

“Package of Practices of Crops Under Natural Farming in Gujarat”

Sr. No.	Crops
1.	Cotton (Gossypium spp L)
2.	Paddy (Oryza sativa L)
3.	Groundnut (Arachis hypogaea L)
4.	Castor (Ricinus communis L)
5.	Maize (Zea mays L)
6.	Wheat (Triticum aestivum L)
7.	Gram (Cicer arietinum L)
8.	Cumin (Cuminum cyminum L)
9.	Potato (Solanum tuberosum L)
10.	Turmeric (Curcuna longa L)
11.	Onion (Allium cepa L)
12.	Sugarcane (Saccharum officinarum L)
14.	Banana (Musa paradisiaca L)
15.	Mango (Mangifera indica L)
16.	Vegetables

Package of practice of Cotton (Gossypium spp L) in Natural Farming

Land preparation:

100 kg decomposed farmyard manure mixed with 100 kg of Ghan Jivamrit per acre should be applied in the soil before sowing of seeds.

Varieties/Spacing:-

- Deshi and Improved varieties are grown
- Spacing between two row is vary from 90 to 120 X 30 to 45 cm
- Seed rate of Deshi is 8 to 10 Kg / ha

Seed treatment:-

Seeds should be treated with Beejamrit for controlling soil borne and seed borne diseases like anthracnose, black arm of cotton , root rot and seedling rot.

Sowing time:

Monsoon - June to July

Jivamrit application

After sowing, 200 litres of Jivamrit per acre should be given in soil with irrigation water. 200 litres of Jivamrit per acre should be given with irrigation water at an interval of 15 days in a month.

Jivamrit / Saptdhanyankur Spray:

- 1) 1st spray, after one month of planting 5 litre Jivamrit mixed with 100 litre of water.
- 2) 2nd spray, after 21 days of first spray 7.5 litre Jivamrit mixed with 120 litre of water.
- 3) 3rd spray, after 21 days of first spray 10 litre Jivamrit mixed with 150 litre of water.
- 4) 4th spray, after 21 days of first spray 15 litre Jivamrit mixed with 150 litre of water.
- 5) 5th spray, after 21 days of first spray 3 litre sour butter milk mixed with 100 litre of water.
- 6) 6th spray, after 21 days of first spray 15 litre Jivamrit mixed with 150 litre of water.

Intercropping:

Castor, maize, marigold, sesamum, greengram, soybean, muthbean etc. sown as an intercrop

Mulching

After sowing of seeds, plant residue is used as mulching.

Crop protection measures:

- If eggs/larva of any insect seen on the leaves then spray mixed with 3 litres of Brahmastra and 3 litres of Agniastra in 200 litre of water.
- Control of sucking pests: spraying of 200 litres neemasthra per acre.
- Control of Nematode: soil drenching with Brahmastra @ 8 litres/100 litres of water (8% dilution).
- Control of fungus/virus: spraying 3-4 days old butter milk mixed with 100 litre of water.
- Control of Pink boll worm and jassid : 5 to 7 litres Brahmastra in 200 litres water.
- Control of Caterpillar: Agniastra 7.5 litres + 250 litres of water

Harvesting stages:

- Picking of cotton should be done in the morning; because due to humidity there is no sticking of dried leaves and other trash.
- Hand picking is the best and suitable way of harvesting cotton at regular intervals.
- To get more production 3-4 times picking should be practised at regular intervals

Package of practices of Paddy (Oryza sativa L) in Natural Farming**Land preparation:****Paddy Nursery:**

- Proper land preparation and levelling of land. Collect residue of paddy debris in each and every corner of the field. Before final ploughing add GhanJivamrit 400 kg per acre in the soil and irrigate field. Seed treatment with Beejamrit and sowing in row

Spraying

- **1st Spraying** : before sowing (10 litres water + 200 ml filtered Jivamrit)
- **2nd Spraying** : after first spraying (10 litres water + 500 ml filtered Jivamrit)
- **3rd Spraying** : after 5 days of sowing (10 litres water + 200 ml filtered Jivamrit)

Land preparation

Before final ploughing, add 200 kg GhanJivamrit uniformly into the field and irrigate it. Later, add 200 litres Jivamrit solution into the soil and mix it well and puddle the field.

Transplanting system:

Raise the nursery of paddy well in advance. Before transplanting, seedling roots are dipped into Beejamrit solution for 30 minutes. Planting should be done in such a way that easily hand weeding operation may be carried out

Weed management:

- Dicotyledonous plants decompose easily in paddy fields, but monocotyledonous plants do not decompose easily in submerged paddy fields. Therefore monocotyledons should be collected and destroyed from the field.

Varieties

- Early: 60 to 90 days maturity period varieties- IR-28, GNRH-2, Mahisagar
- Medium-Late: 120 days maturity period varieties- masuri, indrani, rajbhog, krisna kamod etc.
- Late: More than 135 days maturity period varieties- Lalakada, Black rice, Brown rice, ambamor, dhudhmalai etc.

Seed rate: Seed rates of 60-90 kg/ha

Spacing: Inter-row spacing of 20 cm and intra-row spacing of 10-15 cm is being followed.

