



# **LIVELIHOOD DIVERSIFICATION THROUGH INTEGRATED PRODUCTION SYSTEM: AONLA BASED AGRO-FORESTRY**

A SLEM BEST PRACTICE

Indian Council of Forestry Research and Education has documented Livelihood Diversification through Integrated Production System : Aonla based Agro-forestry as a best practice for sustainable land and ecosystem management (SLEM) under the World Bank funded SLEM Project.

Indian Gooseberry also known as Aonla (*Emblica officinalis*) is an indigenous fruit plant. In many formulations aonla has been used by the health practitioners, as it contains diuretic, laxative and antibiotic properties. Aonla can be grown successfully as a sole crop but more profitable in agro-forestry system in the states including Chhattisgarh and Madhya Pradesh.



#### Major benefits of Aonla based Agro-forestry are:

- ▶▶ Aonla based agro-forestry system has immense potential to utilize and conserve rainfed area for betterment of poor farmers.
- ▶▶ Aonla being a deep rooted and deciduous tree has a wide range of adaptability to grow in any type of soil
- ▶▶ A highly tolerant potential fruit species suited to grow under salt-affected and wasteland/ravine lands with the little investments and higher economic return.

#### Agro-techniques of Aonla Cultivation

**Soil :** The tree is well adapted to grow in any types of soil of dry regions. Aonla is a hardy plant and can be grown in variable soil conditions.

- ▶▶ Light to medium heavy soils are ideal for aonla cultivation
- ▶▶ Purely sandy soils should be avoided for aonla cultivation
- ▶▶ It is a potential crop for degraded lands and marginal soils
- ▶▶ It can tolerate salinity and alkalinity
- ▶▶ It can be successfully grown in soils having pH of 6.5-9.5
- ▶▶ Soils having high water table are not suitable for aonla cultivation

#### Climate

- ▶▶ It is a tropical plant and thrives well in annual rainfall of 630-800 mm
- ▶▶ The young plant up to the age of 3 years should be protected from hot wind during May-June and from frost during winter months.
- ▶▶ The mature plants can tolerate freezing temperature as well as a high temperature up to 46°C.

#### Cultivation Techniques

- ▶▶ Grafted or budded aonla plants are planted at a spacing of 10×10 m (100-110 plants per hectare) during the months of July-August.
- ▶▶ Pits of 1×1×1 m size are dug two months prior to planting.
- ▶▶ In each pit, 3-4 baskets of farmyard manure and 1 kg neem cake or 500 gm bone meal are mixed with soil before filling the pits.
- ▶▶ Each pit should also be filled with surface soil mixed with 15 kg farm yard manure and 0.5 kg of phosphorus before planting the grafted seedlings. Pits are watered if there is no rain. To control termite 100 gm endosulfan is also mixed. In sodic soils, 5-8 kg gypsum with 20 kg sand is also mixed.
- ▶▶ High yielding aonla varieties such as Neelun (NA 7), Krishna (NA4) and Chakaiya are particularly suited for closer planting with a spacing of 3 m by 3 m. By adopting this spacing and following hexagonal or triangular method of planting as many as 1200 plants can be accommodated in a hectare.



## Irrigation

- ▶▶ Waterspouts below the bud union are removed periodically and 4-6 well spaced branches per tree are allowed to develop. Though aonla is hardy and low water needing plant, however, young plants require watering during summer months. Watering is required at 15 days interval during winter and at 8-10 days interval during peak summer till they are fully established.
- ▶▶ Established aonla orchards, in general do not require irrigation particularly in normal soils. In bearing plantation, first irrigation should be given after manure and fertilizer application in January/ February.
- ▶▶ Irrigation should be avoided during flowering period (March-April). Later on, watering is done as per need for optimizing productivity. In salt affected soils, irrigation at 10-15 days interval is recommended.
- ▶▶ Drip irrigation can also be used which can save water up to 40-45%.



## Trimming and pruning

Leaving only 4-5 well shaped healthy branches with wide angle at about 0.75 m from the ground level, dead, diseased, criss-crossing branches and suckers should be pruned off at the end of December

## Mulching and inter cropping

Mulching with organic wastes, paddy straw, sugarcane trash and farmyard manure is very effective to establish aonla orchard and reduce watering. During initial 3-4 years of planting, aonla orchards present an excellent opportunity for utilizing vacant interspaces in the orchard. Vegetables like bottle gourd, okra, coriander, cauliflower, pea, and turmeric; flowers like gladiolus and marigold have been found well suited for intercropping in aonla orchards. In salt affected or marginal soils, intercropping of Dhaincha (*Sesbania bispinosa*) for a few years is beneficial for improving the physicochemical properties of the soil. During summer, the crop should be mulched with paddy straw or wheat straw at the base of the tree up to 15-20 cm from the trunk. Inter crops like green gram, black gram, cow pea and horse gram / shade-tolerant plants can be grown up to 8 years.

