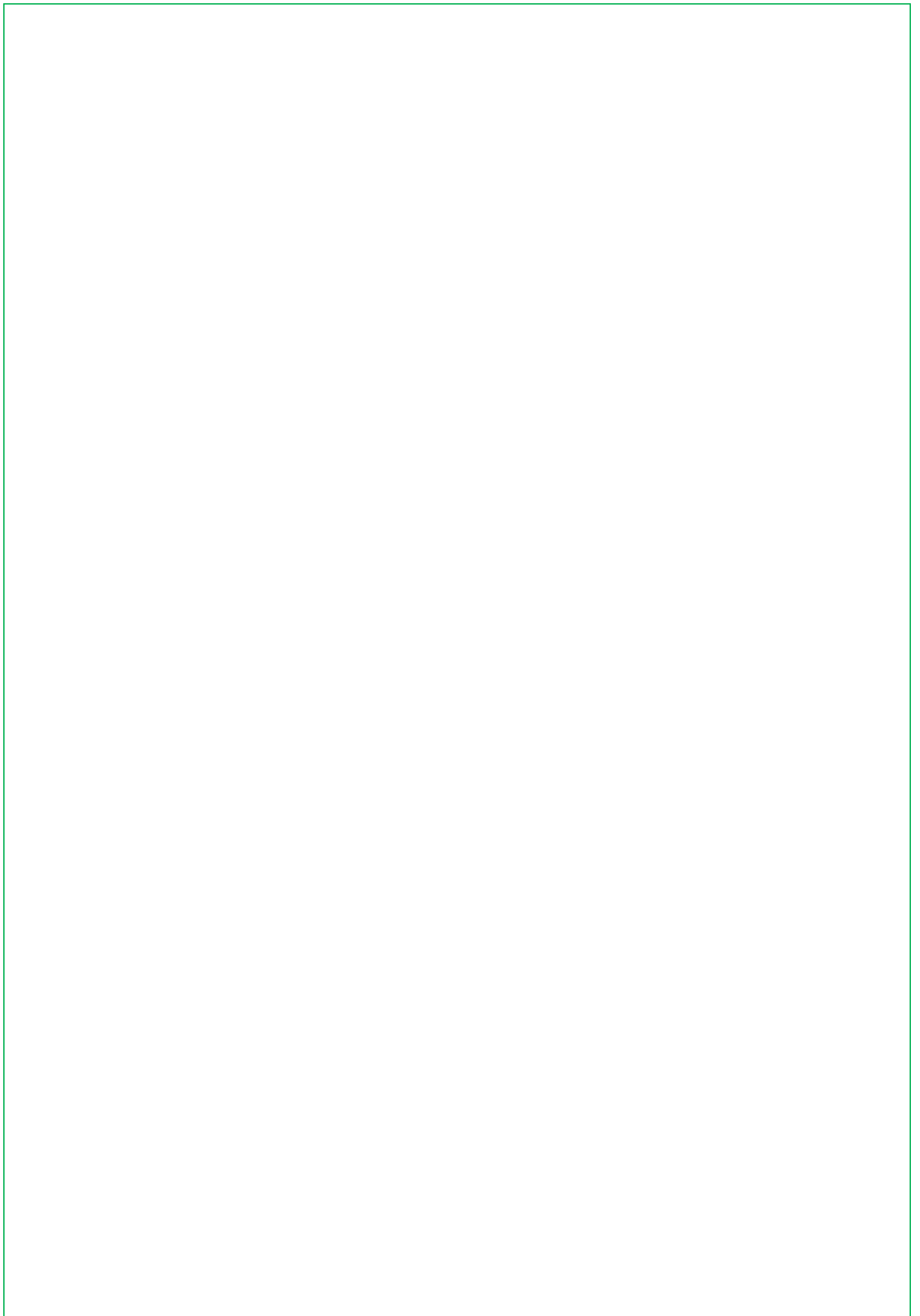


**⑤ The recipes from an expert poultry nutritionist working at a long-established organic feed company.**

Brand name Ingredient	<b>19% Broiler Grower:</b>	<b>16% Pullet Grower:</b>	<b>17% Layer Ration:</b>	
Shelled Corn	1015 lb.	1215 lb.	965 lb.	
Roasted Soybeans	625 lb.	450 lb.	600 lb.	
Oats	100 lb.	100 lb.	100 lb.	
Alfalfa Meal	100 lb.	100 lb.	100 lb.	
Fish Meal, 60%	75 lb.	50 lb.	NONE	
Aragonite (calcium)	25 lb.	25 lb.	175 lb.	
Poultry Nutri-Balancer	60 lb.	60 lb.	60 lb.	
<b>TOTAL</b>	<b>2000 lb.</b>	<b>2000 lb.</b>	<b>2000</b>	

✧ All Rations should be Medium ground or rolled.

***This leaflet was prepared by ISMAP team under Japan International Cooperation Agency (JICA) with Directed by Prof. Shaker Abd EL-Tawab abd EL-Latif, Department of Animal Production, Faculty of Agriculture, Minia University, Egypt***



**Improving Small-scale Farmers' Market-oriented Agriculture Project  
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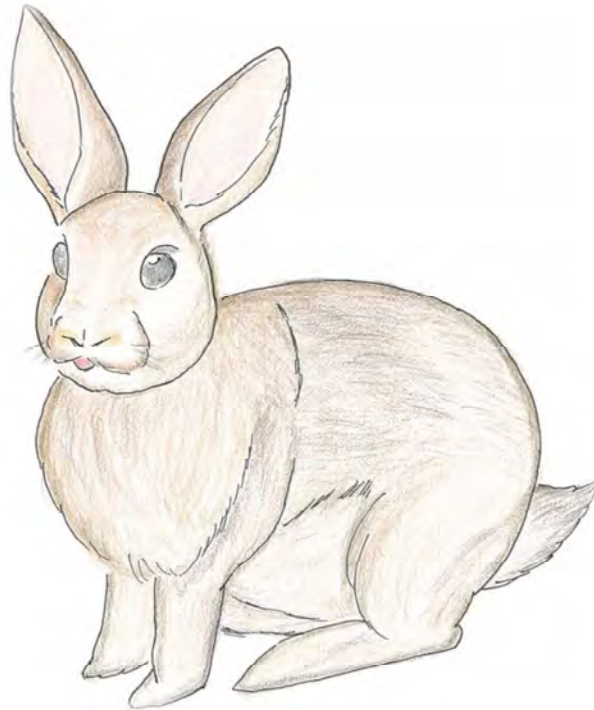


**Japan International Cooperation Agency (JICA)**



# Leaflet for Rabbit raising

~Challenges of Ms.Gamilla and Mr.Ahamed Part 2~



**Improving Small-Scale Farmers' Market-Oriented Agriculture Project (ISMAP)**



## **1. Before you prepare Rabbit**

- **The best time for buying rabbits is after their weaning.**



- **You need to prepare number of rabbit with good balance. It is recommendable for you to buy 4 mother rabbits for 1 male rabbit as minimum. Ex, 8 mother rabbit for 2 males, 16 female rabbits for 4 male rabbits. You need to keep female and male separately.**



- **It is better to prepare one cage for one rabbit as house. It is not recommendable to keep rabbits on floor. Diseases can be transmitted to rabbit easily if you keep rabbit on floor.**

