



Manual for

# Organic Waste Management

2018

*Alliance of Indian Wastepickers*

Sponsored under CSR  
initiative of NSKFDC





# The Alliance of Indian Wastepickers

Alliance of Indian Wastepickers is a national coalition of organizations working with waste-pickers and other informal waste collectors. The alliance was created to have coordinated efforts to ensure inclusion of waste pickers in various national level programmes. Organizations/members of alliance represent more than 40000 waste-pickers and other informal waste-pickers in India. Secretariat of the alliance has been rotating amongst member organizations starting from Kagad Kach Patra Kashtakari Panchayat (KKPKP), Pune. After that, Bangalore based organization of wastepickers- Hasiru Dala hosted the secretariat for 3 years. Currently the secretariat of the coalition is hosted by Stree Mukti Sangathana.

#### Our Work:

1. Policy analysis and recommending policy measures to all levels of governments- Union, state and urban and rural local governments, different departments within each level of three tier governments, for the inclusion of waste pickers and informal waste collectors in solid waste management and social protection measures.
2. Capacity building of member organizations and municipal authorities to facilitate integration of waste-pickers by undertaking training sessions on social entitlements, financial literacy, organic and dry waste management.
3. Research focusing on waste management techniques, informal waste chains and status of waste-pickers and informal waste collectors.
4. Awareness generation about the role played by waste-pickers and informal waste collectors in keeping the cities clean, mitigating climate change and contributing to manufacturing. In other words, waste-pickers and informal waste collectors are the important link between Swachh Bharat, India's commitments for mitigating climate change and Make in India.

# National Safai Karamcharis Finance & Development Corporation (NSKFDC)

National Safai Karamcharis Finance & Development Corporation (NSKFDC), a wholly owned Govt. of India Undertaking under the Ministry of Social Justice & Empowerment (M/o SJ&E) was set up on 24th January 1997 as a Company “Not for Profit” under Section 25 of the Companies Act, 1956. NSKFDC is in operation since October 1997, as an Apex Corporation for the all-round socio-economic upliftment of the Safai Karamcharis, Scavengers and their dependants throughout India, through various loan and non-loan-based schemes including Skill Development Training Programme for enabling them for getting suitable job/self-employment. It aims to empower the Safai Karamcharis, Manual Scavengers and their dependents to break away from traditional occupation, depressed social condition & poverty and leverage them to work their own way up the social and economic ladder with dignity and pride.

Apart from operating various loan and non-loan-based schemes for the upliftment of the target group, NSKFDC is also acting as a Nodal Agency for implementation of the Central Sector Self Employment Scheme for Rehabilitation of Manual Scavengers (SRMS) under the aegis of the Ministry of Social Justice & Empowerment. NSKFDC under its CSR initiative is supporting Hasiru Dala for the Project “Up-gradation of Skills of Wastepickers and Informal Waste Collectors. This project aims to upgrade skills of wastepickers, their leaders and activists to become entrepreneurs in waste sector and to organize wastepickers for integration in solid waste management respectively.

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# Foreword

India has a vibrant recycling industry that has a turnover of more than a billion dollars. Be it making polyester fabric from pet bottle, saving 17 trees for every tons of papers recycled or extracting precious metal from e-waste. According to World Bank reports, informal recyclers (waste-pickers and informal waste collectors) constitute 1% of the population in developing countries. Wastepickers, scrap dealers and traders are the pillars of this industry who facilitate the waste reaching recycling industry. They are pillars of Swachh Bharat & Make in India, they pick, sort and aggregate discards, transform them in ore for manufacturing of finished products. Informal waste economy players including wastepickers are gaining recognition. There are huge economic, environmental and social benefits for the country because of the contribution made by wastepickers, itinerant buyers and scrap dealers. Waste-pickers and informal waste collectors do not want to stay as waste-pickers forever. They want to learn new skills to better their life and livelihood. New challenges are mounting, there are no opportunities to learn new skills. Recognizing this need and observing blaring gaps, Alliance of Indian Wastepickers with financial support from National Safai Karmachari Finance & Development Corporation has launched national training programme for skill up-gradation. This training programme offers opportunity learn and build required competencies for wastepickers and informal waste collectors who want to become service providers and stay relevant in the market.

The given manual is focused on organic waste management, the processes of organic waste management include different ways of composting, bio-methanization and terrace gardening. The first part is focused on organic waste management and second part goes deeper in organic waste management. The organic waste management is emerging sector. If trained well, the waste-pickers can become service providers for organic waste management, as has happened in cities like Mumbai, Bengaluru and Pune. The manual details the course content, sets standard for the course and provides uniformity in its implementation. This is required in a sector like this, which lacks professional trainers.

The course teaching uses adult learning techniques as most of wastepickers and informal waste collectors have not gone through formal schooling. Experiential learning is the focus of the training methodology. The training can be imparted in all national languages: Kannada, Tamil, Marathi, Gujarati and Hindi. Trainers are encouraged to innovate with local approaches to enhance participation. We welcome feedback and suggestions for improving the manual.

# Goal and Brief about the Training

To train waste pickers so that they can avail different opportunities for their livelihood viz.- composting experts, gardeners, waste management service providers.

## *Duration of the training*

1. 6 sessions of approx. 6 hrs
2. Field visit on a separate day (5 hrs.)

I session :

Part a) - Introduction (30 mins)

Part b) -Conversion of garbage into compost, reasons, benefits (20 mins)

II session - Composting at home level (30 mins)

III session - Composting at community level (60 mins)

IV session - Bio methanation (60 mins)

V session - Other models such as Organic Waste Converter, Dr Karve's biogas plant, rotating drums (40 mins)

VI session – Terrace gardening ( )

## *Course methodology:*

- Adult Learning Principles (problem-based and collaborative rather than teaching)
- Structured learning activities: presentations, movies, discussions
- Engagement of participants in group exercises
- Utilize existing experience on knowledge
- Experiential learning
- Individual counselling for better business





### *Participant number and required material for the training session*

Maximum 25 waste pickers

Sessions & duration - As mentioned in 'duration of training'

Material required :

I session - Part a) Paper cuttings of some pictures.

Part b)- Images of fertilizer packets, chalk, board/  
projector (If available), clips of food safety from  
the series Satyamev Jayate.

II session - Composting at home level - Magic basket of SPSWM  
Co- Society, ready compost, chopping board, knife and some  
organic waste.

III session - Community composting – images of concrete  
compost pit , FRP pit ready model of Mindtree , rake , coco peat  
( block and powder), bucket ,water, excerpts of film by SMS /  
footage of SWaCH+ , clips of waste management from the series  
Satyamev Jayate.

IV session – Biomethanation- Images of Nisargrun plant, Excerpts  
of film by SMS, ready model of Nisargarun of SMS.

V session – Other models – OWC, Dr. Karve's biogas plant,  
cylindrical containers, daily dump, etc.

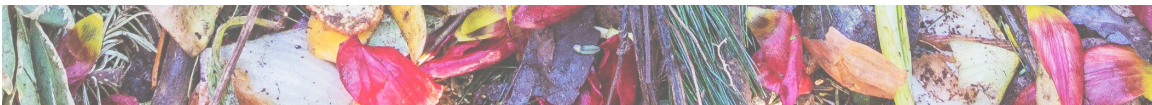
## *Duration of the training :*

### *Instructions to the trainer :*

- Trainer must be well versed in local language
- Trainer must know the terminology of waste pickers.
- Trainer must have the detailed information of the bio gas plant, organic waste convertor, scientific terms, names of machinery & its parts.
- Trainer must have visited the field to see how the machines work e.g. organic waste convertor, bio-methanization.
- Trainer must enter the class with all the equipments & material required for sessions (the list of required material is mentioned in each session note.
- Trainer must understand that for waste pickers dry waste is a livelihood which gives them instant money. Whereas composting process takes 45 days and the returns are very low unless housing society pays for the services rendered by waste pickers. When waste is mixed, waste pickers have to rubble through this waste and make lot of efforts to separate and pick up waste. Wet waste when thrown in open spaces attracts dogs, rats and other animals and insects. It generates lot of worms if stale. Thus, waste pickers avoid working with wet waste. Special efforts are to be made to involve waste pickers in learning biodegradable waste management. Simultaneous efforts will have to be made to motivate the citizens to segregate the waste at source and hand over all dry waste to waste pickers and make the payment for processing of the organic waste.



