

**Government of Tripura
State Mission Management Unit
Tripura Rural Livelihood Mission
Rural Development Department, Agartala**

F.No.2 (30)-RD (TRLM)/LH (Organic)/2019/962-69

Date: 22/05/20

To,
The District Mission Manager
(DM & Collector)
District Mission Management Unit
West Tripura/ Khowai/ Unakoti/ North Tripura/
Sepahijala/Dhalai/ Gomati/ South Tripura

Subject: - Advisory on Agri - nutrition garden

Sir,

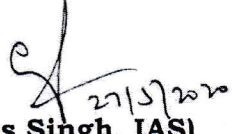
I would like to inform you that, TRLM is working with rural poor women since 2014 to bring all rural poor household under SHG fold and support them in enhancing their livelihoods. Presently around 19,000 household are involved in various livelihood activities like Paddy, goatery, Vegetables, Agri - nutrition garden etc. Till March 2020, 7571 household have been supported in promotion of Agri - nutrition garden under farm livelihood intervention and TRLM is encouraging to adopt the good practices of nutrition garden among all the SHG members under TRLM fold.

In this context, an advisory on Agri - nutrition garden is enclosed herewith, outlining the elements which will be useful for promoting of Nutrition garden at field level

This is for information and necessary action please.

Yours faithfully,

Enclo- As stated


(Vikas Singh, IAS)
Chief Executive Officer
(Addl. Secretary, RD Dept.)
Tripura Rural Livelihood Mission

(367798)

File No. K-11060/02/2019/NRLM (Livelihoods)/Part I
Government of India
Ministry of Rural Development
Department of Rural Development
(RL Division)

7th Floor, NDCC – II Building
Jai Singh Road, New Delhi – 110001
Date: 10th December, 2019

To,

The SMD/CEO,
All State Rural Livelihoods Mission

Subject; Advisory on Agri-nutrition garden

Dear All,

I am directed to say that DAY-NRLM has come up with an advisory on agri-nutrition garden which is an important constituent of farm livelihoods intervention. One of the integral component of farm livelihood intervention under DAY- NRLM, is assuring year-round household-level food and nutritional security by optimally using the resources available to the poor smallholders. Mahila Kisan Shasaktikaran Pariyojana (MKSP), launched in 2010-11 under DAY-NRLM has a stated objective of securing health and nutrition at the household level and more particularly for women and children. DAY-NRLM under its farm livelihoods intervention works with women farmers for the promotion of Agri-nutrition garden by involving them and thus increases the success rate manifold.

Till September 2019, 28.71 lakhs households have been supported in promotion of Agri-nutrition garden across the country through DAY-NRLM, Farm livelihoods interventions. In these years, we have seen many good practices emerging across the country in Agri-nutrition garden. In this context it is being felt that an advisory on Agri-nutrition garden outlining its element will be useful.

This advisory will serve as a reference document for rolling out kitchen gardens (Hereafter the Agri-Nutri gardens) in the respective State Rural Livelihood Missions (SRLMs).

Enclosure: Advisory on Agri-nutrition garden

Yours faithfully



(HR Meena)

Deputy Secretary in Govt. Of India

Advisory on promotion of Agri Nutri Garden under farm livelihoods

DAY-NRLM recognizes that the poor have multiple livelihood activities, and therefore, the mission focuses on enhancing and expanding the existing livelihoods of the rural poor. More than 70% of the rural poor are dependent on agriculture either as farmers or as agricultural labourers. Livestock rearing is the complementary activity in agriculture as another significant livelihood activity of the poor with small ruminants and poultry forming the major chunk of the livelihood basket. In forest-fringe areas, the forest-dwellers depend on the collection, value addition, and sale of Non-Timber Forest Produce (NTFP). Along with it, DAY-NRLM has been actively involved in promoting fishery and allied activities for livelihoods promotion. One of the integral component of farm livelihood intervention under DAY-NRLM, is assuring year-round household-level food and nutritional security by optimally using the resources available to the poor smallholders. Mahila Kisan Shasaktikaran Pariyojana (MKSP), launched in 2010-11 under DAY-NRLM has a stated objective of securing health and nutrition at the household level and more particularly for women and children. DAY-NRLM under its farm livelihoods intervention works with women farmers for the promotion of agri-nutrition garden by involving them and thus increases the success rate manifold.

Till September 2019, 28.71 lakhs households have been supported in promotion of agri-nutrition garden across the country through DAY-NRLM, Farm livelihoods interventions. In these years, we have seen many good practices emerging across the country in agri-nutrition garden. In this context it is being felt that an advisory on agri-nutrition garden outlining its element will be useful.

1. Why is Nutrition Garden required?

The centrality to the actions of DAY-NRLM are women coming from marginalised sections of the socioeconomic strata. The biggest issue affecting them related to poverty is food security and malnutrition. As mothers, they carry on the legacy of malnutrition, hunger, and therefore unhealthy current and future generations. The cycle of malnutrition is cyclic and affects generations. For example, if an adolescent girl is malnourished, then after marriage, there is a certainty that the girl will also become a malnourished pregnant woman. Generally, a malnourished child is born to such a mother. The child, even after growing up does not escape the cycle of malnutrition. The malnourished girl born from such a mother repeats the cycle of malnutrition. Though, the livelihood interventions are targeted towards income enhancement and food security it leaves out the crucial missing link of proper nutrition at the household level.

According to the World Health Organisation (WHO), having low dietary diversity at the household level is one of the reasons for malnutrition. Therefore, ensuring dietary diversity at the household level would help people to come out of the malnutrition cycle. One of the crucial components, thus, is to raise a nutrition garden in the backyard of each of the

household. At DAY-NRLM, the combination of fruits and vegetables, which are locally consumed and grown. This advisory will serve as a reference document for rolling out kitchen gardens (hereafter the Agri-Nutri gardens) in the respective State Rural Livelihood Missions (SRLMs).

Figure 1 Requirements for proper nutrition

Carbohydrates: Provides energy in terms of glucose to perform daily tasks (rice, wheat, ragi, maize, other cereals and starch-based food)

Fats: Other sources of energy and maintain the lubrication (animal fat, vegetable oil, egg yolk, meat, fish, cashew among others)

Protein: Primary role of protein in the diet is for healing injured tissue and for growth and development in the body (poultry, meat, eggs and fish, and plant proteins such as nuts, seeds, beans and legumes)

Vitamins and Minerals: Help perform bodily functions adequately and help the body fight diseases and immune system (fresh fruit and vegetables)

The purpose of the establishment of nutrition garden is to grow fruits and vegetables suited to the local agro-climatic condition for tackling malnutrition. Apart from growing the vegetables and fruits, rearing livestock, supplies the required animal protein in terms of milk, eggs, and meat for complete nutritional needs of the household. The Agri-nutri gardens are designed as such that, while ensuring food for the house, it does provide some additional income, as and when needed. According to a report published in 2010-11, the Food and Agriculture Organization has reported that about 70% reduction in complications related to deficiency of Vitamin-A is possible by the promotion of nutrition gardens.