Cropping system models such as aonla + ber or guava (two tier), aonla + dhaincha + wheat or barley, aonla + dhaincha + onion/garlic or brinjal, aonla + dhaincha + German chamomile (Three tier), etc. have been found much remunerative.



## Protection from insects and pests

- ▶▶ Major insect pest: Bark eating caterpillar
- ▶▶ Major disease: Rust
- ▶▶ Injection of endosulfan 0.05% or monocrotophos 0.03% in holes and plugging with mud is effective in protecting the tree against bark eating caterpillar.
- ▶▶ Spraying of indofil M-45 @ 0.3% twice, first in early September and second 15 days after first application controls the spread of rust

## Manuring schedule

A dose of 10 kg farm yard manure, 100 gm nitrogen, and 100 gm phosphorus are given to one-year old plants, which is increased yearly up to 10 years of age, there after a constant dose is given. Full dose of farmyard manure and phosphorus is given in tree basin during the months of January- February and the remaining half is applied in August. In sodic soils, 100-500 gm of Boron and Zinc sulphate is also added with fertilizers.

## Harvesting and yield

- ▶▶ A grafted/budded plant starts bearing fruits at the age of 3-4 years after planting. Commercial yield is obtained after 8-10 years, which continues up to 25-30 years with good management
- ▶▶ The fruits are harvested during February when they become dull greenish yellow from light green
- ▶▶ The mature fruits are hard and they do not fall at gentle touch and therefore vigorous shaking is required
- ▶▶ Fruits can also be harvested using long bamboo poles attached with hooks
- ▶▶ A grown up 8-10 years old aonla tree may produce 100-120 kg/year
- ▶▶ The average weight of the fruit is 60-70 g and 1 kg contain about 15-20 fruits
- ▶▶ A well-maintained tree yields up to an age of 70 years

Indian Council of Forestry Research and Education (ICFRE), Dehradun as Ecosystem Services Improvement Project Implementing Unit (ESIP-PIU) is building the capacity of the local communities of ESIP project areas of Chhattisgarh and Madhya Pradesh for upscaling of Livelihood Diversification through Integrated Production System: Aonla based Agro-forestry: A SLEM Best Practice.



## Brief About ESIP

The World Bank funded Ecosystem Services Improvement Project (ESIP) supports the goals of the Green India Mission by demonstrating models for adaptation-based mitigation through sustainable land and ecosystem management and livelihood benefits. ESIP will introduce new tools and technologies for better management of natural resources, including biodiversity and carbon stocks. Main components of the project are: strengthening capacity of government institutions in forestry and land management programs, improving forest quality, and scaling up of sustainable land and ecosystem management (SLEM) best practices. ESIP is being implemented in the states of Madhya Pradesh and Chhattisgarh by Indian Council of Forestry Research and Education, Chhattisgarh State Forest Department and Madhya Pradesh State Forest Department under the overall direction of Ministry of Environment, Forest and Climate Change, Government of India.

## Brief About ICFRE

Indian Council of Forestry Research and Education (ICFRE) is an autonomous body of the Ministry of Environment, Forest and Climate Change, Government of India. It is an apex body in the national forestry research system that promotes and undertakes need based research, education and extension in the forestry sector. It has a pan India presence with its 9 research institutes (Arid Forest Research Institute, Jodhpur; Forest Research Institute, Dehradun; Himalayan Forest Research Institute, Shimla; Institute of Forest Biodiversity, Hyderabad; Institute of Forest Productivity, Ranchi; Institute of Forest Genetics and Tree Breeding, Coimbatore; Institute of Wood Science and Technology, Bengaluru; Rain Forest Research Institute, Jorhat and Tropical Forest Research Institute, Jabalpur) and 5 centers located at Agartala, Aizawl, Prayagraj, Chhindwara and Visakhapatnam. Each institute are directs and manages research, extension and education in forestry sector in the states under their jurisdiction.

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