# Part 1: Composting



## *Session 1- Introduction of participants and relevance of organic waste management*

### *Part - a) Introduction (30 minutes)*

Material required – Chits of images such as cup & saucer, plate & spoon, shoe & socks, comb & clip, cylinder & gas stove, jug & glass, saree & blouse, salwar & kurta, laptop & mouse, cell phone & charger, speaker & mike, mattress & pillow, needle & thread, nut & bolt, Kheer & Puri, butter & bread, tap & water drop, rain & umbrella, Introductory game..

Put the chits (all in pairs but scattered on the floor (see that the number of chits & participants are exactly same as well as not a single picture without its pairing match is left in the box.) Ask each participant to pick one and see the picture. Ask them to find their partner with the clues. Once everyone finds her/ his partner ask them to sit with the partner and self introduction on the basis of  
a) Name (only name) b) Mother's name c) Favourite dish  
d) Idea of enjoyment.

Then each pair will come in front of the group & A will introduce B with details like their favorite dish or movie.

She/ He is daughter/ son of Hirabai, She / He loves to eat Mysorepak/ wafers. She/ He finds enjoyment in watching Shahrukh Khan's movies or sleeping till 9 AM.

- This will enable participants to shed away their shyness.
- Recollect enjoyable memories of happy moments, favorite food. (Favourite food should be listed from each participant- provide some images of food dishes such as Gulabjamun, Mysorepak, Bajiripuri, Wafers, seasonal fruits. Ask each participant to select her/ his favourite 3 among given images. Try to provide 2 most favourites during workshop)

*Part b) - Conversion of garbage to compost- reasons & benefits  
(20 minutes)*

Material required - Images of crops, chemical fertilizers, chalk, board/projector (If available), clips of food safety from the series Satyamev Jayate

This session is more about sharing information. It can be conducted through questions and answers

Use ready images or draw some diagrams.

Start with the question and get answers from participants.

- What is food & how do we get it?
- What is required for good produce?

- As the cities are getting cleaner and the waste on streets is reducing, would they like to move out of waste-picking?

- Would they like to undertake organic waste management?

- What will be the difference between waste-picking and organic waste management? They may not be able to earn their income on daily basis. The money will come on monthly or weekly basis or based on the visits they have made to the household. Timing of work will be fixed. They maybe able to earn a little more by selling the compost, in addition to providing organic waste management services.

- Who will hire them for services?

The apartment complexes, individual households, universities, companies for setting and operating organic waste management facilities.





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- Who will hire them for services?

The apartment complexes, individual households, universities, companies for setting and operating organic waste management facilities.

## *Session 2- Biodegradable waste management- (30 mins)*

Composting at domestic level/ individual level - small basket prepared by Savitribai Phule Solid Waste Management Co-operative Society, Mumbai.

Time required- 30 Minutes.

Material required- Model basket (2 models), chopping board, some organic waste approx. 1 kg. Demonstration -Show the basket.

Demonstrate the chopping of waste & mixing it into basket.

Features of home composting basket

1. Ideal for one family with 0.5 kg wet waste
2. Without foul odor

### *Magic bucket for family use - Model 1*

Make this with a plastic bucket or two mud pots placed one on top of the other.

Tripod stands for bucket

Collection vessel for effluent formed during processing.

### *Selection of bucket*

- Suitably sized according to the needs of the family. A 35-litre bucket is sufficient for a family of four.
- It should have holes on the sides and bottom as depicted in the picture.
- The holes at the bottom are necessary for draining excess water and effluent generated.
- The side holes enable ventilation.

### *Materials needed:*

Broken bricks, soil, fertiliser (micro-organisms or commercially available EM culture), dried leaves and wet garbage.



### *Filling the bucket*

- Add 2" thick bottom layer of broken bricks.
- Cover the brick pieces completely with soil.
- Add a layer of wet garbage to fully cover the soil.
- Evenly distribute the culture on this layer.
- Add dried leaves to cover the wet garbage.
- Now start adding wet garbage to this prepared bucket. Rake after every addition.

### *Material required*

Culture  
Fertiliser  
Soil  
Broken bricks  
Dried leaves layer  
Wet garbage  
Dried leaves layer

### *Garbage handling capacity of bucket*

Keep the bucket in a corner elevated from the ground on a few bricks. Place a shallow collection dish below it to collect drained water. You can reuse this water for potted plants. The quantity of waste that the bucket can handle depends on its size.

- Do not add more than 500 g waste per day in a 16-litre bucket.
- Do not add more than 1 kg waste per day in a 35-litre bucket.
- Do not add more than 1.5 kg waste per day in a 50-litre bucket.



### *Care to be taken during processing of the garbage*

- Keep the magic bucket in a well-ventilated area. The better the aeration, less the smell. (Allow air passage from bottom too.)
- Put maximum half kilogram of biodegradable waste per day.
- Crush the wet waste into small pieces, if possible in a mixer & then add. The crushed waste accelerates the decomposition process
- For the first month add only raw vegetable, fruit and flowers waste or filter watery food and then add to the basket.
- After one month add left over & cooked food waste.
- Don't add watery food waste.
- After adding waste stir immediately with rod.
- Keep the basket open for at least one hr in a day
- If the garbage is too dry, sprinkle some water in the bucket.
- Spread 2 spoonfuls of magic powder twice a week.
- If insects or worms are seen, add medicated soil.
- If flies are attracted, dip a camphor tablet in oil and keep at the edge of the bucket and also apply it at the holes on the side.
- If worms are seen sprinkle red chilli powder or salt around them.
- Take care to ensure that rain water does not enter in the bucket.
- Keeping camphor tablets around the pit, keeps red ants away. Any snails if present, can be got rid of, by wetting half a cup of tobacco and sprinkling it on the pit.
- If there is any problem, please add powder from the packet supplied to you.
- If the basket is full please keep the bottom layer and remove the middle layer which is manure.

### *Identifying complete conversion of garbage to fertiliser*

The bucket fills up as we add garbage to it. The micro-organisms convert it to fertiliser and lose water as vapour, and the level decreases. This goes on as we add fresh garbage on top. At the end, the contents are converted into what looks like black soil and has no bad odour. The fertiliser is now ready.

### *Identifying the quality of the fertiliser*

- Appearance: Black, fine, uniform granules.
- Flowability: It is dry, and any lumps can be easily broken by hand. It is free flowing.
- Extraneous matter: It does not contain dry garbage. No glass and poisonous substances like dry cells are present.
- Density: Sinks in water.
- Smell: It does not have foul smell and does not attract flies.

### *Identifying poor quality fertiliser*

- Appearance: Whitish, ash or chocolate coloured, possibly with a fungal layer. Also contains large sized portions.
- Flowability: Has high water content and does not flow or too dry and lumpy.
- Extraneous matter: Paper, plastic and other non-biodegradable material present.
- Density: Floats on water.
- Smell: It has a foul smell, as it is partly decayed, and worms and insects may be present.

## *Model 2*

Members of SPSWMC Soc. prepare such baskets for domestic composting. The basket is available in market. It must be prepared for composting purpose by using nylon, soldering iron. The basket contains the material that converts the waste into compost along with a rake to stir it. The kitchen waste must be chopped & added into the material. The material acts as culture. The moisture & air percentage must be maintained in the basket to get speedy and effective results. The process accelerates if finely chopped waste is added. The microbes present in the culture convert the waste into compost. The process, if regulated well shows result within 45 days. Black granules of odourless compost can be observed within 2 weeks which indicate the process has been successfully started.

Important- Raking/stirring the waste, maintaining air & moisture in the basket does not give foul or stinking smell.

Open the basket, show the rake, material in it.

Composting -Time required- 20 minutes

## *How to use :*

1. Keep the basket in a sufficiently ventilated place in a corner.
2. Keep it above the ground.
3. Put maximum half kilogram of biodegradable waste per day.
4. Crush the wet waste into small pieces, if possible in a mixer
5. The crushed waste accelerates the decomposition process.
6. For the first month add only raw Vegetable, Fruit ,and flowers waste or filter watery food and then add to the basket
7. After one month add cooked food waste.
8. Don't add watery food waste.
9. If waste gets fully dried sprinkle little water.
10. Keep the basket open for at least one hr in a day. is any problem

## *Setting up a compost pit :*

Material required- Images of compost pits (concrete / fiber), the rake, gloves, shoes, mask water, bucket, small stool. Use stills / video clips of how pit is erected, the layering in the pit, how segregated waste is mixed & raked in the pit.

