



# **Cultivating Medicinal and Aromatic Plants in Shallow Basaltic Soil**

**Technology Data Repository**

**ICAR-National Institute of Abiotic Stress Management  
Baramati, Pune, Maharashtra**

## Technology Data Repository

### General

#### Part 1

Technology Code -----

#### Organization Details

Subject Matter division: Natural Resource Management  
Organization Name: ICAR- National Institute of Abiotic Stress Management

#### Details of Inventors

Principal Inventor: Harisha CB  
PI Designation: Scientist (Spices, Plantation, Medicinal and Aromatic plants)  
PI Email: Harisha.B@icar.gov.in  
PI Address: ICAR-NIASM, Baramati, Pune, Maharashtra  
Co-Inventor Name: Dr. D.D. Nangare, Dr. Pravin B Taware  
Co-Inventor Email: dd.nangare@icar.gov.in, pravin.taware@icar.gov.in  
Technology Name: Cultivating Medicinal and Aromatic Plants in Shallow Basaltic Soil

#### Technology Details

Major Resource: Natural resource management  
Minor Subject Classification: Plant production  
Minor Subject Sub Classification: crop husbandry  
Technology Group: crop production under and Abiotic stress mitigation  
Technology related to: Land use and species selection under abiotic stress

#### Complete Details of Technology

A technology for establishment of perennial medicinal and aromatic species on superficially subdued basalt igneous rocky area has been developed. In this technology, pits of 1 m x 1 m dimensions with 1 m depth are prepared with the help of excavator machine. As the rock is very hard, breaking the hard pan with stone breaker to loosen the lower portion of the pits. The pits are filled with soil mixture comprising native murrum soil with black soil in 1:1 proportion along with 20 kg farm yard manure (FYM). The various medicinal and aromatic species (climbers, trees, and shrubs) saplings are planted in the pits followed by watering. The standard canopy management practices are followed to achieve satisfactory development during the subsequent years.

#### Brief Description of Technology Including Salient Features

In peninsular India, lands with superficially subdued basalt igneous rocks exist in large areas. These lands are porous, shallow and gravelly with low in organic matter, high bulk density and

poor water retention capacity. In these shallow basaltic soils, poor soil content, low water retention and presence of hard rocks and murrum are the major constraints for establishment of any plant species and also all species of plants can not perform well under this type of soil. To overcome this situation pit opening by stone breaker to develop loose substrata in the hard rock facilitating better root penetration. Further native soil devoid of stones mixed with black soil in 1:1 proportion to fill these pits, results in good initial stand of plants due to enhanced moisture holding at root-zone. Soil and water conservation measures such as mulching, half-moon shape bunds and *In-situ* water harvesting was also practiced. Tree species such as *Azadirachta indica*, *Butea monosperma*, *Putranjeeva roxburgaii*, *Ptreocarpus santalinus*, *Satalum album*, *Sapindus sp*, *Cassia sinuat*, *Gmelina arborea*, *Limonia acidissima*, *Swertania mahgoni*, *Terminalia sp*. *Aegle marmelos*, *Pongemiapinnata*. Among small trees/shrubs *Adathoda zylanica*, *Lawsonia inermis*, *Commiphora wightii*, *Eucalyptus globra*, *Premna integrifolia*, *Vitex nigundo* and *Carissa caronda* establish better under this edaphic condition. The climbing plants such as *Tinospora cordifolia*, *Gymnema sylvestre*, *Cissus quadrangularis*, *Abrus precatorius* *Jasminum sambac* and *J. grandiflorum* are better in terms of growth pattern and establishment in soil and moisture stress condition. These species are hardy and can grow better in shallow basaltic soil conditions.

### Benefits/Utility

India has 6.4 million hectare of barren rocky land, which is unsuitable for cultivation of commercial crops due to poor soil conditions. The technology of utilization of barren and rocky basaltic soils for growing medicinal plants and establishing herbal garden which provides an opportunity for the conservation of dry land rare endangered and threatened (RET) species. Half moon trenches will help for conserving soil moisture for successful establishment of tree plants. Proper pruning and training management practices and plant geometry also help for successful establishment of plant species and also identifying suitable plant species for shallow basaltic rocky lands. The standardised establishment methods will benefit for conservation of RET species, alternate land use and improvement in biodiversity of location by diverse plant species.

### Precaution with the Technology

NA

### How to Use

- **Making pits:** Prepare the layout marking in fields as per spacing recommendations and dug pits with the help of excavator machine. If the rock is very hard, breaker may be used to achieve required depth. Final pit dimension to be maintained as 1 m x 1 m with depth of 1 m. Remove all the materials from pit and keep only fine material aside for filling mixture.
- **Filling of pits:** Pits so formed are to be filled with soil mixture. Mix native murrum soil with black soil in 1:1 proportion and fill in the pit along with 20 kg FYM.
- **Planting:** Re-mark the layout, bigger trees can be grown on 6 x 6 m spacing and smaller trees shrubs and climber can grow on 4 x 4 m spacing. Plant the saplings in the pits followed by immediate watering.
- **Suitable plant species:**
  - Bigger trees: *Azadirachta indica*, *Butea monosperma*, *Putranjeeva roxburgaii*, *Ptreocarpus santalinus*, *Satalum album*, *Sapindus sp*, *Cassia sinuat*, *Gmelina arborea*, *Limonia acidissima*, *Swertania mahgoni*, *Terminalia sp*. *Aegle marmelos*, *Pongemia pinnata*.

