



PRODUCTIVE UTILIZATION OF BOULDERY RIVERBED LANDS BY CULTIVATION OF AROMATIC GRASSES



**CENTRAL SOIL & WATER CONSERVATION
RESEARCH & TRAINING INSTITUTE**

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Published by

Director

Central Soil & Water Conservation
Research & Training Institute,
218, Kaulagarh Road, Dehradun-248 195 (Uttarakhand)

Editing

Sangeeta N. Sharma
Nirmal Kumar

Layout, Proof-reading & Production

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Photographs

Laxmi Kant Sharma

Printed at

Allied Printers
84, Nehar Wali Gali, Near Kotwali,
Dehradun-248 001 (Uttarakhand)
Phone : 2654505, 3290845

FOREWORD



Aromatic grasses can reduce soil erosion by improving vertical movement of water/runoff into the soil profile. The root system of the grasses act as the underground curtain which reinforces the soil particles to prevent erosion. Grasses develop rapidly and produce humus too. Vegetative cover developed by grasses also helps in soil conservation which is an important requirement for sustainable agricultural production.

Aromatic grasses (lemon and java grass) are well suited to bouldery riverbed land in western Himalayan region. These grasses with well developed fibrous root systems check soil erosion, improve soil health, and yield good economic returns. The oil from these grasses is used for perfuming soaps, detergents, cosmetics, incense sticks and for making mosquito repellent creams. These are in turn converted into citronellal, hydroxyl citronellal, synthetic menthol and esters of geraniol and citronellol. These compounds are used for making high grade blended perfumes.

Results of trials carried out at CSWCRTI, Research Farm, at Selakui, Dehradun are presented in this brochure which indicates economically viable productive utilization of bouldery riverbed lands by cultivation of aromatic grasses.

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INTRODUCTION

In North Western Himalayan region, large areas are categorized as bouldery riverbed lands, which are formed by deposition of huge amounts of bed materials (stones, gravels, boulders) brought down by torrents. Recent surveys indicate that an area of approximately 2.73 m ha is affected by deposition of bed loads in the foothills of Himalayas of which 0.3 m ha area falls in Doon Valley. Infiltration rate at these sites is as high as 30 to 35 cm hr⁻¹ due to sandy soil texture and a permeable stony layer at lower depths of the profile. Gravels, sand, and clay constitute about 75-80, 18-21, 2-4%, respectively in the soil. These gravelly sites are not fit for cultivation of crops, but can be made productive with cultivation of aromatic grasses. Lemon grass (*Cymbopogon flexuosus*), varieties CKP-25 and Kaveri and java grass (*C. winterianus*), varieties Java-2, Bio 13 are suitable perennial multicut varieties of Indian origin (Photo 1). These grasses contain Valuable compounds such as geraniol, geranyl acetate,



Photo 1: Java grass production on bouldery land

citral, citronellol, piperitone, eugenol and elimicin, which are either used in perfumery and allied industries or as starting material for the synthesis of vitamin-A in aromatherapy and in flavoring Industries. These grasses are source of valuable aromatic oil known as “oil of grass”. The grasses start yielding oil in the same year and continue up to 4-5 years under proper management. Thus, the aromatic grasses have potential for rehabilitation of degraded boulder lands for improving soil health, productivity and economics.

TECHNOLOGY DEVELOPED

The technology was developed for productive use of degraded lands through cultivation of aromatic grasses for natural resource conservation. Trials for more than two years have indicated that cultivation of aromatic grasses can give good returns and also enrich soil conditions by the turning over of plant biomass.

- ▶ Aromatic grasses : Lemongrass and citronella
- ▶ Plant population (50,000 ha⁻¹)
- ▶ Planting methods (Multi row system)

ESTABLISHMENT OF AROMATIC GRASSES

- ▶ The month wise calendar for operations for cultivation of lemon and java grass is given in Table 1.
- ▶ The site for grass plantation is cleared of all bushes and unwanted shrubs along with their root systems.
- ▶ Degraded lands having coarse textured soils and small to medium sized stones and gravels are suitable for growing these aromatic grasses.
- ▶ Two to three ploughings are necessary before planting for better establishment of aromatic grasses.
- ▶ Planting of rooted slips @ 50,000 ha⁻¹ is done (photo 2).
- ▶ Planting is done during July-August. However, with irrigation, planting also can be done during March-April.



Photo 2: Aromatic grass planting by rooted slips

- ▶ One or two slips are planted in each hole of about 10-15 cm depth made by a sharp thick stick. Soil should be firmed around the slip to remove trapped air in the hole.
- ▶ Watering is to be done immediately after planting.