The process is same as in above but quantity is large so care has to be taken about meticulous segregation and mixing, layering of coco peat & waste. Fine chopping is not possible because of bulk of waste.

## *Construction of the compost pit:*

Material for pit- Bricks, cement, Shahabad tiles or stone, steel mesh, corrugated sheets or tarpaulin for roof ( shed of any material( tin roof/plastic/ bamboo.

The size of the pit depends on the amount of waste to be added daily and on the space that the residential society is able to make available. (5 x 3 x 2 ft pit suitable for 20 -100 families)

Lay the foundation at least 5" below ground level, to reduce the nuisance of mice and rats. The base should be of cement concrete and suitably sloped to drain excess water.

Compost pit needs holes on the walls as well as at the bottom to facilitate drainage of excess water and allow ingress of air. (These holes should be small enough to prevent entry of mice/ rats. The holes should be 1 foot apart.)

A sliding steel mesh cover will prevent entry of animals and birds, (like rats, dogs, hens). The mesh cover should be light and easy to slide completely to one side. There should be no cross bars in the opening as it hinders the motions of a shovel or rake to mix the waste periodically. Painting the mesh will protect it from rust. Any repairs should be done promptly.

A corrugated roof or tarpaulin cover on the compost pit is necessary as the fertiliser can dry out during summer, while in the monsoon it can accumulate water and generate a foul odour. In both situations the compost becomes substandard.

To avoid the problems in processing and for a good quality fertiliser it is necessary to build the compost pit carefully.

### *Layering in the compost pit and its advantages*

First layer: 1-2" thick at the bottom. Use bagasse or dried leaves. These do not decay easily and prevent choking of the holes which otherwise would have choked with garbage or fertiliser.

Second layer: About 2" thick and ideally of cow-dung. Alternately ready or partially processed fertiliser may be used. These materials contain a large cache of micro-organisms, which are ever hungry for food. They immediately start devouring the garbage and converting it into fertiliser.

When this layer is mixed with the wet garbage that is periodically added on top, no bad odour is generated. Both these layers therefore, have an important role in the proper working of the compost pit.

### *Preparation of garbage for addition to pit*

The wet garbage is often a mix of heterogeneous wastes like leftover food, decaying raw food, discarded portions of raw and cooked food.

Micro organisms will take longer time to degrade large pieces so they must be chopped or shredded. Hard material like bones & coconut shells take longer time to degrade. (It is advisable to treat these in a separate container/ pit)

### *Process for composting*

Add the wet garbage uniformly on the second layer in the pit. Rake the contents to mix. The seeding material starts the process of converting to the fertiliser.

During this process the temperature of the compost can rise to 60 - 70 oC. Control the temperature by sprinkling 1 litre of water (or as required, described immediately below) on the compost and rake it.

Add 2 capful of micro-organism culture to 1 litre of water every week and sprinkle this solution on the compost pit. Rake the material.

Moisture is essential for survival of the micro-organisms in the fertiliser so do not let it dry. Take care that soil or any dry garbage does not mix with the composting material.

When the fertiliser is ready (described later in this section) it may be packed in gunny bags and stored in cool & dry place.

### *Use of water*

It is important to maintain the water content for the process to proceed properly.

Summer: Add upto 4 or 5 litres of water otherwise the micro-organisms can die. A wet gunny bag spread on the pit will also help retain moisture.

Monsoon: Excess water generates a foul odour. Keep rain water out by a corrugated sheet roof or a tarpaulin cover.

Winter: Water added while seeding the micro-organisms is sufficient.

### *Raking the compost pit*

Raking the contents of the pit on alternate days enables aeration and supplies oxygen needed for the process.

The contents should not be raked for the first 2 days.

Raking should be done after addition of magic powder (details given later) and nutrients.



आपला कचरा कोणते  
वेळी घालायला येतो?

कचरा कुडी Compost Pit

5 feet x 3 feet x 2 feet  
सुद्धा यात 100 लिटरचे

आपला कचरा कोणते वेळी घालायला येतो?

आपला कचरा कोणते वेळी घालायला येतो?



Water Treatment Process

Water Treatment Process

Water Treatment Process

आपल्या भावारात  
in your comp

आपला कचरा कोणते वेळी घालायला येतो?

विसरत  
ity



## *Vermicompost*

Vermiculture can be used to make vermicompost from wet garbage.

### *Compost pit for vermicompost*

The construction of the compost pit is the same as for the organic fertiliser described earlier.

Base layers: Broken bricks or pebbles followed by soil, then dried leaves. Each layer to be 2 - 3" thick. Sprinkle cow-dung slurry on this.

Processing layers: Add plenty of dried partially processed fertiliser, and finally fill the pit with pre-dried wet garbage and close it with a gunny bag.

The pit is filled with garbage, closed and allowed to stand undisturbed for at least 8 days, allowing the heat generated to be released. After the waste has cooled, live earthworms are introduced into the pit. At least 3 kg of earthworms are needed for a pit sized 5 x 3 x 2 feet.

The earthworms will burrow deep down into the pit and none will be visible on top.

### *Care for vermicomposting*

- Unsegregated garbage can be harmful to the vermiculture.
- Non-uniform or very thick layers of garbage can raise the temperature and destroy the vermiculture.
- It is important to maintain temperature, moisture and air inside the composting pit. The culture is also sensitive to direct sunlight.
- If necessary, sprinkle water in the pit and on the gunny bags covering the top. Check at least once a week.
- Add 25 - 30 earthworms to the pit. Do not rake the pit.
- When the fertiliser is ready, some earthworms begin to adhere to the gunny bags as there is no more food available for them in the pit. This process takes about 1 - 1.5 months and forms a high quality fertiliser.





### *Vermicompost:*

Never rake this fertiliser as this will injure the earthworms. Carefully empty the pit and arrange the fertiliser in a heap. The earthworms will burrow inside due to the sunlight. This helps in easy separation of the fertiliser and the worms. The worms can be used in the next batch of compost.

The quality of fertiliser prepared by using micro-organisms can also be improved by re-processing it with vermiculture.



## Part 2: Terrace Gardening

## *1. Importance of Organic Gardening.*

### *Ask waste-pickers what is organic terrace gardening?*

(OTG) is the concept of growing our own food in our city dwellings be it in our own yards/ home gardens, or on terraces, balconies or even spaces as small as window sills.

Organic Gardening is important as its about moving away from unsustainable technologies and lifestyles, and adopting more of eco-friendly and sustainable methods of living This also encourages people on waste segregation, home composting, organic foods and using natural seeds instead of genetically modified foods.