Nutrient management:

- After sowing, application of Jivamrit 200 litres/ acre in soil through irrigation at every 15 days interval.
- Spraying of Jivamrit must be done in moonlight days.

Spraying of Jivamrit: in one acre planting area, spray 200 litres Jivamrit filtered by cotton cloth as per the following details

After one month of sowing	100 litres water + 5 litres Jivamrit
After 15 days of 1 st spraying	150 litres water + 10 litres filtered Jivamrit
After 15 days of 2 nd spraying	150 litres water + 15 litres filtered Jivamrit
After 15 days of 3 rd spraying	200 litres water + 15 litres filtered Jivamrit
After 15 days of 4 th spraying	200 litres water + 20 litres filtered Jivamrit
Milking stage of crop	Sapt dhanyakuran ark/acre or 200 litre water + 5 litres sour Buttermilk

Crop protection measures:-

- When black and red spots start appearing on the plants, apply 200 litres water + 5 litres butter milk (3 day old sour butter milk)+ 15 litres Jivamrit.
- For the control of sucking pests, leaf roller caterpillar and army worm, spray neemastra 5 litres /200 litres water, agniastra 8 litres/200 litres water, brahmastra 8 litres/200 litres water and dashparni ark @ 8 litres/200 litres water in one acre of land.

Package of practices of Groundnut (*Arachis hypogaea* L) in Natural Farming

Land preparation:

Well decomposed FYM @ 250 Kg + GhanJivamrit 250 Kg per hectare should be applied and incorporated in the soil at the time of field preparation.

Varieties and seed rate:

- Bunch type – GG-2, GG-5, GG-7, TG-26, TG-37-A, GJG-9 (120 kg/ha)-60 cm
- Semi Spreading type – GG-20, GJG-22 (100 kg/ha)-45 cm
- Spreading type – GAUG-10, GG-11, GG-12, GG-13, JGJ-HPS-1, GJG-17 (80 kg/ha)-30cm

Spacing and distance:

- A soil depth of 15 - 20 cm is generally considered good for groundnut cultivation.
- This plant spacing are easily accommodated on 1.2 m wide broad beds with 30 cm furrows on either side of the bed.
- Four rows of groundnut at 30 cm spacing is recommended per bed.

Seed treatment:

- Seeds should be treated with beejamrit for controlling soil borne diseases like root rot and seedling rot and collar rot.
- Seed treatment should be done well before sowing so that it should be spread and dried overnight and used for sowing the next morning.
- Before sowing, soak the seeds in cow urine @ 25% solution, which may improve the germination and induce drought hardiness.

Sowing time:

- Early sowing (Last week of May to First week of June)
- Timely sowing (15-30 June as per suitable rainfall)
- Summer - 15th Jan to 15th Feb

Sowing methods:

100 kg decomposed FYM mixed with 100 kg of GhanJivamrit should be applied in the soil before sowing of seeds. After sowing mulching should be done with crop residue. 200 litres Jivamrit should be applied in soil in every 15 days interval.

Irrigation management:

- Irrigation should be given at the following critical growth stages.
- 1st irrigation, 4 - 5 days after sowing, 20 days after sowing, At flowering give two irrigations.
- At pegging stage give one or two irrigations. In pod development stage, 2 - 3 irrigations depending on the soil type.
- After sowing give first two irrigations with 500 litres Jivamrit with water

Jivamrit spray:

- 12.5 litre. Jivamrit + 250 litre. of water at 30 days after sowing (DAS)
- 19 litre Jivamrit + 300 litre. of water at 51 DAS
- 25 litre Jivamrit + 375 litre. of water at 72 DAS
- 37.5 litre. Jivamrit + 375 litre. of water at 83 DAS
- 7.5 litre Sour Buttermilk + 250 litre. of water at 104 DAS

Mix / Intercropping:

Groundnut + Cotton, Groundnut + Castor, Groundnut + Sesamum

Crop protection measure:

- If eggs/larvae of any insect are visible on the leaves then mix the spray with 3 litres of brahmastra and 3 litres of agniastra in 200 litres of water.
- Control of sucking pests: -Spraying of 200 litres neemastra per acre.
- Control of Nematode: - soil drenching with @ 8 litres/100 litres of water (8% dilution).
- Control of fungus/virus: - Spraying 3-4 days old butter milk mixed with 100 litre of water.

Harvesting stage :

-90 to 120 Days After Sowing

Package of practices of (Castor *Ricinus communis* L) in Natural Farming**Land preparation:**

Ghan Jivamrit @ 250 Kg per hectare should be applied and incorporated in the soil at the time of field preparation.

Varieties

GCH-1,2,3,4,5 and 7 varieties should be select for castor in Gujarat

Spacing:

- Spacing in low fertile soil - 90 cm x 60 cm under rainfed and 90 cm x 20 cm under irrigated conditions (North Gujarat) and in fertile soil - 120 cm x 60 cm.
- The seeds may be sown at a 8 cm depth behind the plough or planter.
- Seed rate is 8 to 10 kg/ha

Seed treatment:

Seeds should be treated with beejamrit for controlling seed and soil borne diseases

Sowing time:

Around 15th August is best time for sowing

Irrigation management:

- Castor being a deep-rooted crop can extract water from considerable depth in the soil. Irrigations may thus be relatively heavy and less frequent. For higher yields wherever possible 2-3 heavy irrigations may be given.
- Under irrigated conditions, 3-4 irrigations at an interval of 15 to 20 days should be given after cessation of monsoon

Jivamrit application:

After sowing 200 litres Jivamrit per acre with first irrigation after that every month 200 litres Jivamrit is given to every irrigation.

