

## **Title: Propagation and management of *Moringa oleifera* (Drumstick tree)**

**Background:** The crops and trees with untapped potential have always been the target of investigation by plant scientists, nutritionists and growers alike. Of late, *Moringa oleifera* is one such tree which has been in the spotlight due to its fast growth, higher nutritional attributes and utilization as a livestock fodder crop. This tree has its origin in sub-Himalayan tracts of the Indian subcontinent which can withstand a diverse temperature range (25-35°C to 48°C) and grows in different types of soils. However, it grows best in the direct sunlight under 2000 m altitude and prefers a neutral to slightly acidic (pH 6.3-7.0), well drained sandy or loamy soil for optimal growth. The tree can attain a height of about 10-12 m. Due to wide adaptability and ease of establishment, it is grown throughout the tropics for multi-purpose use viz. human food, livestock forage, medicinal values, dye and water purification. Although all parts of Moringa tree are traditionally used for different purposes, its leaves are most widely used globally as they contain high amount of macronutrients viz. Mg and K which in turn, can effectively be used to fulfill the dietary and nutritional requirements of livestock animals. The leaves also have a good amount of beta-carotene, vitamin C, calcium and iron. Therefore, in addition to their use in human consumption, the leaves of this tree have also been used as a major component in animal feed/fodder. Most importantly, according to a recent Japanese research report, the rate of absorption of carbon dioxide by the Moringa tree is twenty times higher than that of general vegetation. This capacity of Moringa tree is inspiring in mitigating the adverse effects of climate change. Keeping in view the suitability of environmental conditions, areas under Bilaspur, Mandi, Suket and Joginder Nagar Forest Divisions can be ideal for its propagation. More specifically, efforts are already on to raise significant planting stock at JICA Nurseries under Mandi and Suket Forest Divisions. Therefore, it is felt that if the propagation of this species is initially undertaken in the areas under these Forest Divisions, the same may easily be developed into a model site and replicated to other appropriate areas subsequently.

**Scheme:** Under the scheme, suitable areas at an appropriate altitude in the Districts Bilaspur and Mandi will be identified. CIGs of interested families will take up propagation through intercropping in the adjoining fenced forest plantation areas of VFDS or on village common land. After initial training, once the cultivation or propagation is started, a shed will be set up on village common land for storage and working on cleaning and packaging. Marketing will be carried out by the marketing committee set up at Cluster level of VFDS and under the aegis of Manager (Marketing) from PMU.

**Activities:** The suitable areas for propagation will be identified in the above mentioned districts. Moringa propagation by seeds is preferred and they must be sown at a maximum depth of 2 cm. The seeds can germinate and grow without irrigation if they are sown during the rainy season (June-July). The waterlogged conditions should be avoided. Depending on the soil moisture and season, the irrigation in pit areas is required at regular intervals for optimal growth of the plant. In case of temperature remaining less than 25°C, irrigation can be done even at an interval of 30-40 days. However, if the temperature remains above 40°C, surface irrigation is recommended every 20 days.

**Nursery raising technique:** *Moringa oleifera* can be propagated by direct seed planting, seedling transplanting and mature stem cuttings. However, propagation by direct seeding is preferable since the plants produced by cuttings will not have a deep root system which in turn, will be more sensitive to drought and termite attacks. The sowing of seeds in the nursery is done during the months of **Feb-Mar** so that the frost conditions can be avoided. Seeds are sown at 2 cm depth in polybags filled with topsoil following which watering should be done once in every 2-3 days. After sowing, they need to be placed in a slightly shaded area and protection from heavy rains should also be done. The young Moringa plants should be nursed at least for a period of 3-4 months before they are ready for transplanting in the field during the month of **July**. While transplanting, it should be ensured that the roots of the plant are not damaged. . The expected cost per plant will be Rs.13.65/- (approx.).

**Costs involved:** Estimated projections have been broadly worked out as below:

No.	Activities	Units	Quantity	Norms	Cost
1.	Constitution of CIG from VFDS	1			
2.	Cost of Planting Material (Seeds)	kg	10	500	<b>5,000</b>
3.	Agricultural Implements	LS		LS	<b>7,000</b>
	<b>Planting</b>				
4.	a) Digging of pits (60x60x60) cm size	%	5,000	3,490.9	<b>1,74,545</b>
	b) Filling of pits (60x60x60)cm size	%	5,000	708.8	<b>35,440</b>
	c) Raising of plants in P-bags in nursery	%	5,000	1,365	<b>68,250</b>
5.	<b>SMC (Soil and Moisture Conservation)</b>				
	Potassium acrylate	LS		LS	<b>15,000</b>
6.	Manure and NPK	LS		LS	<b>40,000</b>
7.	Carriage of manure	LS		LS	<b>4,000</b>
8.	Initial Watering Cost	LS		LS	<b>50,000</b>
9.	Carriage of extracted material	LS		LS	<b>20,000</b>
10.	Cleaning & Packing cost	LS		LS	<b>20,000</b>
11.	Packaging material cost	LS		LS	<b>5,000</b>
12.	Cost of labels				<b>1,000</b>
13.	Sale & Auction	LS		LS	<b>1,000</b>
14.	General Overheads/Other Charges	LS		LS	<b>50,000</b>
	<b>Total</b>				<b>4,96,235</b>

**Financial Returns:** Total expected average yield of green biomass (1<sup>st</sup> harvesting for fodder after 90 days of sowing and 45 days for subsequent harvests) would be 2.95 MT/ha/year (approx.) over a period of 8-10 years which on the minimum market price of Rs. 4500/quintal may give annual return of Rs. 1,35,000/- (for 10 ha) (as per NMPB rates and the Drumstick Farming Project Report: <https://www.agrifarming.in/drumstick-farming-project-report-cost-profit>). The projected rate/kg is 95/kg whereas, keeping in view market fluctuations, the rate applied in the model is kept as low as INR 45/kg.

**Cost Benefit Analysis:** The Benefit : Cost = 10,80,000/4,96,235 =2.18. Any project which on PNV gives a value of 2.18 times that of investment is sustainable.

**Sustainability:** The sustainability of this activity will depend on motivation of people after the project period. If the practice of cultivation coupled with proper care of this species is adopted on their cultivable land and/or village common lands, they are bound to get rich dividends out of it.

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