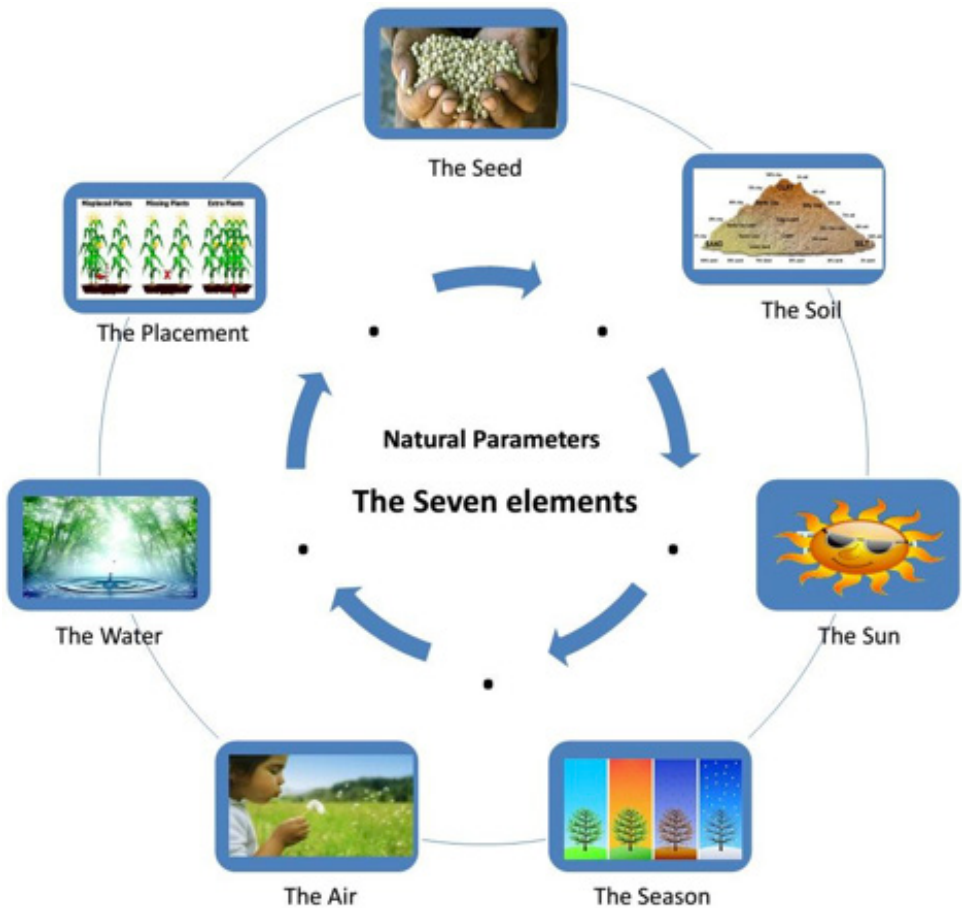
## *2. Benefits of growing our own food.*

### *By growing our own food we achieve the following:*

- a. Sustainability
- b. We know what goes into growing it.
- c. It is fresh.
- d. Brings a connection with nature and food we eat.
- e. Healthy and tasty.
- f. Encourages us to do waste segregation & home composting.



## 4. Natural Parameters: The Seven Elements



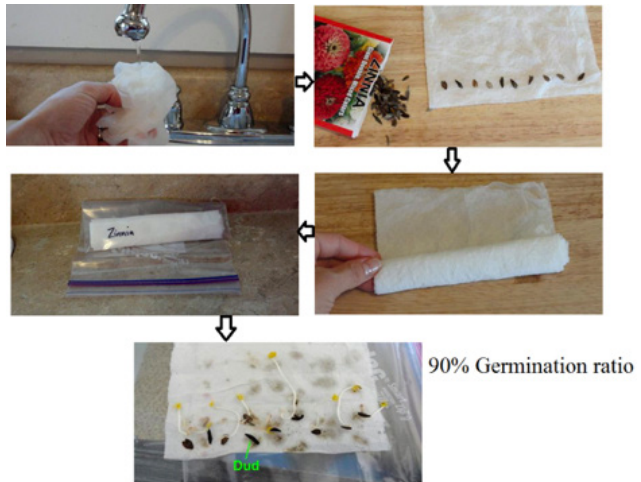
### a. Seed

*Where should I source the seeds from?*

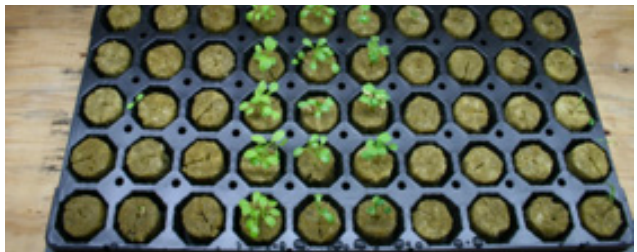
- From Friends or existing terrace garden.
- From Previous planting.
- Seeds from certified organizations like Vanastree.

## How do you differentiate the good seed vs bad seed?

- Method 1:
  - Pour the seeds into a container full of water and allow them to sit overnight.
  - The seeds that are still able to germinate will sink to the bottom of the container while the bad seeds will remain floating on top.
- Method 2:
  - Germination test



- Method 3:
  - Create Nursery in seed trays & select good ones.



## *What is the difference between Heirloom, Hybrid and GMO*

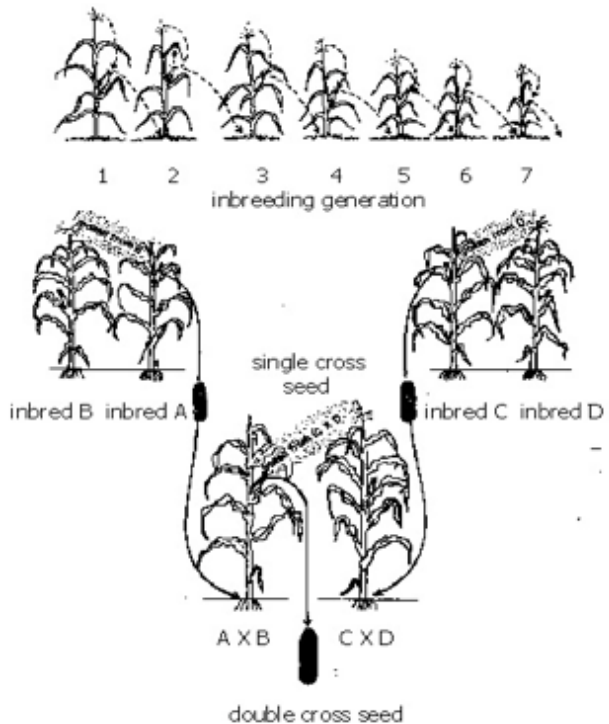
Heirloom Seed :

- Seed from a plant that has been passed from one generation to another, carefully grown and saved because it is considered valuable.
- The value could lie in its flavor, productivity, hardiness or adaptability.
- Many heirlooms have been grown, saved and passed down for more than 100 years.
- Most heirlooms have been saved and selected because they have the best flavor and production in home and small market gardens.
- We get the benefit of this long development cycle, as only the best producing, most flavorful, most memorable and most dependable varieties have made the selection throughout the years.
- Delicate, weak or fickle varieties are no longer with us.



Hybrid Seed :

- Produced by artificially cross pollinating two genetically different plants of the same species, such as two different tomatoes or two varieties of corn.
- The cross pollination is done by hand, and a seed that is saved will not grow true to either parent.
- Thus the farmer or gardener has no choice but to purchase new seed each year.
- Hybrids are typically bred for commercial use and profit to change the characteristic of the resulting plants, such as higher yield, greater uniformity, more even ripening, improved color and disease resistance.
- Flavor has only recently begun to be addressed when selecting characteristics for new hybrids.





### GMO Seed :

- Have been altered using DNA from completely different species and organisms to give different traits such as resistance to herbicides and acceptance of chemical fertilizers.
- Some GMO corn, for instance, manufactures its own herbicide in its root structure.
- Some DNA donors have come from fish, frogs and bacteria.
- The major crops that are genetically modified are corn, cotton, soybeans and wheat. Sugar beets and alfalfa have recently been deregulated, and potatoes are being studied.
- Most common garden vegetables are not yet genetically modified simply because the financial return in the market is not present yet.



*Heirloom Seeds are the best!*

# SEEDS EXPLAINED HEIRLOOM, HYBRID, GMO

## DEFINITION

- heirloom seed**  
seed that is produced through open-pollination by a natural means. An heirloom plant has one parent.
- hybrid seed**  
seed that is produced by cross-pollinating two plants in nature or in a lab. A hybrid plant has two parents.
- GMO seed**  
seed that has had its DNA altered using techniques of genetic engineering in a lab.

## CHARACTERISTICS

- Heirloom plants are typically "true to type". Plants are like the parent of the seed.
- Hybrid plants typically have improved characteristics such as better yield, greater uniformity, improved color, disease resistance, etc.
- GMO plants typically have modified or unique traits that the plant wouldn't otherwise possess.

## ADVANTAGES

- Greater selection of plants to choose from.  
Resistant to pests, disease, extreme weather.  
Non-homogenous tastes.
- Very popular, easy to find.  
Produce high yield, uniform crops.  
Plants may be more disease resistant.
- ??