Jivamrit spray:

After one month of sowing Jivamrit should be applied at an interval of 25 days.

Mix / Inter cropping:

- Castor + Sunflower (1:2)
- Castor + Soybean (1: 1)
- Castor + Cluster bean (2: 1)

Mulching:

Mulching is done in castor by crop residue

Crop protection measure:

- Initially, spray of neem oil or neemastra should be done for control of sucking pests like thrips and whitefly @ 200 litre per acre.
- For caterpillars and insects, dashparni ark/ agniastra should be sprayed at recommended dose @ 7.5 litre + 250 litre of water
- The use of sour buttermilk or Sonthaster for fungal diseases in castor gives best results @ 7.5 litre sour buttermilk + 250 litre of water

Package of practices of Maize (Zea mays L) in Natural Farming**Land preparation:**

Ghan Jivamrit @ 200 kg per hectare should be applied and incorporated in the soil at the time of field preparation.

Varieties:

Gujarat maize -2, Gujarat maize -4, narmada moti, ganga safed-2, etc

Spacing: 60 cm X 20 cm.

Seed rate: 15 to 20 kg per hectare

Seed treatment:

- Seeds are treated with beejamrit for controlling soil borne diseases and healthy growth.
- Treatments should be given a day before sowing; Soak seeds overnight and use for sowing on the next day

Sowing time:

- Kharif season crop: Seed is sown in the month of June-July.
- Rabi season crop: Seed is sown in October- November.

Irrigation:

- The Kharif crop requires irrigation only when there is an extended period of water stress.
- However, the Rabi crop needs frequent irrigation at intervals of 15-20 days.

Use of Jivamrit in Soil:

Apply Jivamrit @ 200 litres per acre with irrigation water after planting. Later on, 200 litres of Jivamrit are given twice in a month with irrigation water.

Spraying schedule of Jivamrit:-

- 1st Spray: After one month of planting apply 5 litres of Jivamrit mixed with 100 litres of water.
- 2nd spray: After 21 days of first spray apply 7.5 litres of Jivamrit mixed with 120 litres of water.
- 3rd spray: After 21 days of second spray apply 10 litres of Jivamrit mixed with 150 litres of water.
- 4th spray: After 21 days of third spray apply 15 litres of Jivamrit mixed with 150 litres of water.
- 5th spray: After 21 days of fourth spray apply 3 litres of sour butter milk mixed with 100 litres of water.

Mix / Intercropping:

As per Agro climatic zone, intercropping is to be done, maize-pigeon pea 1:1 or maize-castor or maize-groundnut 2:2

Crop protection measure:

- 1) For control of sucking pests: Spraying of neemastra 200 litres per acre.
- 2) For control of worms: Spraying of brahmastra @ 3 litres/100 litres of Water.
- 3) For control of borer, FAW and fruit fly: Spraying of agniastra @3 litres /100 litres of water.
- 4) For control of fungus/virus: Spraying 3-4 days old 3 litres of butter milk mixed with 100 litres of water.

Package of practice of Wheat (*Triticum aestivum* L) in Natural Farming

Land preparation:

With available FYM, apply GhanJivamrit @ 250 Kg per hectare in the soil at the time of field preparation.

Varieties:

Timely sowing: Lok – 1, GW-366, GW-322, GW-496, GW-451, GW-503, GW-190, GW-273

Limited irrigation – GW-1139, GW-1255, HI-8489

Seed rate and seed treatment:-

- 125 kg seed per hectare required for regular sowing and 125-150 kg seeds for late sowing
- Seeds should be treated with beejamrit for controlling soil borne diseases like root rot and seedling rot.
- Treatment should be given the previous night and treated seeds should be dried overnight and used for sowing in the next morning.

Sowing time:

- Early sowing (1st week of Nov.)
- Timely sowing (10-15 Nov)
- Late sowing (25 Nov. to 15 Dec.)

Spacing and distance:

- Row to row – 25cm
- Plant to plant – 5cm

Irrigation schedule:

- First irrigation 20-25 days after sowing (Crown root initiation stage).
- Second Irrigation 40-45 days after sowing (tillering stage).
- Third Irrigation 70-75 days after sowing (late jointing stage).
- Fourth Irrigation 90-95 days of sowing (flowering stage).
- Fifth Irrigation after 110-115 days of sowing (dough stage)

Use of Jivamrit in Soil:

200 litres of Jivamrit should be given in soil with irrigation water after planting for one acre land. 200 litres of Jivamrit should be given with irrigation water two times in a month.