## **2. The Place to Keep rabbit**

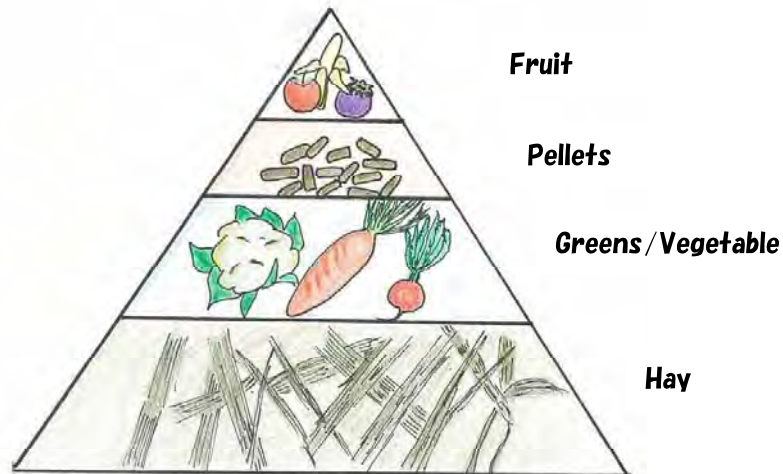
- **It is recommendable to keep rabbit in cage. There are several kinds of cage, such as made from wood and metal.**



- **It is better to have sun light in the place but better to avoid direct sun light during summer season.**
- **Better to prepare good ventilation.**
- **Male rabbits and female rabbits should be separately kept in the different cages.**

### 3. Food and Water

- You need to give good balance of diet to rabbits as shown in the pyramid.



- Rabbit prefer to eat both fresh vegetable and dried food.
- It is recommendable to give pellet type food which is commercially prepared.



Pellet-Type food

- Berseem (Egyptian Clover) is one of the best green fodder you can feed to rabbit. But please don't feed wet Berseem.
- Don't give vegetable which is wet.
- Green lettuce or other types of leafy green vegetables should not be fed to rabbits, especially young ones. The green, leafy vegetables have a high water content and cause diarrhea and dehydration because the rabbits cease to drink water.
- You need to keep water all the time in the cage but you better to give food at proper timing in early morning and afternoon.
- It is better to give kinds of vitamins mixing with water and food. Vitamins are chemical that are require in very small amount to speed up chemical reactions within the rabbit body. The most important vitamins are vitamins A, D and the



## **Band Choline.**

### **Your professor's Advice**

**Well, you may want to depend on forages/kitchen wastes vegetables to feed to rabbits because these are cheap and easy to provide.**

**However it is not healthy for rabbit to be given only these because..**

- Forage availability varies with season. It cannot keep good nutritious balance through a year.**
- The quality of the forage reduces during dry season**
- It can introduce diseases and health problems if you depend on only forages/kitchen wastes.**

## **4. Cleaning**

- In order to prevent disease, you need to clean inside the cage and around the cage.**
- You need to wash container for water and food regularly.**
- It is better to give them vitamins which make rabbit strong resistance to diseases.**
- You need to give vaccination to rabbits.**

## **5. Insemination**

- Sexually mature at 4-6 months, depending on breed. There is no specific season for introducing females to male for mating. In nature, the female rabbit becomes sexually active based on the length of day (hours of sun light in a day) and temperature. To mate a doe, you need to move female rabbit to the cage of male rabbit for natural mating.**
- After finishing mating between male and female at the male cage ( it takes about 2 to 10 mints) we should move the female directly to her cage. We should not keep it at the male cage after mating.**
- After 21 days of the mating we should check and confirm the doe pregnancy. If the mating is not successful, we need to move female rabbit again from its cage to male rabbit cage to do mating again for few mints. We can try mating again from another**



male. After that we should move the female to its cage again.