MAINTENANCE AND MANAGEMENT

- ▶ FYM @ 10 t ha⁻¹ is applied and mixed well at the time of final land preparation.
- ▶ Fertilizers are applied @150: 60: 60 and 50:50:40 kg N P K ha⁻¹ yr⁻¹ for lemon and java grass, respectively. Half of nitrogen and full quantity of phosphorus and potassium are applied as basal doses. Remaining quantity of nitrogen is applied in three equal splits.
- ▶ Top dressing of urea @ 30 kg is done after every harvest to facilitate vegetative growth.
- ▶ Since, aromatic grasses have the weed supersession capacity, one hand weeding after one month followed by one hoeing at 50-60 days after planting is enough to control weeds.
- ▶ After each harvest, a nominal weeding and earthing of plants is beneficial for the next flush.
- ▶ The grasses are irrigated at monthly interval during winter and moisture stress period (March-mid June) or as and when required.

HARVESTING OF GRASSES

- ▶ Grasses are ready for first cut after 6-7 months of planting.
- ▶ The grass is harvested 20 cm above the ground level in the first year (Photo 3).
- ▶ Subsequent harvesting should



Photo 3: Harvesting of Lemon grass

- ▶ be done at an interval of 3-4 months. However, on degraded lands, if production is low, then only one cut (annual) is recommended.
- ▶ Frequent cutting stimulates growth, which also improves oil yield.
- ▶ Delayed harvesting reduces oil content.
- ▶ The grass should be harvested early in the morning.
- ▶ The dried grass should have green colour and it should be free of mould.
- ▶ Drying should therefore be done as quickly as possible, under shade.
- ▶ The flowering stalks are harvested and discarded from time to time, otherwise the crop yield gets adversely affected.

HERBAND OIL YIELD

- ▶ Aromatic grasses start yielding biomass after 6-7 month of planting in the first year and continue for 4-5 years commercially.
- ▶ Yield start declining after 5th year of establishment. At this stage, replanting is recommended for after ploughing and removing of old stock.

- ▶ The average yields of 500 q ha⁻¹ with oil yield (237 kg ha⁻¹) and 300 q ha⁻¹ with oil yield (254 kg ha⁻¹) are expected in lemon and java grass, respectively (Photo 4).



Photo 4: Java and Lemon grass oil.

DISEASES AND PEST MANAGEMENT

There is no serious attack of diseases and pest in the aromatic grasses

- ▶ Generally aromatic grasses may be attacked by leaf blight caused by *Carbularia veruciformis*. This can be controlled by Carbendazim (bavistin @ 1g litre⁻¹) followed by benzimidazole (Benlate 50 wp at 0.2% @ 550-750 litre ha⁻¹) at 10 days interval.
- ▶ The most important pest is scale insect, which produces yellow spot on the stem and sucks the sap of the leaves and stem. The insect can be controlled by spraying 0.5% Dimethoate.

ECONOMICS

- ▶ The cost of establishment of grasses on degraded lands is ₹ 82,750 ha⁻¹ (Table 2).
- ▶ The average net benefits from lemon grass and java grass (up to 4-5 years) on degraded lands are ₹ 42,250 and ₹ 32,750 ha⁻¹ yr⁻¹, respectively (Table 3).

Table 1: Month wise calendar of operations for sustainable cultivation of lemon and java grasses

Activity	Months											
	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
Site selection and clearing	✓	-	-	-	-	-	-	-	-	-	-	-
Planting of grasses	-	-	-	✓	✓	-	-	-	-	-	-	-
Weeding and fertilizer application	-	-	-	-	-	✓	✓	-	-	-	✓	✓
Irrigation	✓	✓	✓	-	-	-	-	-	-	✓	✓	✓
Harvesting of grasses	v	-	-	-	-	-	v	-	-	-	-	-
Monitoring of grasses for diseases and pests	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Table 2: Cost of establishment of aromatic grasses (2010 prices)

Sl. No.	Activity / work	Approximate cost (₹ ha ⁻¹ yr ⁻¹)
1.	Land preparation	10000
2.	Planting material 50000 slips @ ₹ 0.5 slip ⁻¹	25000
3.	Manures (1000 cft FYM)@ ₹ 7.5 cft ⁻¹	7500
4.	Fertilizers	6000
5.	Weedings (2 times)	4000
6.	Harvesting	10000
7.	Cost of distillation (₹405 t ⁻¹)	20250
	Total	82750

Table 3: Yield and economic analyses of the grasses (average of 3 years)

Aromatic grasses	Herb yield (a/ha ⁻¹)	Oil yield (kg ha ⁻¹)	Input cost (₹ha ⁻¹)	Gross income (kg ha ⁻¹)	Net income (₹ ha ⁻¹ yr ⁻¹)
Lemon grass	500	237	82750	125000	42250
Java grass	300	254	82750	115500	32750

SCOPE OF AROMATIC GRASSES

In foot hills of Uttarakhand, large area 2.94 lakh ha are categorized as bouldery wasteland of which about 30 percent (0.3 m ha) falls in this category in Doon valley. These degraded lands are covered by uneconomic vegetation and are unsuitable for grain production. These degraded bouldery lands have potential for rehabilitation by aromatic grasses for improving soil health, productivity and economics.

ACKNOWLEDGMENT

We wish to thank Mr. Raghvander, Technical Assistant for his kind support during field work.



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