2. Objectives of promotion of Agri-nutri garden

- 2.1. Ensuring adequate nutrition available in the household to avert malnutrition among family members (especially women and children)
- 2.2. Providing round the year availability of nutritious fruits, vegetables, milk, egg, and meat and reduce dependence on the market. Bringing food diversity at household level.
- 2.3. Availability of quality food material free from chemical substances, reducing toxicity and enhancing nutrition
- 2.4. Reduction of expenditure on food items and expenses related to health; therefore, increasing cash flow for an improved socio-economic condition

3. Agri-Nutri garden under DAY-NRLM

To promote supplemental food production among the underprivileged and poor people in rural areas, DAY- NRLM supports the Agri-Nutrition garden model to improve nutrition security and supplement household income. The primary objective behind this model is to

help improve the nutrition status of small and marginal farmers and their families, providing them with an assorted mix of fruits and vegetables for most time of the year. Communities, which are appreciable to the idea of rearing poultry birds and small ruminants are encouraged to rear animals on a low scale, which fulfils dietary requirements and provides an income as and when needed.

Agri-Nutri gardens can be established and maintained on a small patch of land with minimum technical inputs; hence, these gardens provide the rural resource-poor communities with a platform for innovations in supplementary food production as well as an opportunity to improve their livelihoods. Family labours, especially the efforts of women, becomes particularly important in the management of these gardens. Empowered with a reasonable minimum amount of skills and knowledge, these women members of rural families can easily fight crop losses and other negative implications, thereby making Nutrition gardening a successful initiative. Besides, the significant use of organic farming practices makes these garden environment-friendly as well.

Nutrition gardens are cost-effective, practical and efficiently meet the balanced dietary requirements of rural households as well as add substantially to the family income. Crops are selected considering the everyday food habits and climatic conditions of the implementation areas, and with the larger goal of ensuring availability of wholesome and nutritious food.

4. Pre-implementation phase for Agri-nutrition Garden

- 4.1. Exposure: The Livelihoods teams of the SRLMs along with CRPs should go on exposure to see successful models on Agri-nutri gardens in their vicinity. The exposure should be arranged to a location where various models are on display.
- 4.2. Situational Analysis: The livelihood team can quantify and assess the situation of the homestead land of each of the beneficiaries. The team then would prepare a database containing information about: the soil type, water availability at the homestead, number of animals/ birds reared by the household to ascertain the amount of bio-manure availability, and the food and nutrition security condition of the family if the need may be the date of Anganwadi Centres on status nutrition of the children and women of the house. It would be wise to record the PDS availability, Midday Meal available to the children, and the availability of nutritious food for the pregnant and lactating women. A matrix may be developed to understand the calendar of food and nutrient availability (as per the box above detailing requirements for proper nutrition) for the household and to identify lean months in the terms of availability.
- 4.3. Information and knowledge dissemination: At the monthly meeting of the VO, the livelihood subcommittee along with the SRLM staff shall discuss the importance of the Agri - nutri garden. In this meeting, the presence of CRP is essential, as they will

be the ones helping the beneficiaries in setting up Agri-nutri gardens and growing vegetables and crops. This discussion must happen at the CLF and SHG level to ensure the importance of the initiative to provide food and nutrition security.

5. Agri-nutri garden design for different types of beneficiaries

The livelihood team, in consultation with experts (practitioners, NRPs, scientists from KVK/ agricultural universities, leading CSOs), should design appropriate Agri-nutri gardens suitable to the geography and landholding of the farmers. In bigger states, where there are different agro-ecological zones and altered food habits, multiple designs should be prepared before implementation.

Various designs and models are provided in the guideline, for example. The state teams must compile a ready reckoner of different models of the Agri-Nutri garden. If there is an aberration (land and water availability), common sense may be applied for designing a particular intervention, with the approval of the concerned beneficiary. The Krishi Sakhi after analysing the data on land and water availability of the specific beneficiary should suggest the model that the beneficiary should adopt. This list created at each of the SHG should generate metadata, indicating the number of different models under implementation at various levels (SHG, CLF, VO, Block, SRLM, NRLM).

5.1 The Design principle of Nutrition Garden

The basic design principle is to establish a year-round supply of seasonal fruits and vegetables, including leafy greens in the homestead by using household-level wastewater and food waste (for manure).

- 5.1.1. A multi-tier design principle may be adopted to get the maximum from the same area. The principle behind the multi-tier design is photo-tropism i.e. different plants require different light, so multi-tier structure is best suited to harvest maximum sunlight.

Example:

First-tier: Root or tuber crops such as carrot, beetroot, ginger, etc. comes under this category. These plants require minimal sunlight.

Second-tier: Creepers, which cover the soil such as bottle gourd, cucumber etc. Creepers will act as live mulch.

Third tier: Leafy vegetables such as spinach, coriander, Amaranthus etc.

Fourth tier: Vegetables such as Brinjal, Tomato, chillies etc.

Fifth tier: Perennial Castor and Perennial Red gram etc.

Sixth tier: Papaya, drumstick, clustered apple, guava etc.

Seventh-tier: Fruit crops such as Mango, cashew, etc. These plants require maximum sunlight.

- 5.1.2. Perennial plants such as a drumstick, banana, papaya, curry leaf, gooseberry,

mango, guava, custard apple, and sapota etc., should be located on one side of the garden. Usually, they should be planted at the rear end of the garden, so that they may not put a shadow over other crops.