## **6. How to check pregnancy of female rabbit**

- *If female rabbit became pregnant, they refuse male rabbit. There are several ways to check if does are pregnant or not.*
- 1. *Palpating is a method used for determining doe pregnancy at 14 days after mating.*
- 2. *Inexperience keepers should practice detecting pregnancy on does that are 20 days pregnant at which stage the fetuses are easy to identify. By around 28 days the mammary gland will have developed significantly and this can be regarded as final confirmation of pregnancy. At around 29 days, the doe will begin to remove fur from her abdomen to make a nest.*
- 3. **Pseudo-Pregnancy**  
*False pregnancy occurs as a result of sterile mating or more commonly from stimulation of one doe riding another. It happens more frequently with does that have not kindled their first litter. Always separate does at least a month prior to breeding.*

## **7. If female rabbit is pregnant...**

- *The doe may pull fur and attempt to make a nest.*
- *Pregnant period is 30-32 days.*
- *Baby rabbit eyes will open at 12-14 days and they will be weaned (leave from mother's milk) at 4-8 weeks.*

## **8. Prevention of disease**

- *If any rabbit get sick, please isolate this rabbit to avoid disease spreading.*
- *You need to feed well to grow them healthy.*
- *It is better to sterilize the cage and around the cage.*

**The problem of Cannibalism and Abortion**

**Cannibalism and abortion are common problems. The causes are many and these are some of the causes:**

- 1. First-litter does (rabbit of first experience in delivering) are extremely nervous. Give them one more chance and then cull if cannibalism recurs.**
- 2. Unbalanced diet**
- 3. Lack of water**
- 4. Predators can cause the doe to stamp her feet and mash the young**
- 5. Unusual noise can cause the doe to injure the young and can result in cannibalism.**
- 6. Moving nest box after young are kindled.**
- 7. Shallow nest box makes the does feel insecure and she is easily disturbed.**

**This leaflet was prepared by ISMAP team under Japan International Cooperation Agency (JICA) with Directed by Prof. Shaker Abd EL-Tawab abd EL-Latif, Department of Animal Production, Faculty of Agriculture, Minia University, Egypt**



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# Leaflet for Mushroom Cultivation

~Challenges of Ms.Gamilla and Mr.Ahamed Part 1~



**Improving Small-Scale Farmers' Market-Oriented Agriculture Project (ISMAP)**



## **1. What is Mushroom?**



**Mushroom has many kinds of variety. Some are eatable and some are poisonous. You need proper advice from professional in order to choose which kinds of mushroom are eatable and available around you. This text book introduces you the variety called Oyster mushroom.**

## **2. Let's go to market survey**

**Before you start cultivation, you need to know the demands on mushroom on market such as super market and some traders. You need to visit some restaurant, hotels by yourself to get information of price they can buy from you.**

### **Ms. Gamilla's story**

**Ms. Gamilla, she is very interested in Mushroom cultivation. She got training from a trainer. Then she contracted the trader. But she did not contract for all her harvest. She continued to look for better business partner who buys better price. Ms. Gamilla advices you.....**

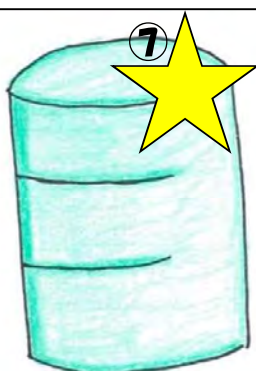
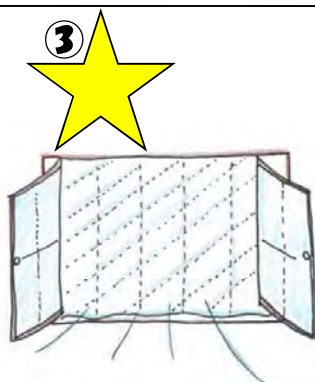
- 1. You better to find someone who can buy before starting cultivation.**
- 2. You still need to look for other business partner who can buy from you with better price.**



### 3. Materials for Mushroom cultivation

- ① Spawn (25Kg/ 500 LE)
- ② Rice straw<sup>1</sup> 120Kg (75LE) + Transportation (50LE)
- ③ Net curtain (for window and door to prevent dust and insects)
- ④ Water sprayer (25LE)
- ⑤ Plastic bag (9 LE/ 500g)
- ⑥ Plastic Net (3 LE/bag)
- ⑦ Metal Drum (Rental fee 5LE)
- ⑧ Thermometer (10LE)
- ⑨ Hygrometer (150LE)