Spraying schedule of Jivamrit:-

- 12.5 litres Jivamrit + 250 litres of water 30 DAS
- 19 litres Jivamrit+ 300 litres of water 51 DAS
- 25 litres Jivamrit+ 375 litres of water 72 DAS
- 37.5 litres Jivamrit + 375 litres of water 83 DAS
- 7.5 litres Sour Buttermilk + 250 litres of water 104 DAS

Mix / inter cropping:

Red Gram, Maize, marigold, sesamum, etc. sown as intercrop.

Crop protection measure:

- Sucking pest – 7.5 litres of neemastra + 250 litres water
- Control of Nematode: -soil drenching with brahmastra @ 8 litres/100 litres of water (8% dilution).
- Caterpillar –Agniastra (7.5 litres) + 250 litres of water
- Fungus and Viruses - 7.5 litres of sour buttermilk + 250 litres of water

Package of practices of Gram (Cicer arietinum L) in Natural Farming**Land Preparation:**

In case of a normal monsoon, the land should be prepared with 1-2 cross harrows. This may help in conservation of moisture in the soil. If delayed monsoon the land is prepared with one ploughing. In winter months farmers add about 200 to 500 litres/acre “Jivamrit”. If farm is not filled with flood then they use about 200 to 400 kg/acre “GhanJivamrit”.

Selection of Variety, spacing and seed rate:

Gujarat desi CHANA-3 and Gujarat desi CHANA-5 varieties have a higher productivity. It shows moderate tolerance to diseases and pests which is popular among farmers. Therefore farmers prefer these varieties in natural farming.

Variety	Spacing(cm)	Seed rate(Kg/ha)
Gujarat chana-1	45 cm	70-90Kg/ha
Gujarat chana-2	30-45 cm	80-100 Kg/ha
Gujarat chana-3	10-15 cm	100 Kg/ha
Gujarat chana-5	45 cm	60 Kg/ha

Seed treatment:

- Seeds are treated with beejamrit for controlling soil borne diseases like root rot and seedling rot.
- Treatment is given the previous night and treated seeds are dried overnight and used for sowing.

Sowing time:

- Sowing time: 15th October to 15th November.

Irrigation management:

There is no need of irrigation because of field is fully filled with water in entire/full monsoon season

Use of Jivamrit in Soil:

200 litres of Jivamrit is given in soil with irrigation water after sowing for one acre land. 200 litres of Jivamrit are given with irrigation water two times in a month.

Spray schedule of Jivamrit for one acre land:

12.5 litres of Jivamrit + 250 litres of water at 30 DAS

19 litres of Jivamrit + 300 litres of water at 51 DAS

25 litres of Jivamrit + 375 litres of water at 72 DAS

7.5 litres of Jivamrit + 250 litres of water at 104 DAS

Crop protection measure:

- Spray agniastra @ 5 litre /acre after 21 days after sowing for protecting the crop from the infestation of larvae. Aphids and other sucking pests are easily controlled with the help of dashparni ark, brahmastra, agniastra, neemastra etc.
- There is no major disease identified in the crop. Bacterial blight, fusarium wilt and root rot are easily controlled with sonthastra and castor cake.

Package of practices of Cumin (Cuminum cyminum L) in Natural Farming

Land preparation:

- Seedbed preparation is done after harvesting of kharif groundnut. As cumin is a shallow rooted crop so deep ploughing is required.
- Cumin is a medium duration crop, so before sowing apply ghanJivamrit @ 250-300 kg/acre along with neem cake

Selection of variety:

Maturity days- 90-100: Gujarat 4 varieties mostly cultivated in the State.

Spacing: Broadcasting method of sowing is most common

Seed rate: 15 to 16 kg/ha

Seed treatment:

Seeds are treated with beejamrit and dried in shade for 3-4 hours before sowing. Sowing is done with the help of seed drill.

Sowing time:

Sowing time -1 to 15th November.

Nutrient management:

- 1st: First spray should be done on next day after sowing
- 2nd: 7-day after sowing
- 3rd: After 1 month of sowing irrigation should be given along with 200 litre of Jivamrit
- 4th: At Flowering stage in 45 days to give saptdhanyankur ark to improve the quality and size of the seeds.
- 5th: After 65 days of sowing apply 200 litres of Jivamrit

Jivamrit spray:

At the time of 3rd irrigation apply Jivamrit @ 1 litres Jivamrit + 15 litres water. Subsequently sprays of Jivamrit are done at an interval of 15 days (3-4 times till crop period ends).

Crop protection measure:

- For the management of termite, apply mixture of dhatura 1 kg + aakda 1 kg + 30 litre cow dung slurry + 1 kg gram flour + 2 to 3 kg sajeev mati with irrigation.
- For the management of alternaria blight, spray of 7 to 10 days old butter milk should be done at the appearance of disease.
- Spray of cow urine, neem oil, neemastra and dashparni ark for management of sucking and caterpillar pests.
- Old buttermilk or sonthastra may be used for fungal control.

Package of practices of Potato (*Solanum tuberosum* L) in Natural Farming

Land preparation:

100 kg decomposed FYM mixed with 100 kg of GhanJivamrit is applied in the soil before planting of potato.

Selection of Variety, Spacing & Seed rate:

Varieties: Kufri pukhraj, Kufri Badshah, Kufri Jyoti

Seed rate: 1.5 to 2.5 tons per hectare.