- 5.1.3. Small spaces can be utilised for growing different short-duration varieties such as coriander, Amaranthus, fenugreek, mint, etc. These crops can be cultivated in different seasons.
- 5.1.4. The fence surrounding the garden can be utilised for growing creepers and gourds such as sponge gourd, bitter gourd, snake gourd, cowpea etc.
- 5.1.5. The inclusion of trellis in for creepers and shade-loving under the trellis-like broccoli, spinach etc.
- 5.1.6. The compost pits should be placed in the corner of the garden.
- 5.1.7. There should be corner pits to collect the utilised household water (bathing water, Nutrition waste etc.)
- 5.1.8. The garden should be divided into small plots with raised bunds. In the bunds, one can grow root crops such as onion, turmeric, ginger etc.
- 5.1.9. Medicinal plants should be integrated into this nutritional Garden like Tulasi, Kalmegh, aloe vera etc.
- 5.1.10. Monocot – Dicot crop combination to maintain equilibrium for soil fertility
- 5.1.11. Companion crops: Companion planting in gardening and agriculture is the planting of different crops in proximity for any of some various reasons, including pest control, pollination, providing habitat for beneficial creatures, maximising use of space, and to otherwise increase crop productivity. A list is given in Annexure.
- 5.1.12. Crop diversity to manage pests
- 5.1.13. The inclusion of livestock (backyard poultry and goat rearing) in the household nutritional security system.
- 5.1.14. Planting vegetables in the gunny bags for the poorest households who do not have land for a nutritional garden.

5.2 Major Intervention for Nutritional Garden

In agro-ecological practices in farm livelihoods under DAY- NRLM emphasis is on the following significant areas:

5.2.1 Seed

- 5.2.1.1 Use of only native quality seeds, in some cases, high yielding varieties can be taken up.
- 5.2.1.2 In no case, HYV or GM seeds should be promoted.
- 5.2.1.3 While purchasing the seeds from the market, expiry date and % of germination should be checked.
- 5.2.1.4 All the seeds and seedlings should be treated with Bijamrut/ cow urine before sowing.
- 5.2.1.5 Seed selection should be carried out with either plain water or brine solution
- 5.2.1.6 Mahila Kisans may be trained in the preparation of good quality seeds from their

garden.

5.2.1.7 Every year seed production should be promoted at each household to avoid dependency on external sources.

5.2.1.8 Seeds should be selected from a healthy plant/ healthy, disease-free fruits.

5.2.2 Soil

Usage of mulching, green manure to increase the soil moisture and organic matter.

5.2.3 Plant nutrient management

5.2.3.1 No chemical fertilisers or chemical pesticides should be used.

5.2.3.2 Kitchen waste should be used for the preparation of compost.

5.2.3.3 Small FYM pits/ corner should be promoted to prepare compost from kitchen waste/ leaf litters. The landless farmers can also do the FYM in the earthen pots/ plastic drums.

5.2.3.4 All households, including the landless family, should have a practice of vermicomposting in a small earthen pot/ plastic drum or any old big sized utensils.

5.2.3.5 Ghan Jeevamrut or jeevamrut can also be applied to the plant for better & healthy growth.

5.2.3.6 Small Bhu-Nadep should be promoted to prepare compost from farm waste/ leaf litters

5.2.3.7 Green manures: Sowing seeds of green manure help to protect the soil and gives extra fertility and more production.

5.2.3.8 Other sources: Ash, oilseed cake, hair etc. are all resources which can be added to the soil to increase fertility as well as helping to prevent pests and diseases.

5.2.4 Water management

5.2.4.1 All the household wastewater (bath/ kitchen) can be collected through a ditch/ pit in the garden. It can do the watering of the plants.

5.2.4.2 At the time of land preparation of the agri-nutrition garden, the small irrigation and drainage channels should be made for better management of available water.

5.2.4.3 Pitch irrigation or drip irrigation should be adapted to avoid excess use of water/ for optimal use of water

5.2.4.4 Small dug well/ drums may be used to store water.

5.2.4.5 Mulching: It prevents the sun and wind from drying the bare soil.

5.2.4.6 Green Manures: Also cover the soil, and so help in conserving water.

5.2.4.7 Windbreak: Wind will dry out the soil, so stopping the wind helps to conserve soil moisture.

5.2.4.8 Provide shade: In the hot season, trees can provide shade to the Agri-nutrition garden. A few small trees, such as Leucaena, mulberry, moringa (drum stick), Persian lilac, or even fruit trees in the fence or within the garden can be used for this. As well as giving shades, these trees can also provide other benefits such as

firewood, fodder or mulch materials.

5.2.4.9 Mist collection: Mist collects on the leaves of the trees around and within the agri-nutrition garden and drips onto the soil for conserving the moisture.

5.2.4.10 Irrigation: By only putting a little water over a wide area, only the surface will be kept moist. This can cause roots to stay near the soil surface, and in intense sun, they can dry out quickly. So, it's much better to irrigate less area with more water, so the moisture goes more in-depth in the soil. Then this area will not need watering for a long time during the hot season, water in the evening or at night and not in the daytime. Collecting and using wastewater from the kitchen can be enough to water the garden. Also, direct water from the communal tap stand can be used in Agri-nutrition garden.

5.2.5 Plant protection

The Agri-nutrition garden needs protection from the very start. It should not be possible for livestock to enter the area. A permanent fence should be made. Thorny plants can be cut and used to create a fence, but the best method is to plant a living fence to protect the garden.

The crop within the garden will also need protection from any damage by pest and diseases. There are many ways to do the same as mixed cropping, rotations, liquid manure, bio-pesticides etc. For that:

5.2.5.1 The weeds should be uprooted as and when seen in the garden.

5.2.5.2 Each household should adopt the preparation and use of Pot Manure (Matka Khad), which acts as both manure and bio-pesticide.

5.2.5.3 Biopesticides like neemasthra, brahmastra, and agneyastra should be applied in case of pest/disease attack.

5.2.5.4 All the seed materials should be treated through Bijamrut or with cow urine

5.2.5.5 Light trap, yellow sticky trap or water trap or pheromone trap may be used to trap insects.

5.2.5.6 Plantation of Marigold around the border will help in trapping insects.

5.2.5.7 A detailed list is given in Annexure

5.3 Agronomic practices

5.3.1 Site selection for agri-nutrition garden

If there is already an agri-nutrition garden then there is a need to improve rather than search for a new site

The following factors need to be considered for a new site:

5.3.1.1 How to protect the garden from livestock, who can graze?

5.3.1.2 How can you bring water to the site and irrigate it?

5.3.1.3 The quality and fertility of soil needs to be managed.

5.3.1.4 How can the site be easily accessed from the house?

5.3.2 Land preparation

5.3.2.1 The raised nursery bed should be promoted to avoid damage of the nursery from the rain.

5.3.2.2 Nursery beds may be covered with locally available materials like paddy straw or broad leaves

5.3.2.3 Adequate FYM/ Vermicompost/ NADEP compost should be added to the field during land preparation.

5.3.2.4 Ridges and furrow method should be adopted to check the excess use of water, manure and to avoid soil erosion.

5.3.2.5 Irrigation and drainage channel should be given in between the sub-plots.

5.3.2.6 The landless farmers can use gunny bags to grow crops. The central opening at the top can be used for non- creeper vegetables. Some holes can be made in the gunny bags. In these side holes, the creeper plants can be planted for optimum use of the gunny bags. The gunny bags should be filled with soil and bio manures like FYM/ Compost/ Matka Khad/ vermicompost.