## DISADVANTAGES

- Not as hardy, disease-resistant as hybrid plants.
- Taste is homogenous, no variety in flavor.  
Can be costly. Seeds from first-generation plants can't be saved and replanted.
- Not proven to be safe for consumption. Linked with serious health risks including infertility, immune problems, accelerated aging, faulty insulin regulation, and changes in major organs and the gastrointestinal system. Can cross-pollinate with non-GMO plants and crops.

Prepared by Laura Wending for Dr. J. Renae Norton, [www.eatingdisorderpro.com](http://www.eatingdisorderpro.com)  
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## How do I save seeds?

- Nurture every plant into maturity (except for diseased or clearly off-type plants); and
- Save equal amounts of seed from each plant.
- Don't allow seeds to be wetted by rains or irrigation water after they have begun to dry.
- Don't practice selective seed collecting habits, i.e., collecting more seeds from plants that do well in your garden.
- Avoid injury during harvest or processing due to such causes as rough treatment or overheating during drying, etc.

<h3>Seed Saving Tips</h3> <p>Grow your favorite plants again, save money, trade seed and preserve plant diversity.</p>		
<b>Beans</b>	Let the pods age on the vine until they turn brown. You can also store the entire plant (with roots) upside down in a warm area until pods dry out. Cross-pollination could affect the purity of your bean seeds in the future. Pole beans are more likely to cross.	<p>The table to the left lists several popular annual vegetables and fruits with easy-to-save seeds and a lower potential for cross-pollination in the home garden. They flower and mature seed in the same year. General advice is given to maintain as much seed purity as possible when plants are more prone to cross. Please seek out other references to enhance your knowledge of seed saving.</p> <p><b>Seed Saving Basics</b></p> <ul style="list-style-type: none"> <li>-Save seeds from <b>heirloom</b> or <b>open pollinated (OP)</b> plants only if you want them to stay true. Hybrid seed will not produce the same plant again.</li> <li>-Choose the healthiest plants and the largest seeds.</li> <li>-Air dry seeds on a fine screen or paper away from direct sunlight and as quickly as possible to reduce contamination.</li> <li>-Label seed (drying and storage).</li> <li>-Use containers that limit moisture.</li> <li>-Drying may not be necessary if planting soon after collection.</li> </ul>
<b>Cantaloupe</b>	Best time to collect seed is when the stem dies and the fruit separates easily. Remove the membranes from the seed by rinsing and gently rubbing with your fingers.	
<b>Cucumber</b>	Harvest seed when cucumbers are fully ripe and yellowed (too ripe for eating).	
<b>Lettuce</b>	Let seed pods dry on the plant. Bag the plant to capture the seeds because they progressively fall off from bottom to top. Do not save seed from plants that bolt too soon. The seed you save may produce plants that go to seed prematurely.	
<b>Peas</b>	Wait until the plant dies and collect the seeds. Peas do not cross-pollinate.	
<b>Peppers</b>	Best time to collect seed is when peppers are full color and beginning to shrivel. Brush off the seeds from the inside stem and let dry. Peppers of the same species could cross. Grow one hot type and one sweet type to prevent cross-pollination.	
<b>Pumpkin</b>	Remove seeds three weeks after harvesting the pumpkin. Varieties within the same species can cross. Rinse off membranes and dry well.	
<b>Squash (Summer)</b>	Harvest seed when the squash has a hard skin and is too ripe to eat. Hold the seeds under water and rinse off the membrane. Avoid cross-pollination-do not plant these species together: Cucurbita Pepo, Cucurbita Moschata, Cucurbita Maxima and Cucurbita Mixta.	
<b>Sunflower</b>	Most sunflowers are hybrids. Save heirloom seeds if you want the flower to stay true. Hang flower heads upside down by a short length of stalk in a cool, dry spot. Once dry, remove the seeds and keep dry until planting.	
<b>Tomato</b>	Save seed when fruit is full color and firm, but still tender to the touch. Remove the protective gel covering the seed. Cross-pollination may occur with wild or currant tomatoes but most popular types will not cross. Ensure space between plants.	
<b>Watermelon</b>	Remove fibers and membranes by rinsing. When dropped in a glass of water, viable seeds will sink to the bottom. Seeds that float may not germinate well.	

## How to store my seeds and how long they are viable (Age)?

- Dry at room temperature on racks or on large sheets of paper for about a week.
- Separate pods or flower heads by shaking the seeds into large paper bags.
- Sift out the dried plant bits then pour seeds into recycled paper envelopes.
- Mark on the packets the type of plant and the date they were harvested
- Fill a jar with your packets and seal the jar shut.
- Keep the jar in a cool dark place to keep the seeds dormant.

## b. Soil

### Three Types of Soil: Sand, Clay & Silt



### What is in the soil?

Any soil that you hold has millions of microorganisms. Probably 10 times more than the human population in a table spoon of soil. Soil also has all the nutrients required for the plant to thrive and survive.

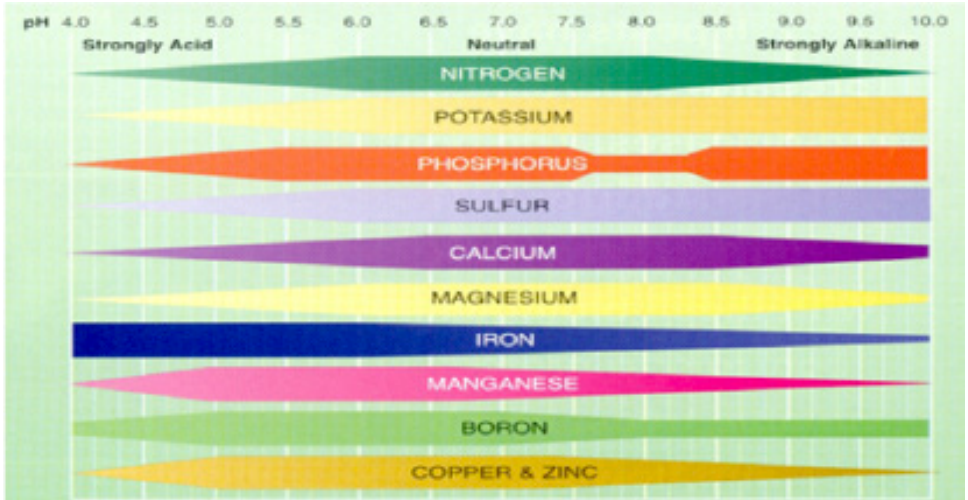
### What is soil pH?

Soil pH is a measurement of the acidity or alkalinity of a soil. On the pH scale, 7.0 is neutral. Below 7.0 acid, and above 7.0 is basic or alkaline.

### What does the plant needs from the soil?

- Macro Nutrients:
  - Primary Nutrients: Nitrogen, Phosphorous and Potassium.
  - Secondary Nutrients: Calcium, Sulfur, Magnesium.
- Micro Nutrients:
  - Boron, Chlorine, Manganese, Iron, Zinc, Copper, Molybdenum, Nickel, Cobalt etc.

## What Soil pH is best for plants?



Vegetable Name	pH Recommended
Beans	6.0-7.5
Beetroot	6.0-7.5
Broccoli	6.0-7.0
Cabbage	6.0-7.0
Carrot	5.5-7.0
Cauliflower	5.5-7.5
Celery	5.8-7.0
Cucumber	5.5-7.0
Garlic	5.5-8.0

Vegetable Name	pH Recommended
Kale	6.0-7.5
Lettuce	6.0-7.0
Peas	6.0-7.5
Pepper, sweet	5.5-7.0
Potato	4.8-6.5
Pumpkin	5.5-7.5
Radish	6.0-7.0
Spinach	6.0-7.5
Tomato	5.5-7.5

- Any soil as long as it is not too acidic or too alkaline.
- The optimum pH range for most plants is between 5.5 and 7.0, However many plants have adapted to thrive at pH values outside this range.