Spacing: Row to row distance of 45 to 60 cm and plant to plant 15 to 20 cm should be maintained

Seed treatment:

Potatoes are propagated vegetative from tubers, either whole or cut into pieces. Many diseases are carried by seed potatoes and disastrous results may follow the use of diseased seed. So, seed should be treated with Beejamrit

Sowing time:

To secure high yields, it is essential to plant the potatoes at the optimum time. The best time of planting is when the maximum and minimum temperature is from 30 C to 32 C and 18 to 20 C, respectively.

- Early crop – 25th September to 10th October
- Main crop – 15th October to 25th October
- Timely Sowing -15th Oct to 15th November

Irrigation Schedule:

Potato crop is very much responsive to good water management and removal of excess water is essential. Due to soil moisture conservation in Natural Farming irrigation should be moderate.

Jivamrit application:

200 litres Jivamrit is given in soil at an interval of 15 days with irrigation water.

Spray schedule:

- 1) 1st spray, after one month of planting, @ 5 litres of Jivamrit mixed with 100 litres of water.
- 2) 2nd spray, after 35 days of planting, @ 10 litres neem oil mixed with 100 litres of water.
- 3) 3rd spray, after 40 days of planting, @ 10 litres Jivamrit mixed with 150 litres of water.
- 4) 4th spray, after 43 days of planting, apply 10 litres of sour butter milk mixed with 100 litres of water.
- 5) 5th spray, after 50 days of planting, apply 10 litres of bramastra and 10 litre agniastra mixed with 200 litre of water.
- 6) 6th spray, after 65 days of planting, apply 20 litre of Jivamrit mixed with 200 litre of water.

7) 7th spray, after 70 days of planting, apply 10 litre of sour butter milk mixed with 100 litre of water.

Mulching:

After planting, mulching should be done with crop residues.

Crop protection measure:

- Sucking pest – Spray 7.5 litre of Neemastra + 250 litre water
- Control of Nematode: - soil drenching with Brahmastra @ 8 litres/100 litres of water (8% dilution).
- Caterpillar –Spray of Agniastra 7.5 litre + 250 litre of water
- Fungus and Viruses - Spray of 7.5 litre of buttermilk + 250 litre of water

Harvesting time:

110 days after planting

Package of practices of Turmeric (*Curcuma longa* L) in Natural Farming

Land preparation and planting method:

- Generally, land is prepared with plough at a depth of 6 to 7 inch followed by land leveller and bund former.
- Beds are prepared 4 feet apart. Turmeric is planted in two lines and plant to plant distance is kept at 3 inches. The turmeric planting is done with drumstick as a mixed crop.
- At the time of land preparation, apply 5 to 6 tons of Ghanjeevramrit per hectare + 2 to 3 tons of castor cake per hectare into soil.

Selection of seeds:

There are so many varieties available for turmeric. Variety selection largely depends on many factors like availability of seed, end use i.e. either value addition into powder, tablet, curcumin oil extract or direct selling to the market. At present, famous varieties among farmers are Salom, Pratibha and Rajapuri.

Spacing and distance:

- Flat Beds: Used under rainfed conditions where soils are light. Flat beds of 1 m in width and of suitable length varying according to the slope of land are prepared.
- Ridges and Furrows: Under irrigated conditions where the land is levelled or plain and soils are heavy, planting is done on ridges and furrows, opened at 75 cm distance and having 3-3.5 m length. Broad ridges should have 90 -100 cm width and 3 – 6 m length depending on the slope.

Seed rate and seed treatment:

Approximate 2500 to 2800 kg per hectare well grown mother rhizomes are required for sowing. Seeds are treated with Beejamrit for controlling soil borne diseases.

Sowing time:

Ideal time for sowing is after 20th May to 15th June, depends on the water availability and moisture condition of the field

Irrigation schedule

- It is a long-term crop that's why frequent irrigation at the interval of 7 to 16 days is required.
- By drip irrigation system at 10 days intervals till June

Spraying schedule of Jivamrit:

1st : 5 Litre jeevavit mixed with 100 litres of water and sprayed 15 days after planting.

2nd : 20 litre Jivamrit mixed with 150 litres of water and sprayed 21 days after first spray.

3rd : 20 litre Jivamrit mixed with 200 litres of water and sprayed at 21 days after second spray

4th : 5 litre sour butter milk mixed with 200 litres of water and sprayed 21 days after the third spray.

5th : 20 litre Jivamrit mixed with 200 litres of water and sprayed 21 days after the fourth spray.
6th : 20 litre Jivamrit mixed with 200 litres of water and then sprayed 21 days after the fifth spray.

Mix / intercropping:

Pulses, onion, garlic, etc. should be grown as companion crops.

Crop protection measure:

Mostly attack of shoot borer, thrips and rhizome scale prevail in the area. It is easily controlled with the Dashparni Ark, Nimastra etc. in the natural farming system.

Package of practice of Onion (*Allium cepa* L) in Natural Farming

Land preparation:

Apply 100 kg of ghanJivamrit per one acre of land for better crop growth.