5.3.3 Sowing and planting

5.3.3.1 Line sowing with proper spacing will increase productivity.

5.3.3.2 All the plantation crops like banana/ papaya/ lemon/ custard apple should be planted in the border of the agri-nutrition garden

5.3.3.3 All the creeper plants should be planted near to the plantation crops/ trees/ near to the hedges

5.3.3.4 Proper spacing should be maintained between the plants and between the rows.

5.3.3.5 Mulching may be promoted to conserve the soil moisture.

5.3.4 Selection of crops

5.3.4.1 There should be at least three to five plantation crops to be planted in the garden.

5.3.4.2 The plantation crops are Papaya, Drumstick, Lemon, Custard apple, guava, pomegranate, curry leaf etc.

5.3.4.3 There should be at least three creepers/ climbers to be planted in the garden. Example: Pumpkin, bitter gourd, bottle gourd, ridge gourd, pointed gourd, small gourd, spine gourd. Tomato, Malabar spinach etc.

5.3.4.4 The common leafy vegetables like Amaranthus (both dark and green) & Malabar spinach, vegetables like brinjal, okra and spices like chilli should be cultivated round the year.

5.3.4.5 Each agri-nutrition garden should have plants representing from legume crops

5.3.4.6 At least two to three tuber crops should be planted in the garden. Example: Yam, Radish, elephant foot yam, taro, sweet potato etc.

5.3.4.7 Minimum one to two beans should be planted. Example: cluster bean, broad

bean, common bean, kidney bean, French bean, cowpea, lima bean, sword bean, ridge bean, field beans, lablab beans, runner beans etc.

5.3.4.8 A detailed list is given in Annexure.

6. Models for Agri-nutri garden

If seeds and seedlings are planted too wide, the interspace will go waste, and this space will be used by weeds to grow. Weeds use precious water and compost, and also waste labour in their removal. Besides the water and compost lost, needs to be replaced. This is why it is better to plant vegetable plants densely. But if only one variety is grown, it will compete with itself for space above and below the ground, and so will not be beneficial. It is better to plant a mix of small and large types, to make different layers of crops on the same bed. These will also have different layers of roots in the soil. This means many plants can be grown in a small space, but there is no competition between crops for space, water and nutrients. As small vegetables are harvested for food, this makes space for the long lasting vegetables, while in between new seedlings can be planted. Some of the models in use for the agri-nutrition gardens are as followed:

6.1 Rectangular model

Seven parallel raised bed plots of 10-20 ft. Length and 3-4 ft. Width to be prepared across the yard. At the four corners four circular mounds to be dug. Around the garden, fruit plants which are lesser in height and are less shrubby should be planted, e.g. papaya, lemon, and guava among others to be planted.

It should be noted that plants like banana or papaya should be planted on the eastern or southeastern side of the garden. This will allow appropriate sunshine to fall on the garden. Plants with larger canopy, i.e. drumstick, guava, custard apple need to be planted on the west or northwestern direction.

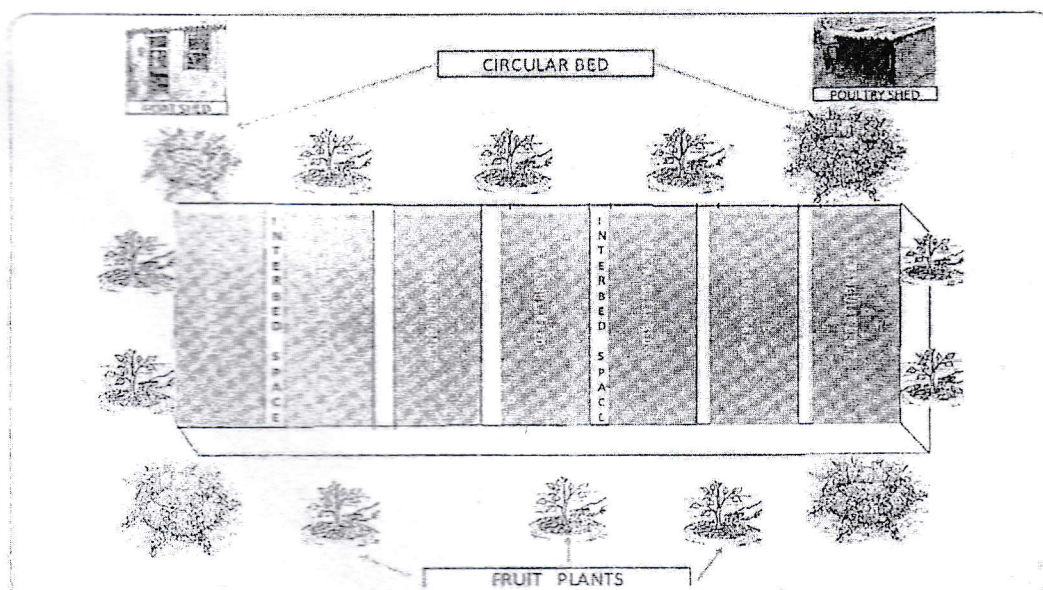


Figure: Rectangular model for Agri-nutrition garden

6.2 Circular model

In this model a circle would be made, and four mounds at the four corners will be made. Around the garden, fruit plans which are lesser in height and are less shrubby should be planted, e.g. papaya, lemon, and guava among others to be planted. It should be noted that plants like banana or papaya should be planted on the eastern or southeastern side of the garden. This will allow appropriate sunshine to fall on the garden. Plants with larger canopy, i.e. drumstick, guava, custard apple need to be planted on the west or northwestern direction.