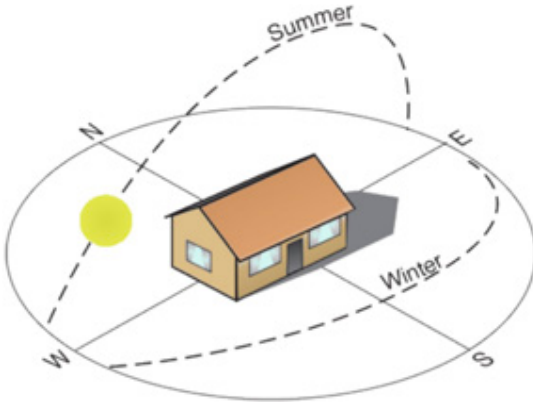
## *What does the plant needs from the soil?*

- Equal proportions of:
  - Red soil
  - Vermi-Compost
  - Regular Compost
  - Coco-peat.
  - Manure (Cow, Horse, Sheep, Chicken, etc.)
- Add Compost/Manure at regular intervals.
- Optional: Compost Tea, Jeevamrutha, Seaweed liquid and Panchagavya.
- Keep experimenting and changing the ratios.



### c. Sun

Understand the path of Sun over your terrace



Different plants have different sunlight requirements. Some do well in semi shade, some need 4-6 hours of sunlight, some require more and some require less.

Sunlight requirement for seedlings  
Seeds sown in a seed tray (or anything similar) don't need direct sunlight for the first 1-2 weeks.

Lower Sunlight 3-4 hours a day	Medium Sunlight 4-6 hours a day	High Sunlight 6-8 hours a day
 Swiss Chard	 Beets	 Peppers
 Cos Lettuce	 Carrots	 Tomatoes
 Lettuce	 Potatoes	 Watermelon
 Parsley	 Broccoli	 Okra
 Arugula	 Radishes	 Eggplant
 Asian Greens	 Turnips	 Strawberries



## Use of Shade Net

If your plants don't do too well under the scorching sun, then you can consider installing a shade net, which cuts off the amount of sunlight hitting the plants.



## d. The season

- Your city and your weather
- Cheat the vegetable and create season keeping Sun path in mind

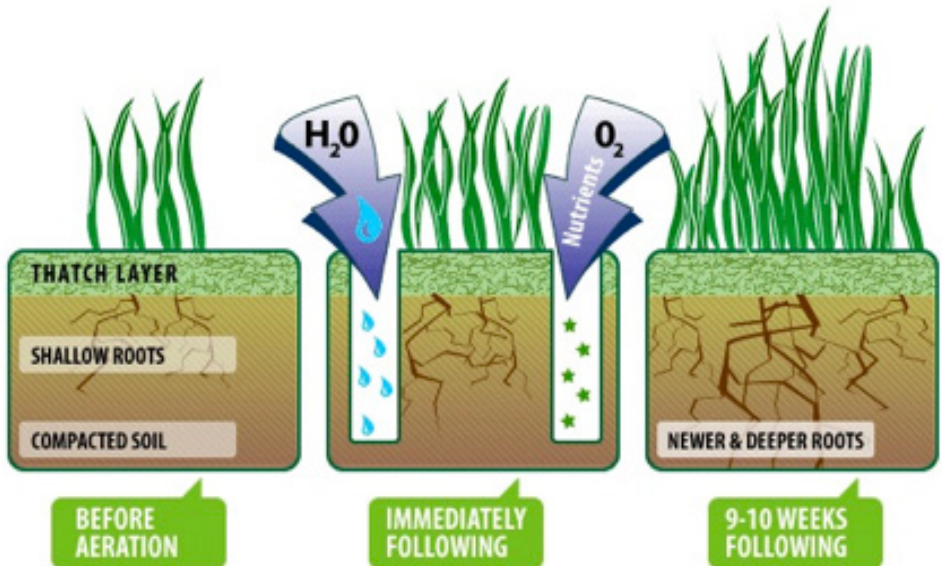
## Sowing Chart

Sowing Seasons		
Month	North India	South India
JANUARY	Brinjal	Lettuce, Spinach, Gourds, Melons, Radish, Carrot, Onion, Tomato, Okra, Brinjal, Bean
FEBRUARY	Applegourd, Bittergourd, Bottle gourd, Cucumber, French Beans, Okra, Sponge, Gourd, Watermelon, Spinach	Same as January
MARCH	Same as February	Amaranthus, Coriander, Gourds, Beans, Melons, Spinach, Okra
APRIL	Capsicum	Onion, Amaranthus, Coriander, Gourds, Okra, Tomato, Chili
MAY	Onion, Pepper, Brinjal	Okra, Onion, Chili
JUNE	All gourds, Brinjal, Cucumber, Cauliflower (Early), Okra, Onion, Sem, Tomato, Pepper	Gourds, Solanaeaceae, Almost all vegetables
JULY	All gourds, Cucumber, Okra, Sem, Tomato	Same as June
AUGUST	Carrot, Cauliflower, Radish, Tomato	Carrot, Cauliflower, Beans, Beet
SEPTEMBER	Cabbage, Carrot, Cauliflower, Peas, Radish, Tomato, Lettuce	Cauliflower, Cucumber, Onion, Peas, Spinach
OCTOBER	Beet, Brinjal, Cabbage, Cauliflower, Lettuce, Peas, Radish, Spinach, Turnip	Brinjal, Cabbage, Capsicum, Cucumber, Beans, Peas, Spinach, Turnip, Watermelon
NOVEMBER	Turnip, Tomato, Radish, Pepper, Peas, Beet	Beet, Eggplant, Cabbage, Carrot, Beans, Lettuce, Melon, Okra, Turnip
DECEMBER	Tomato	Lettuce, Pumpkin, Watermelon, Muskmelon, Ash gourd, Ridge gourd, Bitter gourd, Bottle gourd, Cucumber, Chilly, Cabbage.



### e. The air

- The better your soil breathes, the more it benefits your plant's growth
- Dense, compacted, heavy soils tend to negatively impact oxygen flow and directly affects the growth and yield.
- Your soil needs to breathe to allow oxygen and vital nutrients to efficiently reach your plants roots.
  - Plant and root growth
  - Microorganism population and activity
  - Water and Nutrient absorption
  - Helps to avoid the development of toxins
  - Prevents potential development of diseases



## *f. The water*

- Do not over water and do not under water.



- On an average, watering every alternate day is good enough.
- Monitor your plants and you will notice when they look dried up or not.
- If you over water:
  - The water that drains out, will take away the nutrients.
  - And of course you are wasting water too!
  - New & Old Leaves fall at the same time.
  - Flowers become moldy.



- Have good Drainage to allow excess water to pass through.



- Use techniques to retain moisture.



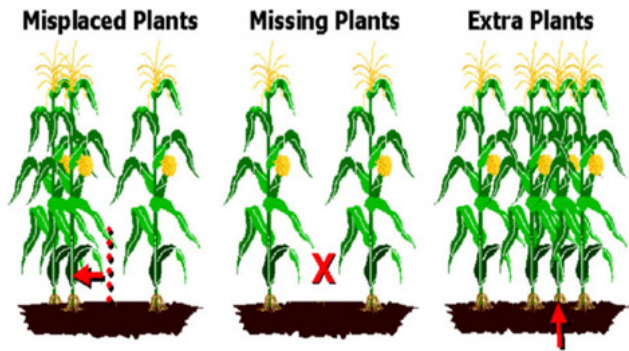
- Drip irrigation system may be considered for big gardens.



## *g. The placement*

### *Types of non-uniform spacing*

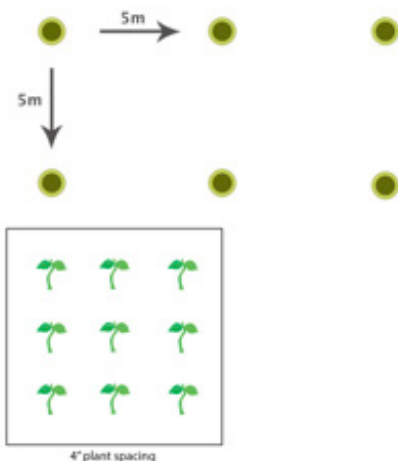
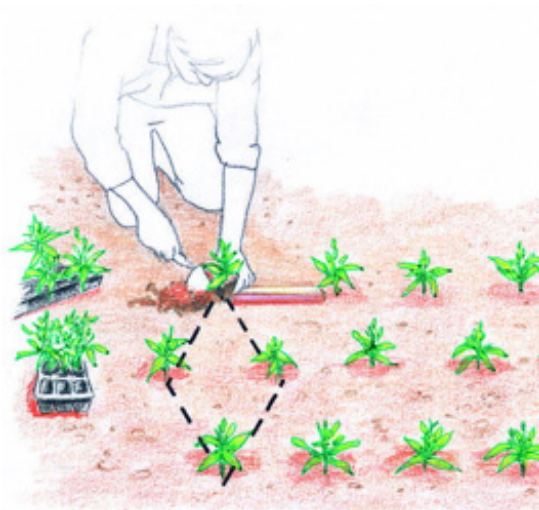
- Misplaced plants
- Missing plants
- Extra Plants.