Seed rate, selection and treatment:

- Seed rate varies from 8 to 10 kg/ha.
- Selection of seeds is also important. Seeds should be free from damage of disease as well as insect-pests. Seed treatment with beejamrit provides protection of seed from pathogens and insect pests and leads to better germination, growth and vigour.

Sowing, transplanting and harvesting timings:

Season	Time of seed sowing / nursery	Time of transplanting	Time of harvesting
Early Kharif	February.-March	April-May	Aug.-Sept.
Kharif	May-June	July-Aug.	October-December
Late Kharif	August-September	October-November	Jan.-Mar.
Rabi	October-November	December.-January	Apr.-May

Method of sowing:

- Generally sowing of seeds is done in raised nursery beds. The surface of beds should be smooth and well levelled.
- Raising seedlings and transplanting is the most common method practice for irrigated crops as it results in large size bulbs and high yield.
- In plains, seeds are sown during October-November for a rabi crop.
- In the hills, seeds are sown from March to June. Seeds are first sown in well prepared nursery beds of 90-120 cm width, 7.5-10.0 cm height and convenient length. Ratio between the nursery area and the main field is about 1:20. Seedlings of 15 cm height and 0.8 cm neck diameter are ideal for transplanting and this is achieved in 8 weeks. However, it varies from 6-10 weeks depending on soil, climate and rainfall. There is a practice of topping seedlings at the time of

transplanting, if seedlings are overgrown.

Spacing and distance:

When the seedlings are 6 to 8 weeks old, transplant at a distance of 10 x 10 cm or 15 x 10 cm in the prepared bed.

Irrigation schedule:

Onion is mainly grown as an irrigated crop in the State. Frequency of irrigation depends on soil and climatic conditions. Requirement of water varies with stages of crop. It requires less water immediately after establishment of seedlings but later on its requirement increases with maximum requirement before maturity (around 3 months after transplanting), and thereafter it reduces. So irrigate the crop at 13-15 days interval during the early stage followed by subsequent irrigations at 7-10 days interval.

Nutrient management:

GhanJivamrit at the time of sowing or preparation of soil by spreading 200 kg of ghanJivamrit all over a field of one hectare area. During the flowering stage, apply 100 kg of ghanJivamrit in one hectare.

Mix / Inter cropping:

- Intercropping is possible as onions are planted at short distances. But rotation and mixed cropping in onions should be carried out by following vegetable crops such as cauliflower, tomato and potato, which require large quantities of FYM.
- During the initial five months after planting sugarcane, onion is grown as an intercrop.

Crop protection measure:

- For the control of insect pests farmers use different plant based formulations available with them. Neemastra formulations are used to manage sucking insects i.e. aphid, thrips and whitefly initially.
- Various other formulations like agniastra, brahmastra and dashparni ark are used for the control of other major pests.
- For the control of various diseases like purple blotch, Alternaria leaf spot, powdery mildew, downy mildew, collar rot, etc. spraying of Jivamrit, Sonthastra, and 10 days old buttermilk, etc. are common practice in natural farming.

Schedule of Jivamrit application for nutrient management:

Spraying	Time of Spraying	Dose
First spray	After one month of sowing	5 litre of Jivamrit in 100 litre of water

Second spray	15 Days after first spray	10 litre of Jivamrit in 150 litre of water
Third Spray	15 Days after second spray	15 litre of Jivamrit in 150 litre of water
Fourth Spray	15 Days after third spray	15 litre of Jivamrit in 200 litre of water
Fifth Spray	15 Days after fourth spray	20 litre of Jivamrit in 200 litre of water
Sixth Spray	15 Days after fifth spray	20 litre of Saptdhanyankur ark or 5 litre of 3 day old buttermilk in 200 litre of water

Package of practice of Sugarcane (*Saccharum officinarum* L) in Natural Farming

Land Preparation:

Land is ploughed before planting. 400 litre of Jivamrit with water is applied and 400 Kg GhanJivamrit is added to the soil.

Planting time: 10th August to 10th November

Seed rate: -20.5 quintals per acre.

Seed treatment: Dip sugarcane nodes in beejamrit for 10 minutes.

Planting methods:

Before planting sugarcane, grow any pulse crops. Prepare beds at 4 feet distance. Sugarcane is planted in two lines. Between the two lines of sugarcane, vegetables and one line of pulse crops are sown as intercrop.

Irrigation Schedule:

Irrigation is given in each bed for up to 3 months and after 3 months irrigation is given in an alternate bed.

Spraying schedule (per acre):

- 1) 5 litre Jivamrit mixed with 100 litres of water one month after planting.
- 2) 20 litre Jivamrit mixed with 150 litres of water 21 days after 1st spray.
- 3) 20 litre Jivamrit mixed with 200 litres of water 21 days after 2rd spray.
- 4) 5 litre sour butter milk mixed with 200 litres of water 21 days after 3rd spray.
- 5) 20 litre Jivamrit mixed with 200 litres of water 21 days after 4th spray.
- 6) 20 litre Jivamrit mixed with 200 litres of water 21 days after 5th spray.

Intercropping:

Pulses, onion, garlic, turmeric etc. are grown as companion crops.