1. The diameter of the garden should be 1 meter.
2. With a 0.5-meter tape should be used with a centre point and a circle should be marked around it
3. Pulverize the soil with hoe/ plough.
4. The plots should be prepared against the direction of the hoe.
5. Farmyard manure/ Compost should be mixed, and mound should be made around the circle

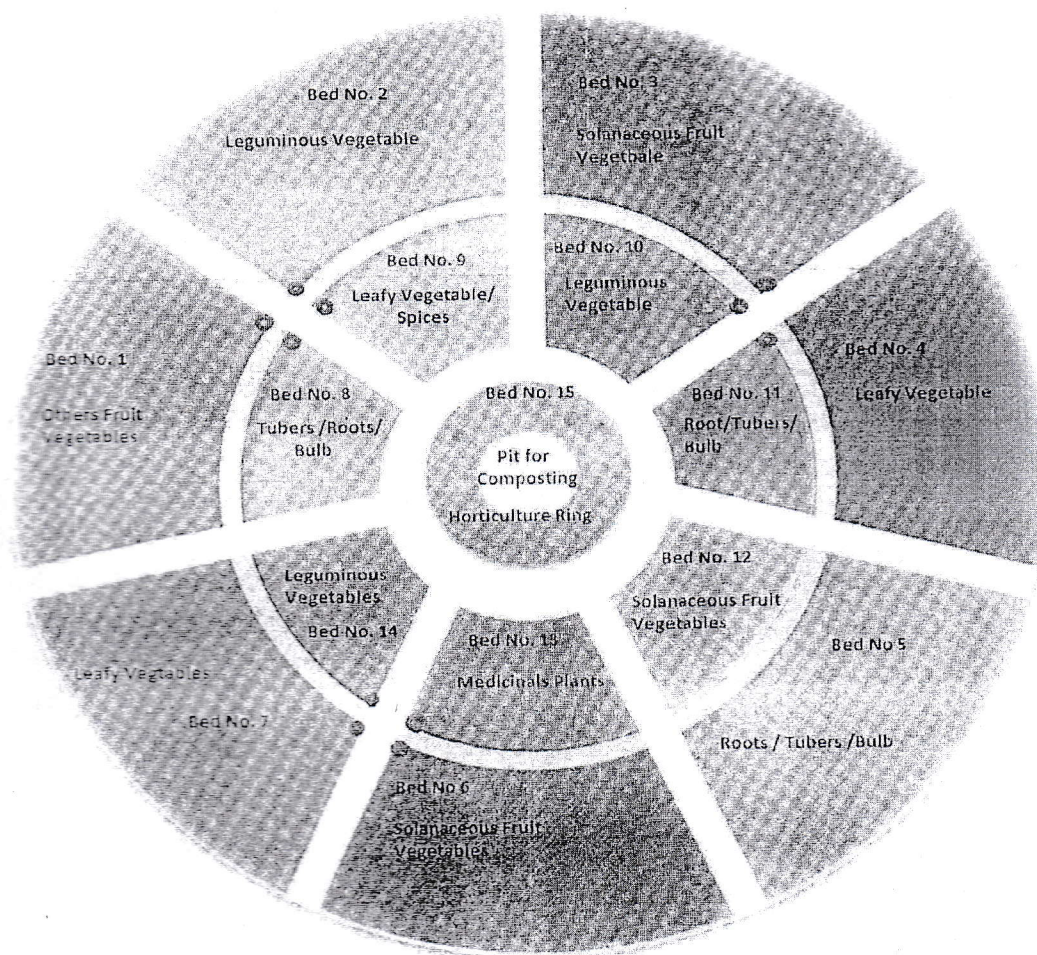


Figure: Circular model for agri-nutrition garden

6.3 Nutrition Garden for landless

Raised Garden	Creepers (bitter gourd, cucumber, ridge gourd, long beans, beans, ivy gourd, and spike gourd, Amaranthus, and spinach can also be grown	In an earthen pot or polythene soil, rice bran, FYM/ Compost in the ratio of 3:1:2 The creepers can be supported with tape, wire, or bamboo sticks
Hanging garden	Vegetable and other leafy vegetables	Pots can be hanged from the roof with the same composition of soil mixture. Is beneficial to keep off cattle
Drum garden	All vegetables	A drum is cut into 2 equal halves where soil mixture is kept for the growth of vegetables

6.4 Nutri garden with a Gunny bag

- 6.4.1. Select a sunlit place
- 6.4.2. Fill the gunny bag with clay loam soil and FYM/ compost
- 6.4.3. Mark 4 holes around the gunny bag at equal distances, the holes should be above 1 foot off the ground level.
- 6.4.4. Put a Bamboo stick in the middle of the bag to facilitate irrigation and drainage of excess water.
- 6.4.5. To settle the soil, pour water for 2 to 3 days
- 6.4.6. Put 4 seeds of 2 different types of creeper in each hole
- 6.4.7. At the top of the gunny bad 2 plants of either tomato/ chilli/ or brinjal can be put.
- 6.4.8. Irrigate the bag in every 2 days to keep the bag moist
- 6.4.9. Keep it off limits from animals and children
- 6.4.10. For the creepers make the facility for trellis, the creepers will start fruiting after 45 days and continue fruiting for 45 days
- 6.4.11. A household would be able to get adequate amounts of vegetables from 2-3 gunny bags

7. Importance of animal protein and its benefits

For growing children and the pregnant and lactating mothers, there is a significant need to provide in terms of milk, egg, and meat to fight malnutrition. From eggs, 12 essential vitamins and minerals are sourced apart from choline, which helps in the development of the brain and more so among the children. Eggs are a great source of protein, which aids in the formation of new tissues and repairing of old tissues. One egg has equal amount of protein as with 30 grams of animal meat. In a week, one should consume about 3 to 4 eggs. Pregnant women should not consume raw or half cooked eggs. Poultry meat is also a good source of protein which is white meat. According to the estimates, one normal human should consume 180 eggs and 12 kgs of animal meat. The faeces and droppings of poultry and goat act as a good source of fertilizers for the Agri-nutrition garden and also help in recycling of roughages.

Recommended consumption of egg for growing children and women

Category of special need	Egg requirement (weekly)	Egg requirement (annual)
Children (6 months to 3 years)	3	156
Children (3 years to 6 years)	5	260
Adolescent girl (10 years to 19 years)	4	208
Pregnant and lactating women	3	156

Therefore, the intervention at the household should be such that each member (children and women), should at least have 120 eggs a year (every 3 days) and have chicken twice a month (26 birds) and sell 12 birds in the market to earn additional income.

7.1 Backyard poultry for household nutrition

The basic tenets of backyard poultry are

- 7.1.1. Secure the birds by the construction of a shed from predators, heat, and rain, while having a litter to soak up the bird droppings (can be sold as manure rich in phosphorous)
- 7.1.2. Apart from scavenging give the birds some balanced feed.
- 7.1.3. Each bird should at least have 200 ml of fresh water per day.
- 7.1.4. Deworming in every 3 months (i.e. 4 times year)
- 7.1.5. 4 times the vaccination of Ranikhet/LaSota, and 2 times vaccination of bird flu. The estimated cost for all the vaccination and deworming per year is about Rs.10.