- Small trees/shrubs: *Adathoda zylanica*, *Lawsonia inermis*, *Commiphora wightii*, *Eucalyptus globra*, *Premna integrifolia*, *Vitex nigundo* and *Carissa caronda*
- Climbing plants: *Tinospora cordifolia*, *Gymnema sylvestre*, *Cissus quadrangularis*, *Abrus precatorius* *Jasminum sambac* and *J. grandiflorum*
- **Water and nutrient management**
  - For water management drip irrigation system to be installed at canopy shadow periphery/boundary with two drippers with discharge of 8 L hr<sup>-1</sup>.
  - Irrigation water requirement should be decided on the basis local PAN based rate of evapo-transpiration (ET).
  - Blanket application of 20 g urea, 25 g of DAP and 15 g of MOP along with 15 kg FYM can be applied before initiation of monsoon and 50% of fertilizer dose can be applied after monsoon during October month. Further nutrient requirements are met with soluble fertilizers through drip irrigation i.e., fertigation.
  - Crop mulching in basin with weed and grass material to conserve soil moisture and also to control weeds. Half-moon shaped bunds constructed across the slope and also full moon bunds will hold and conserve the runoff.
- **Training, Pruning and intercultural operations**
  - During initial two-three years plants should be pruned to form single stem to provide better framework.
  - Climbing plants should be trained on cemented pole provided with square plate with hole to grow the climbing shoots. This enables maximum leaf area to expose to sunlight and also easy cultural operations.
  - Climbing plants and shrubs can be pruned every year during spring season to ensure maximum flowering, foliage yield and also keep the canopy under optimum size for easy cultural operations
  - Application of cut ends with fungicide to prevent secondary infections

**Technology spread:** The technology is disseminated through TV broadcast (DD Kisan), Social media (You tube), and also institute visits, technical bulletin and Technology folder at ICAR-NIASM.

**Target Users/Stake Holders:** State forest department, collages, village panchayats and Farmers who is interested in afforestation with Rare Endangered and Threatened (RET) species of dry land and hardy medicinal and aromatic plants for conservation and utilization in barren land with hard basaltic strata.

**Technology Contact:**

Name: Director, ICAR-NIASM  
 Email: director.niasm@icar.gov.in  
 Phone No.: (02112) 254055  
 Fax No.: (02112) 254057  
 Address: ICAR-National Institute of Abiotic Stress Management, Baramati,  
 Pune, Maharashtra 413 115

**Keywords for Technology:** Abiotic stress, shallow soils, basalt rock, medicinal and aromatic species, Rare and endangered, conservation

## Technology Development Details

### Part 2

**Project Details:** Establishment of model herbal garden for medicinal and aromatic plants

(Through which technology was developed)

Time of initiation of technology development: 2018

Time of completion of technology development: 2021

Technology validation by: Within ICAR and farmers

### Technology Validation Details

Subject Matter Division: Natural Resource Management

Organization Name: ICAR-National Institute of Abiotic  
(if within ICAR) Stress Management, Baramati

Organization Name:  
(if outside)

Year of Validation (YYYY): 2020

Year of Release/Adoption (YYYY): 2021

Country: India

Through Technology Transfer: Yes

Minimum Temperature: 10.7°C

Maximum Temperature: 39.8°C

Average Temperature: 30.9°C

Average Rainfall: 588 mm

## **Applies To (Regional Differentiation)**

### **Part 3**

#### **Location**

Zone (as per the planning commission): Western Plateau and Hill Region

Sub zone (as per planning commission): Western Maharashtra Plain Zone, Western Maharashtra Scarcity Zone, Central Plateau, Central Vidharva

Agro-Ecological zone (NBSS & LUP): Deccan Plateau for semi-arid eco-region

Agro-Ecological Sub zone (NBSS & LUP): Deccan Plateau (Malwa Plateau, Gujarat plains and Kathiawar peninsula) hot, semiarid eco-region with moderately deep black soils; Deccan Plateau, hot semiarid eco-region with mixed red and black soils; Deccan Plateau, hot semiarid eco-region with red loamy soils

State Name: Maharashtra

District Name: Pune

#### **Soil Type/ Resource Type**

Soil Order: Entisol and Vertisol

Soil Sub Order: Orthents and Usterts

Soil great group: Ustorthents and Haplusterts

Soil great sub group: Lithic Ustorthents and Typic Haplusterts

#### **Commodity Details**

Commodity: Medicinal and aromatic plants

Commodity Type: Plants

Commodity Name: Medicinal and aromatic plants