Crop protection measure:

- If any eggs/larvae of insects are visible on the leaves, spray a mixture of 3 litres of brahmastra + 3 litre of agniashtra in 200 litre of water.
- If an attack of any fungus is observed, spray a mixture of 3 litres sour buttermilk in 150 litre of water.

Package of practices of Banana (*Musa paradisiaca* L) in Natural Farming

Land preparation

At the time of land preparation, apply 200 kg ghanJivamrit thoroughly in the soil.

Selection of plants:

- Cavendish – Small size variety called elaichi banana also.
- Robusta- Medium height G-9 Bajrangi etc.
- Deshi- It grows high –creates a family (suckers) and is very sweet in taste.
- Rhizomes having 400 to 500 gm weight are selected for planting.

Seed treatment:

Rhizomes are dipped into beejamrit culture and then sown in the pit.

Planting time:

Mainly bananas are planted from June to August

Spacing: 6 X 6 feet

Planting method:

Beejamrit treatment by dipping sucker of banana and treated sucker are kept in shadow for 24 hours for drying. Dug the pit at 6x6 feet row spacing. The pits are prepared 1.5x1.5x1.5 feet and fill it with soil and 150 gm ghanJivamrit. After drying, suckers are planted in the prepared pit and light irrigation applied.

Irrigation Schedule:

After planting, irrigation is given in all furrows. After 3 months, irrigation is done in alternate furrows with Jivamrit. New shoots arising from rhizomes are cut and kept on the soil as mulching.

Crop protection measures:

There is no infestation of insect- pests and diseases are observed in the crop in natural farming so no need to spray neemastra, agniastra etc.

Mix / Intercropping:

Marigold, onion, cluster bean and vegetables are planted as intercrops. Jivamrit is applied with irrigation water at 15 days intervals.

Nutrient management:

Cluster beans fix N from air till fourth month to banana and chilli, after four months, pigeon pea will continuously fix nitrogen. Marigold will protect the banana plant from nematodes. Honeybees will attract beneficial farm insects, which will protect the plant from insects and also be useful in pollination. Production of more **humus** in banana crops due to mulching, which helps to grow banana stems and also increase fruit yield.

Stems are kept as such after harvesting, and mulching by cutting its leaves. When the side suckers grow

the plant juice will transfer from the mother plant to suckers which help to grow fast. After second year all the side suckers are removed by leaving two side suckers of opposite direction. So, that banana produces fruits for number of years without planting new plant. When new banana leaves produce, the oldest leaves turn yellow and fall down which provide nitrogen, phosphorus, potassium and magnesium to the roots of mother plant. They also provide calcium, iron, manganese, boron and zinc.

Spraying Schedule of Jivamrit: In one acre planting area 200 litre Jivamrit filtered by cotton cloth is sprayed at initial stage :

1 st	After one month of sowing	100 litre water + 5 litre Jivamrit
2 nd	21 days after 1 st spraying	150 litre water + 10 litre Jivamrit
3 rd	21 days after 2 nd spraying	200 litre water + 20 litre Jivamrit
4 th	21 days after 3 rd spraying	200 litre water + 5 litre sour buttermilk + 15 litre Jivamrit
5 th	1 month after 4 th spraying	200 litre water + 20 litre Jivamrit at fruit setting stage
6 th	Milking stage of crop	Sapt dhanyakuran ark + 5 ltr sour buttermilk in 200 ltr. water

After Fruit Setting

1 st	15 days after fruit setting	200 litre water + 10 litre Jivamrit on leaves and fruits
2 nd	15 days after 1 st spraying	200 g rice powder, 200 g powder of white/black in 5 litre water -boil until half of the water evaporates and let it cool down at room temperature, add 200 litre of water and 500 g jaggery, filter by cotton cloth and spray immediately.
3 rd	15 days after 2 nd spraying	200 litre water + 15 litre Jivamrit
4 th	15 days after 3 rd spraying	Sapt dhanyakuran ark without adding water
5 th	15 days after 4 th spraying	200 litre water + 20 litre Jivamrit

6 th	15 days after 5 th spraying	200 litre water + 2 litre coconut water/Saptdhanyakur ark without adding water
7 th	15 days after 6 th spraying	200 litre water + 5litre sour buttermilk
8 th	15 days after 7 th spraying	Saptdhanyakur ark

Package of practice of Mango (*Mangifera indica* L) in Natural Farming

Preparation of land:

Usual ploughing, harrowing and levelling as well as preparation of irrigation channels. Square system of planting is most convenient for mango cultivation.

Selection of seedlings:

Selection of good and healthy plants, getting of native mango stones and grafting of Kesar mango stalks on it.

Planting time:

According to the natural method, mangoes are planted in the month of July-September. At that time, the soil is fertile due to high moisture content and micro-organisms in the soil.

Systems of planting:

The systems in vogue are the 1. Square 2. Rectangular 3. Quincunx 4. Hexagonal and 5. Contour. Square system is the most common in mango. The planting distance will vary with the vigour of the cultivar and the location ranging between 12x12 ft.