The scale and operation of backyard poultry

- 7.1.6. Each female bird gives about 50 eggs per year, while giving 3 to 4 eggs at a time.
- 7.1.7. If a household rears 4 birds, the household will get 200 eggs per year.
- 7.1.8. The household should consume 120 eggs and use the rest 80 for hatching.
- 7.1.9. With an 80 % success in hatching, there will be 64 chicks.

- 7.1.10. Out of the 64 chicks, 60% will become full-size birds at the age of 6 to 8 months; i.e. 38 full-size birds.
- 7.1.11. The household should consume 26 birds, and sell the rest 12 birds. The birds will at least fetch a price of Rs.300 providing an income of Rs. 3,600 in the household. The expenses on balanced feed are about Rs.500, and the cost on deworming and vaccination is about Rs. 500. Therefore, the net income from poultry is about Rs. 2,600.

7.2 Improved goat rearing for household nutrition

The basic tenets of improved goat rearing are

7.2.1 Secure the goat shed from predators, heat, and rain, with proper drainage (the goat dung can be composted and used as high manure, the market price of the manure is very high with proven bio-availability)

7.2.2 Balanced feed for the animals.

7.3.3 Each goat should have fresh water.

7.3.4 Deworming in every 4 months (i.e. 3 times year)

7.3.6 Vaccination against 4 deadly diseases (PPR, Goat Pox, Enterotoxemia, and Foot and Mouth Disease)

The scale and operation of improved goat rearing

7.3.7 In 24 months (at an interval of 8 months), one female goat gives birth to 5 kids, while there is a chance that 2 kids might die due to complications/ natural sequences.

7.3.8 The sale price of the three goats in the 24 month cycle is approximately Rs. 9,000 (kids: in the first birth - 16 months, second birth- 8 months, and the third birth- 0 to 1 month).

7.3.9 If a household rears 2 goats, the income is Rs. 9,000 per annum. The cost of deworming and vaccination is Rs.120 per year per goat (includes the cost of Krishi Sakhi). Therefore, the price of the whole herd is Rs.480-Rs.500 per annum for the household. Apart from it, the cost of balanced feed per year is about Rs.300.

7.3.4 Therefore, the net income from the enterprise is Rs. 8,200

8. Funding and Convergence

Funding for Agri-nutrition garden: The budgetary requirement of formation of Agri-nutrition garden is low which can be taken as a loan by Mahila Kisan from the SHG. There is no need to keep a separate budget for the promotion of the same.

Different schemes are under implementation, which supplies inputs and planting materials for agriculture. The SRLF block team may arrange such linkages for procurement of inputs. If needed personal assets for in-situ soil and water conservation may be created under the MGNREGS.

Annexure

1. Crop combination in nutrition garden

Plot	Season	Main Vegetable	Supplementary vegetable
Raised beds	Kharif/ Rainy	Brinjal/ Eggplant	Radish, Amaranth Leaf
		Chilli	Marigold,
			Coriander
		Okra	Long beans/ Okra
	Rabi/ Winter	Pumpkin/ ash gourd, bottle gourd, pointed gourd, bitter gourd, ridge gourd, Snake gourd, cucumber	Water spinach
		Tomato, Onion	Spinach
		Beans	Coriander, Mint
		Carrot	Fenugreek
	Zaid/Summer	Cabbage/ Cauliflower	Radish
		Okra	Long bean
Circular bed	Kharif/ Rainy	Brinjal + Long beans + Bitter Gourd/ Snake Gourd	Guar bean
		Chili + Long beans + cucumber/ pumpkin	
		Okra + Long bean + Ridge gourd / Malabar Spinach	
		Brinjal + Scarlet gourd/ Ivy gourd + Water spinach	
	Rabi/ Winter	Tomato + Bean + Spinach	
		Ivy gourd + Water spinach + Coriander / mint / fenugreek	
	Zaid/Summer	Okra + Malabar spinach	
		Guar Bean + Amaranth leaf	
		Brinjal + Bean	

2. Examples of good co-crop

Crop name	Companion crop	Enemy crop
Beans, Green peas	Almost all vegetables	Onion and garlic
Brinjal, chilli, tomato	Onion, pulses, radish, carrot, coriander, Holy Basil, and marigold	Mustard and Rapeseed
Pumpkin	Pulses, Onion, and marigold	Coriander and Holy Basil

3. Examples of better intercropping

Cabbage	Radish, carrot, turnip, beetroot
Potato	Amaranthus, carrot, radish, wild spinach
Tomato	Radish, carrot, and Amaranthus
Onion	Amaranthus and wild spinach
Garlic	Coriander and other leafy vegetables
Pumpkin	Kharif radish
Maize	Cucumber, pumpkin, Long beans, and watermelon

4. Planting distance (plant to plant and row to row) in cms

Vegetable	Row to row	Plant to plant
Brinjal	75	60
Chili	60	45

Vegetable	Row to row	Plant to plant
Tomato	75	60
Bean	45	30
Long beans	45	30
Water spinach	25	20
Radish	25	20
Carrot	25	20
Guar bean	60	45
Okra	75	60
Pumpkin/ bottle gourd	150	120
Ridge gourd/ snake gourd/ cucumber/ ivy gourd/ bitter gourd/ Malabar spinach	120	90
Tree based fruits		
Drumstick	700	600
Lemon	500	400
Mango	1000	800
Papaya	300	250
Banana	300	250
Custard apple	700	600
Guava	800	600

5. Vitamin information

Type	Vegetables	Vitamins and Minerals
Leafy vegetables	Amaranthus, spinach, Malabar spinach, water spinach, pumpkin leaves, drumstick leaves	Vitamin A, C, and K, Folate, and Iron+ Dietary Fibres
Red coloured vegetables	Pumpkin, Tomato, carrot, among others	Vitamin A
Other	Brinjal, bottle gourd, snake gourd, bitter gourd, and cucumber	Vitamin A and C + Potassium
	Beans, flat green beans, drumstick	Protein, iron, calcium, Folate, Phosphorous
Tuber	Potato, sweet potato, turnip	Carbohydrates, Potassium, and fibre