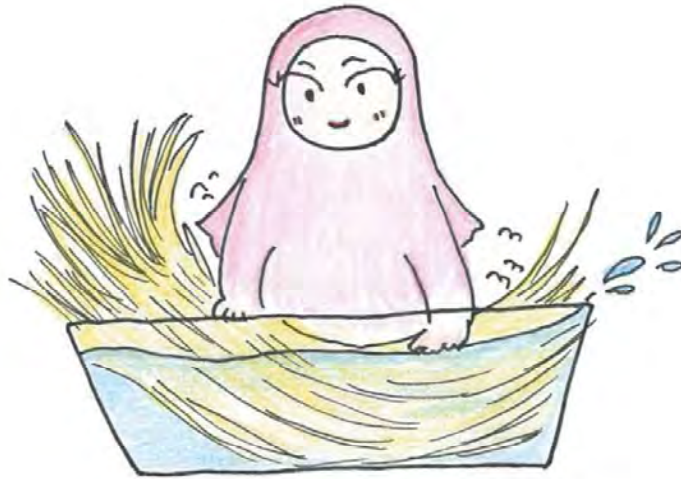
(\*These prices are just examples.)



<sup>1</sup> Except for rice straw, there are other options such as wheat straw, sugarcane (after squeezing liquid, and so on).

## 4. Let' s cultivate mushroom

### ①. Soaking into water (24 hours).

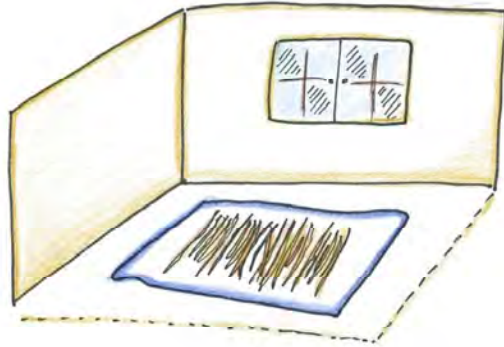
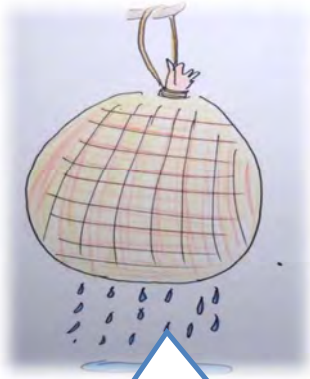


②. **Wheat bran and limestone is added to the rice straw at 5%. Then, boiling rice straw for 2 hours with putting into steel drum. It is convenient to use plastic net in order to avoid the straw to be scattered. You can put stone on the net to prevent from floating.**





**③. Cooling and draining off water from the straw for 2 to 3 hours. It is better to put straw in house in order to avoid dust.**

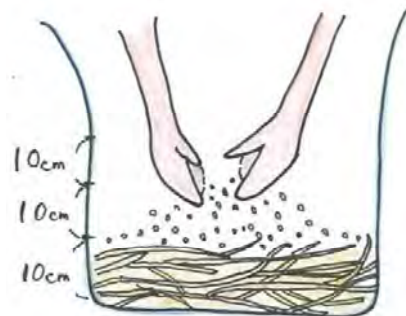


Water containing become around 50-60 %

**④. Transfer the rice straw into plastic bag (clear color is better than black color although they use black plastic bag in photos. It is better to make small size around 1Kg). And Sprinkling spawns of mushroom each 10 cm layer. You can make 4 to 5 layers for each bag.**