*What Vegetables can be grown in clusters and why?*

*What should be spacing between each plant?*

- The spacing of crops is determined by the ultimate height and spread of the crop.
- There is the space between the seeds or plants along the row and then the space between rows.
- Space is needed for weeding along and between rows, to create good air circulation and to allow each crop to grow to its determined size.
- Some crops in may be harvested when they are young – smaller sweeter carrots and beetroot for example, baby salad leaves – rather than fully mature size, so spacing could be closer.

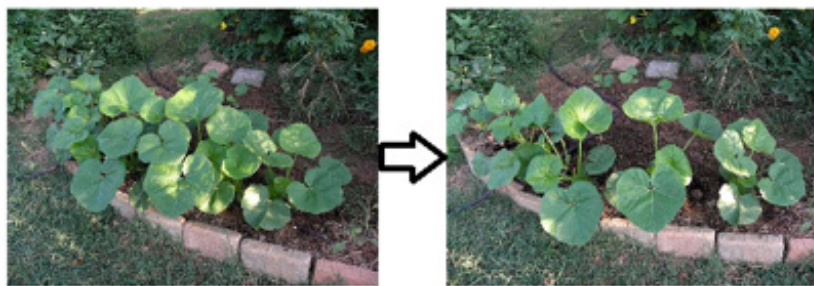
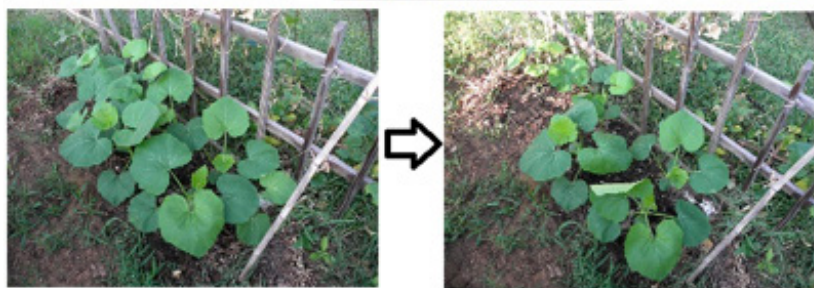


crop size	along row	between row
<b>small upright habit</b> e.g. Onion, garlic 	15cms ( half a trowel)	30cms ( 1 trowel)
<b>small bushy habit</b> e.g. radish and baby carrots, baby leaves 	10 cms ( just short of half a trowel or small plant label)	15cms (half a trowel)
<b>medium size bushy habit</b> e.g. Beetroot and parsnips, lettuce, French beans 	15cms (half a trowel)	30cms (1 trowel)
<b>large bushy habit</b> e.g. potatoes, broad beans 	potatoes 30cms (1 trowel) beans 20cms (dibber)	potatoes and beans 45 cms ( 1 ½ trowels) peas 60 cms ( 2 trowels)
<b>large trailing habit</b> pumpkin and courgette, climbing beans 	90 - 120cms (3 to 4 trowels) (15cms for beans – half a trowel)	90 – 120cms (4 – 5 trowels)

Square Foot Garden example (4 feet x 4 feet)

 <p>1 Cabbage</p>	 <p>9 Green Beans</p>	 <p>1 Pepper</p>	 <p>16 Onions</p>
 <p>1 Broccoli</p>	 <p>9 Green Beans</p>	 <p>4 Lettuce</p>	 <p>32 Green Onions</p>
 <p>1 Cauliflower</p>	 <p>16 Beets</p>	 <p>4 Lettuce</p>	 <p>16 Carrots</p>
 <p>1 Cherry Tomato</p>	 <p>9 Spinach</p>	 <p>16 Carrots</p>	 <p>32 Radish</p>

*What is Thinning?*



Can I grow multiple variety of the same vegetable in close proximity?

- Companion Planting.



- Succession Planting

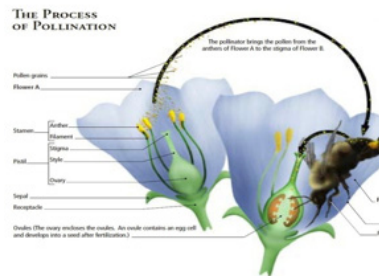


- Diversified Crop variety planting.



What is pollination, hand pollination and cross pollination?

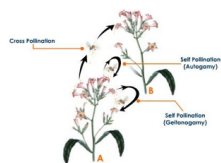
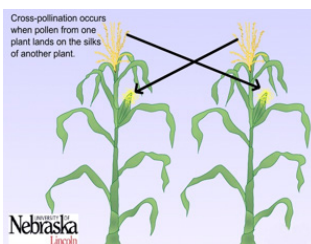
- Pollination



- Hand Pollination



- Cross Pollination





## 5. Garden know-how

### a. Mulching



### b. Pruning



### c. Bolting



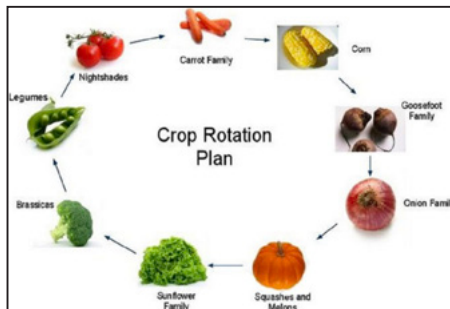
### *d. Chitting*



### *e. Companion Planting*



### *f. Crop Rotation*



## 6. Hands-on session

### a. Mulching

Covered in section on Soil



### b. Preparation of seedling





### *c. Transplantation*





*d. Watering seedling*



*e. Techniques of watering plants.*



*f. Filling soil in different containers.*



## 7. Plant Disease Management

### a. Viral infections

Mosaic Virus  
Curl Top Virus

### b. Bacterial diseases

Leaf Spot  
Root rot, Stem rot and Fruit rot

### b. Fungal diseases

Damping off  
Leaf curl  
Powdery Mildew  
Blight (Early & Late)