6. Planting time and period

Vegetable	Months	Days
Bottle gourd	February- March, May-June	140-150
Beans	November-January	90-130
Bitter gourd	March-May	90-125
Ridge gourd	February- March, May-June	120-150
Brinjal	May-June, October-November, January-February	120-150
Chili	February-May	210-240
Long bean	June- September	90-105
Coriander	June-September, October-November	30-40
Cucumber	June-October, January-February	90-100

Vegetable	Months	Days
Carrot	September-November	90-100
Okra	Round the year except the cold winter months	100-110
Pumpkin	February- March, May-June	90-125
Snake gourd	February- March, May-June	135-180
Radish	September-January	45-60
Tomato	October-November, January-February	90-145
White Amaranthus (Kharif)	March-April, October-November	40-100
Red Amaranthus (Rabi)	March-April, October-November	40-100
Amaranthus (White and red)	October-January	30-40
	March-October	40-100

7. Cultivation techniques of common vegetables

Vegetable	Season	Method of planting	Spacing	Seed rate	Pit size	Fertilizer management (for 1 cent area)	Duration of crop	Duration of crop
Amaranthus viridis	All	Seeds should be mixed with sand and broadcast in beds	-	10-15 gms/ cent	-	Farm Yard manure 100 kgs or compost 50 kgs with 2 kgs of neem cake	-	Varies according to variety
Ash gourd Benincasa hispida	July-Nov April	Dec- pits	2.5 x 2 mts	3-4 seeds/ pit	30 x 30 x 30 cms	1 kg of FYM and 100 gms neem cake	Compost or vermicompost 250-500 gms / plant	140-150 days
Beans Phaseolus vulgaris	July- January	Seeds to be dibbled in pits	2 x 2.5 mts	3-5 seeds/ pit	30 x 30 x 30 cms	1 kg of FYM and 100 gms of Neem cake per pit	Vermicompost- 500 gms / pit	6-7 months
Bitter gourd Momordica charantia	Dec - Mar	Seeds to be dibbled in pits	2 x 2 mts	3-5 seeds/ pit	0.5 x 0.5 x 0.5 feet	1 kg of FYM and 100 gms of Neem cake per pit	Vermicompost - 500 gms/ pit	90-125 days
Bottle gourd Lagenaria siceraria	July-Aug Nov	Oct- pits	2 x 2.5 mts	3-5 seeds/ pit	1 x 1 x 1 feet	1 kg of FYM and 100 gms of Neem cake per pit	Vermicompost- 500 gms/ pit	120-150 days
Brinjal Solanum melongena	Dec-Jan	Sown in nursery and transplanted after 28-30 days	75 x 60 cms	2 gms/ cent	-	100 kgs of FYM and 1-1.5 kgs of Neem cake	Groundnut cake - 1 kg/cent	165-180 days
Carrot Daucus carota	July-Feb	Seeds to be sown in ridges	30 x 10 cm	16 gms/ cent	-	100 kgs of FYM and 1-1.5 kgs of Neem cake	Vermicompost 10 kg /cent	100-120 days
Chilli Capsicum annuum	Nov-April	Sown in nursery and transplanted after 40-45 days	30 x 30 cms	5-6 gms/ cent	-	Farm Yard manure 100 kgs or compost 50 kgs with 2 kgs of neem cake	25 kgs vermicompost with 4 kgs of well decomposed poultry manure	210-240 days
Cluster beans- Cyamopsis tetragonoloba	July-Aug Dec	Nov- the ridges	45 x 30 cms	40-50 gms/ cent	-	Farm Yard manure 100 kgs or compost 50 kgs with 2 kgs of neem cake	-	90-105 days
Coriander Coriandrum sativum	June-July Nov	Oct- ridges	20 x 15 cm	50-100 gms/ cent	-	100 kgs of FYM and 1-1.5 kgs of Neem cake	Vermicompost 10 kg /cent	30-40 days
Cucumber Cucumis sativus	June-July April	Jan- ridges	60- 90 cms	4 gm/ cent	-	100 kgs of FYM and 1-1.5 kgs of Neem cake	Neem cake - 1 kg/cent	90 - 100 days

Curry leaf <i>Murraya koenigii</i>	June-July	Seedlings to be raised in the nursery. One year old seedlings to be transplanted in the main yield	10-12 feet	-	1.5 x 1.5 x 1.5 feet	3 kgs of FYM and 300 gms Neem cake before planting	-	20 years
Drumstick <i>Moringa oleifera</i>	June-July	Cuttings to be planted in pits	10-12 feet	-	1.5 x 1.5 x 1.5 feet	3 kgs of FYM and 300 gms Neem cake before planting	-	10 years
Lady's finger <i>Abelmoschus esculentus</i>	Jan-Feb August	Direct sowing in the main field	30 x 30 cms	40 gm/cent	-	100 kgs of FYM and 1-1.5 kgs of Neem cake	Neem cake -- 1 kg/cent	100-110 days
Pumpkin <i>Cucurbita maxima</i>	July-Jan April	Seeds to be dibbled in pits	2 x 2.5 mts	3-5 seeds/pit	1 x 1 x 1 feet	1 kg of FYM and 100 gms of Neem cake per pit.	Compost or vermicompost 250-500 gms / plant	Varies according to variety
Radish <i>Raphanus sativus</i>	June-July Sep in Plains	Seeds to be sown in ridges	15 x 10 cm	40 gm/cent	-	100 kgs of FYM and 1-1.5 kgs of Neem cake	Vermicompost 10 kg /cent	45-60 days
Ribbed gourd <i>Luffa oculangula</i>	July-Dec April	Seeds to be dibbled in pits	2 mts between pits	3-4 seeds/pit	-	1 kg of FYM and 100 gms of Neem cake per pit	Vermicompost- 500 gms/pit	125 days
Snake gourd <i>Trichosanthes cucumerina</i>	July-Dec April	Seeds to be dibbled in pits	2 x 2.5 mts	3-5 seeds/pit	30 x 30 cms	1 kg of FYM and 100 gms of Neem cake per pit	Vermicompost- 500 gms/pit	135-180 days
Tomato <i>Lycopersicon esculentum</i>	Dec-Jan June-Oct-Nov	Sown in nursery and transplanted after 28-30 days	60 x 75 cms	2 gms/cent	-	100 kgs of FYM and 1-1.5 kgs of Neem cake	Groundnut cake -- 1 kg/cent	125-145 days
Vegetable cowpea <i>Vigna unguiculata</i>	June-July Mar	Seeds to be sown in ridges	45 x 15cm 60 x 30 cm	80 gm/cent	-	1 kg of FYM and 100 gms of Neem cake per pit	Vermicompost- 500 gms/pit	75-90 days
Watermelon: <i>Citrullus lanatus</i>	Dec-May	Seeds to be dibbled in pits	2 x 2mts	3-4 seeds/pit	30 x 30 cms	1 kg of FYM and 100 gms of Neem cake per pit.	Compost or vermicompost 250-500 gms / plant	120 days