Preparation of pits and planting:

- Dig pit at a distance of 12 to 15 feet in the mango orchard and Jivamrit, ghanJivamrit are applied in it.
- Planting distance will vary according to vigour of variety and type of soil.
- Pits of 1.5x1.5x0.5 feet are dug during summer (two months before monsoon) and kept open under the sun. Pits are filled with ghanJivamrit upto ¼ of pit + 0.5 litre Jivamrit. Before planting, grafts/seeds are treated with beejamrit.
- Planting is done during the rainy season when the soil in the pits has already settled. While planting, the earth ball should not be broken, and the graft union remains well above the ground level. The planting is preferably done during cloudy weather and in the evening. The plants are irrigated immediately after planting. Mix cropping with drumstick, pomegranate etc., provide sufficient sunlight and nutrients for the mango plantation.

Irrigation schedule:

- Irrigation in mango orchards at an interval of 30 days in winter and 15 days interval in summer. If drip irrigation is done, give 20 litres in winter and 20 litres in summer at an interval of a day. In summer, cover dry leaves around the trunk so that moisture is retained. Two to three irrigations in the month of March / April are required.
- It is a long duration crop that's why its required frequent irrigation at the interval of 7 to 16 days according to the soil condition.
- By drip irrigation system, give irrigation at 10 days intervals till June.

Crop protection measures:

- Use Brahmastra, Agniashtra, Sonthastra, Khati Chhach etc. according to the pest & disease found in mango crop.
- Spoiled or bird-eaten mangoes are kept in a 500-litre tank of water for 6 months and then sprayed to provide natural hormones.
- To prevent falling flowers, add Hing in buttermilk and use after 10 days.
- Mango is prone to damage by a large number of pests, diseases and disorders. The most important of the recommended and common control measures are summarised below:
 - **Mango Hopper:** Two sprays of Agniashtra (at panicle stage).
 - **Mealy Bug:** Spraying Neemastra in November.
 - **Powdery mildew:** Two to three sprays of sour buttermilk or sonthastra in 10-15 days.
 - **Anthracnose:** Two sprays of Dashparni ark at fortnightly intervals.
 - **Fruit drops:** Regular irrigation during fruit development for timely and effective control.
 - **Mango malformation:** Frequently remove the malformed part.

Mix / Intercropping:

- Initially fenugreek, chickpeas, and vegetables are planted around the plant trunk as intercrops.
- Green turmeric is planted after thickening of ageing as turmeric turns the soil green and provides a good amount of nitrogen.

Schedule of Jivamrit application for nutrient management:

- Spraying of Jivamrit on the day of Poonam, the plant absorbs more nutrients.
- Jivamrit are applied through placement in circular trenches around the trunk of the tree.

Age of the tree	Jivamrit litre / tree	Ghan Jivamrit kg / tree
First Year	1	1
Second Year	2	2
Third Year	3	3
Fourth Year	4	4
Fifth Year	5	5
Sixth Year	6	6

Seventh Year	7	7
Eighth Year	8	8
Ninth Year	9	9
Tenth Year	10	10

Package of practice of Vegetables in Natural Farming

Land preparation:

For green manuring, leguminous crops like dhaincha, sunhemp, etc. are grown, and spray 200 litres of Jivamrit with irrigation water

Seed treatment:

Seeds are treated with Beejamrit culture for 7 hrs and then dried in shadow before sowing.

Planting methods:

- In case of intercropping, spacing between two plants is 2 feet and a raised bed is prepared at 4 feet.
- In case of intra-cropping, spacing between plants is 2.5 feet and raised bed is prepared at 5 feet and Jivamrit is applied on raised bed.
- Decomposed FYM mixed with 25 kg ghanJivamrit is applied in the field.
- Brinjal, chilli, tomato, cucumber, bottle gourd, bitter gourd, water melon, musk melon etc. seeds are treated with beejamrit and sown on two sides of the bed slopes.
- Cluster bean, marigold is sown on both sides of raised bed at lower sides.

Use of Jivamrit in soil:

200 litres of Jivamrit should be given in soil with irrigation water after planting. 200 litres of Jivamrit should be given with irrigation water at an interval of 15 days in a month. 6 times Jivamrit require for vegetable crops with irrigation water. Spray 10 percent desi cow urine, if the crop becomes yellow.

Spraying schedule of Jivamrit:

- 1st Spray: After one month of planting, spray 5 litres of Jivamrit mixed with 100 litre of water.
- 2nd spray: After 21 days of first spray, apply 7.5 litres of Jivamrit mixed with 120 litre of water.
- 3rd spray: After 21 days of Second spray, apply 10 litres of Jivamrit mixed with 150 litre of water.
- 4th spray: after 21 days of Third spray, apply 15 litres of Jivamrit mixed with 150 litre of water.
- 5th spray: after 21 days of fourth spray, spray 3 litres sour buttermilk mixed with 100 litre of water.
- 6th spray, after 21 days of first spray 15 litres Jivamrit mixed with 150 litre of water.

Crop protection measures:

- Control of sucking pests: Spraying of neemastra @ 200 litre per acre of land
- Control of Worm: Spraying of bramastra @ 3 litre/100 litre of water.

- Control of shoot borer and fruit fly: Spraying of agniastar @3 litre/100 litre of water.
- Control of fungus/virus: Spraying 3-4 days old butter milk mixed with 100 litre of water.