## 8. Pest Management

### a. Leaf Miners



*b. White Flies*



*c. Aphids*

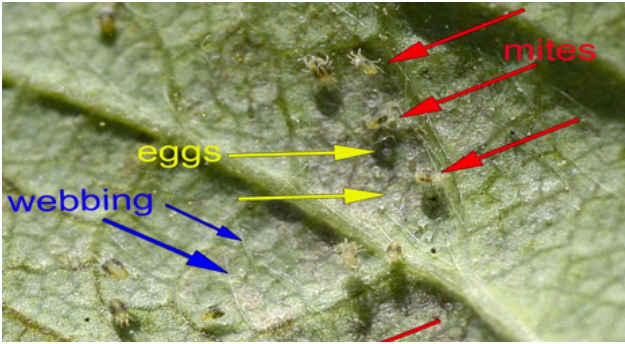


*d. Mealybugs*





*e. Spider Mites*



*f. Caterpillars*



*g. Cutworms*



## *9. Organic Pest Control Methods.*

### *a. Creating repellents*

Marigold, Garlic, Herbs, Cucumber peels

### *b. Using Neem Oil*

### *c. Encouraging beneficial Insects*

## *10. Pests - The good side of the Garden*

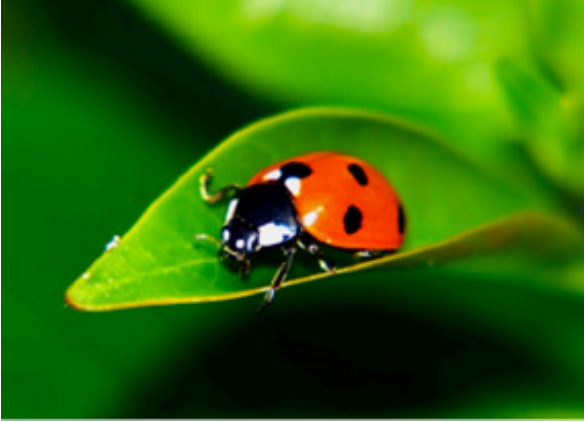
### *a. Bees*



### *b. Wasps*



*c. Lady Bugs*



*d. Aphid Parasite*



*e. Green Lacewing*



*f. Praying Mantis*



*g. Soldier Fly*



*h. Mealybug Destroyer*

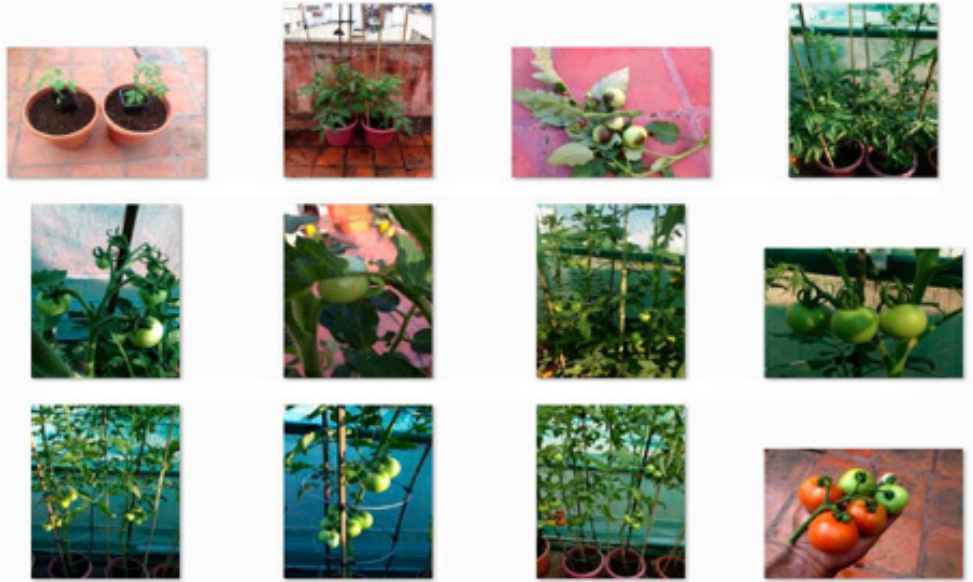


## 10. Planting Charts

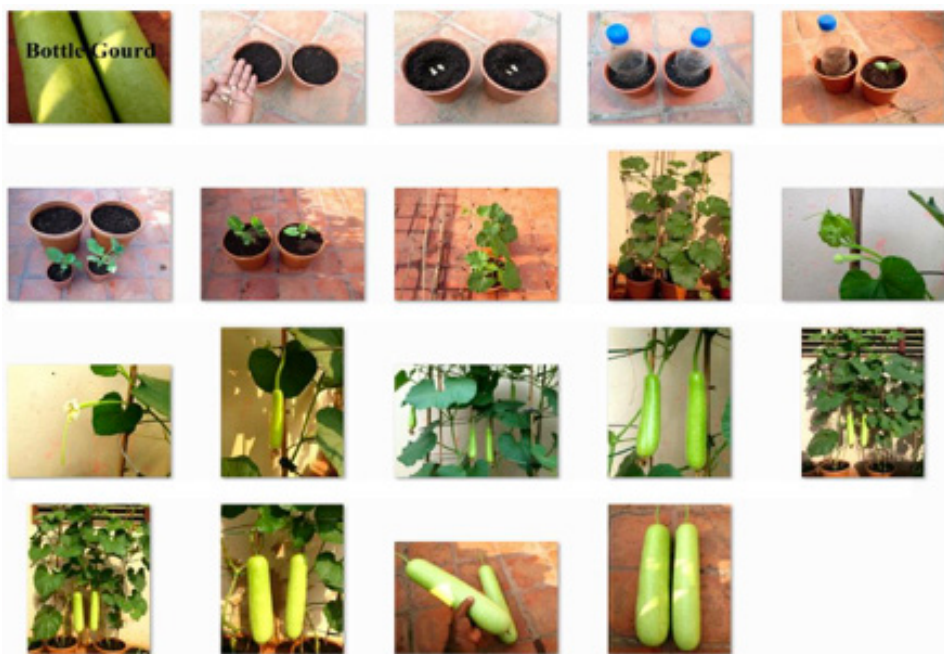
### a. Spinach



*b. Tomato*



### *c. Bottle Gourd*

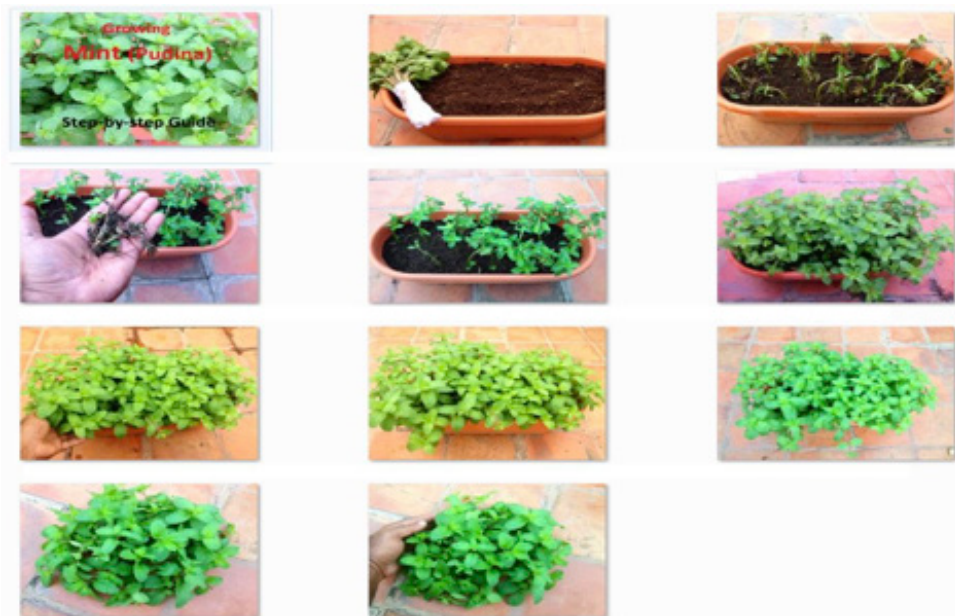




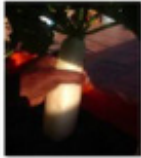
## d. Corn



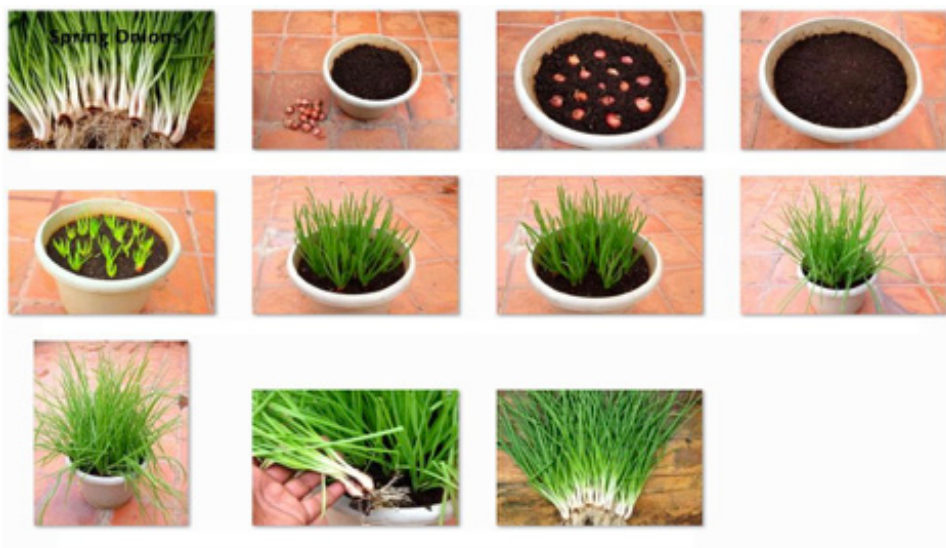
*e. Pudina*



*f. Radish*



## *g. Spring Onions*



## *h. Sweet Potatoes*