**Sprinkling all over the layer**



**Sprinkling spawns all over the layer. Then, making layer each 10 cm with pressing by hand.**



**⑤. Close the bag**

**Try not to keep air inside but not by squeezing.**



**⑥. Put bag in the room**

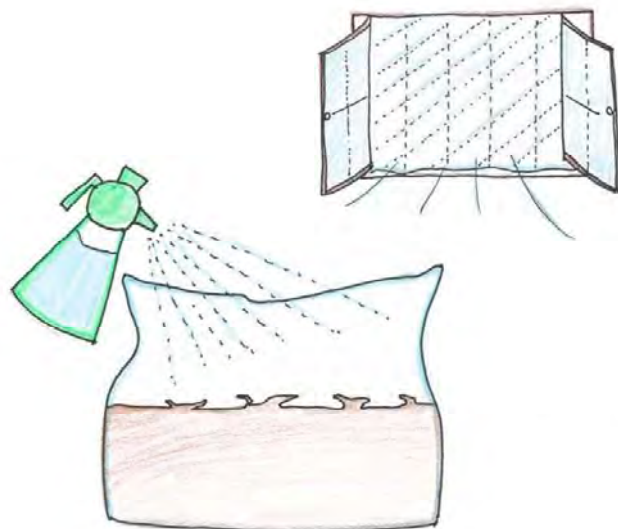
**The room should be cleaned, cool and have window. It is better to avoid the room which has direct sunlight. You need to keep moisture in the room with spraying water and putting tray filling by water. You can check the humidity (keep 80 %) by hydrometer. And keep 20 to 25 degree. From October to March is best season in Assiut and Minia if you do not have air conditioner.**



**⑦. Open plastic bag after around 15 to 21 days when you see the color changes to white.**



**⑧. Open window (window should be covered by net.) and change air. It is better to use net curtain to prevent dust and insect. And spray water to keep moisture both for mushroom bed and the room..**



## ⑨. Harvesting mushroom

**After around one week to 10 days from opening bag, small mushroom can be found around the mushroom bed. Then, after 2 days, mushroom becomes large enough to be harvested.**



**1 week after opening bag.**

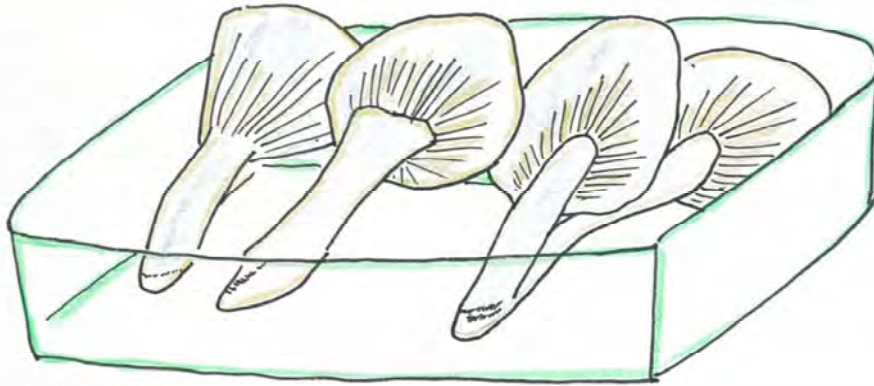


**2 days more! It is just size to harvest!!**



**You can cut it from its root.**

## **5. Post Harvesting**



***You can discuss how to package your mushroom with your business partner. Some business partner gives you plastic tray for packaging but some does not. You may need to purchase it. And some may want fresh mushroom but some may request you dried mushroom. You need to answer their request as business.***

## **6. Cultivation Diary**

**When you start something, you are afraid to be failed. However, “Failure teaches Success”. Your fail can be the step for next success. The most important thing is “do not waste your experience”. Please keep your cultivation diary each time as below:**



**1<sup>st</sup> April 2015:**

**40Kg of straw was being boiled and packed into plastic bag with spawn. I was not very sure how much the straw should be dried after cooling. (I gripped the straw. It was wet but no water was screwed out.)**

**15<sup>th</sup> April 2015:**

**I opened the plastic bag because it was just 15 days after closing bag. I realized it was better to use clear plastic bag in order to see inside.**

**(From Ms. Gamilla's diary)**

**We wish your success!!!**

**Prepared by ISMAP project member**

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