8. List of plants to be planted based on nutrition

Nutrition	Vegetable/ fruit
Proteins	Broccoli, Spinach, Banana , Strawberry, Water melon
Calcium	Almond, Broccoli, Chinese cabbage, Kale, Orange
Iron	Dark leafy greens , carrot
Vitamin A	Asparagus, Cauliflower, Cabbage, Carrot, Lettuce, Mango, Sweet potato
Thiamin	Green leafy vegetables (Asparagus, Avocados, Broccoli, Cabbage)
Riboflavin	Mushroom, Plantain, Spinach , Apple, Tamarind
Niacin	Asparagus, Broccoli, Mushrooms, Pea nuts
Vitamin C	Grape fruit, Guava, Lemon, Sweet potato, Tomato , Water melon , Drum stick leaves, spinach
Total Folate	Asparagus, Broccoli, Lettuce, Spinach , Strawberries , Beets
Vitamin B Complex	Amaranth
Copper	Yam and radish
Zinc	Sweet Potato
Iodine	Tapioca

9. Companion crops

Vegetable	Companion Plant	Don't Plant Together
Asparagus	Tomatoes	None
Beans (Bush or Pole)	Celery, corn, cucumbers, radish, strawberries and summer savory	Garlic and onion
Beets	Bush beans (not pole beans), cabbage, broccoli, kale, lettuce, onions, garlic	Pole beans
Cabbage Family (cabbage, broccoli, kale, Brussels sprouts)	Beets, celery, dill, Swiss chard, lettuce, spinach, onions, potatoes	Pole beans
Carrots	Beans, tomatoes	None
Celery	Beans, tomatoes, cabbages	None
Corn	Cucumber, melons, squash, peas, beans, pumpkin	Tomatoes
Cucumber	Beans, corn, peas, cabbage	None
Eggplant	Beans, pepper	None
Melons	Corn, pumpkin, radish, squash	None
Onions	Beets, carrots, Swiss chard, lettuce, peppers	All beans and peas
Peas	Beans, carrots, corn, cucumbers, radish, turnip	Garlic, onions
Potatoes	Beans, corn, peas	Tomatoes
Squash	Corn, melons, pumpkins	None
Tomatoes	Carrots, celery, cucumbers, onions, peppers	Corn, potatoes, kohlrabi

10. Care of poultry birds

1. The birds can be fed with maize, broken rice, bajra, jowar, ragi, and rice bran
2. Mix the feed with little bit water for making a mash before giving it to the birds
3. For getting more and bigger eggs the birds should be fed with dried fish powder, scallop/snail powder, earthworm, and termites.
4. Waste food items in the house should be given to the birds.
5. It is advisable to keep the birds in a secured space free from predators while letting them gain weight in the confined space.
6. The chicks up to the age of 21 days, can be kept in bamboo baskets for protection and safekeeping.
7. The birds can be kept inside a bamboo made enclosure or a separate shed according to the financial condition of the rearer.
8. The shed can be made with locally available raw material (timber and bamboo), each bird needs a space of 1 sq ft, and the shed must not be overcrowded.
9. The shed should be well lit with ventilation. There must be facility to clean the shed on a timely manner
10. Nearby shrubs should be cleared to check snakes. Application of ash and lime keeps the lice and ticks in check.
11. MGNREGS has the provision of creation of individual livelihood asset (here the poultry shed) with the following estimates
 - a. 14 female birds, with the sole purpose of eggs: 44 sq ft. = Rs. 30,000
 - b. 48 large indigenous birds: 70 sq ft. = Rs. 36,000
 - c. 48 large indigenous birds: 118 sq ft. = Rs. 52,000
12. Market: The birds should always be sold by weighing and not by mere estimation of weight.

11. Care of goats

1. Each adult goat consumes about 2 to 3 kgs of green leaves/ fodder
2. *Ficus racemosa*, *Acacia nilotica*, *Ficus spp.*, *Azolla*, *Stylo hemata*, *Napier grass*, *gliricidia*, *Ficus spp.*, *radish leaves*, *jackfruit leaves*, *moringa leaves*, *mango leaves*, *maize leaves* are nutritious fodder for the goats. The leaves can be dried to give during the lean season.
3. The cover of legumes is a good source of protein and can be given to the goats.
4. Use of mineral mixture for the goats will increase the shine on the animal, increase milk yield, help in pregnancy, increase urea content in the dung, and helps to avoid the animal drinking its urine.
5. Black salt can be given to animals who have improper digestion and is underweight. It helps lactating animals.
6. Urea Molasses Block should be given to animals having mostly dry fodder.
7. The newborn kid should be wiped off at the nose and mouth portions.
8. The umbilical cord should be cut at a distance of 4.6 cms with a new blade with the application of iodine for 5 days.
9. The newborn should always be fed with colostrum for immunity.
10. The tits of the lactating animal should be washed with Dettol or potassium permanganate.
11. The goat is a very adaptable animal for accommodation. However, it is good to have a separate goat shed if reared for an economic purpose as it protects the animal from predators and nature. It keeps the animal clean and hygienic, hence less susceptible to diseases. This helps the animal to rest and recuperate.
 - a. The shed should have a proper roof to a height of 8 to 9 feet to protect from sun, heat, and rains,
 - b. The floor should have a slope for easy drainage
 - c. The walls should not have any opening to protect from snakes
 - d. Every day, the shed should be cleaned and the dung and urine to be used for making compost
 - e. An enclosure could be made to keep the goats during daytime and deworming and vaccination.
 - f. A water pane and a feeder can be kept for the animals

12. MGNREGS has the provision for the creation of individual livelihood asset (here the goat shed) with the following estimates

- a. 3 does and 6 other goats: 45 sq ft. = Rs. 34,000
- b. 5 does and 10 other goats: 97 sq ft. = Rs. 43,000

13. Market:

- a. The castrated bucks should be sold within the age of 2 years.
- b. Goats with growth issues, old female and diseased goats should be sold off immediately
- c. Healthy Does should be bought at the age of one year
- d. The buck should have equal testicles and should not be aggressive while mating
- e. Inbreeding should be avoided at any cost.