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Lemongrass value chain: Constraints, opportunities and pathways for women entrepreneurs in Jharkhand: A review

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ABSTRACT

Lemongrass (*Cymbopogon flexuosus*) is an important aromatic and medicinal crop with considerable potential for income generation, employment creation and livelihood diversification, particularly among women farmers and rural entrepreneurs. Its relatively low input requirement, perennial nature, suitability for rainfed and marginal lands, and diverse applications in essential oils, herbal teas, pharmaceuticals, cosmetics, food and beverages make it a promising enterprise in Jharkhand. The present review examines the lemongrass value chain with a specific focus on identifying mechanisms for enhancing the income of women entrepreneurs. The review maps the major value-chain stages, including input supply, land preparation, cultivation, harvesting, post-harvest management, processing, value addition, storage, transportation and marketing, and identifies the roles of key actors and institutional enablers. Particular emphasis is placed on women's participation in cultivation, processing, packaging and marketing through self-help groups and livelihood-based initiatives.

The review indicates that substantial opportunities exist for increasing returns through improved planting material, scientific agronomic practices, efficient harvesting and post-harvest handling, decentralized steam-distillation units, quality improvement, branding, packaging and direct market linkages. Value addition through essential oil extraction, herbal tea, dried leaves and other processed products can enable women entrepreneurs to capture a greater share of the value generated along the chain rather than relying solely on the sale of raw herbage. However, the value chain faces constraints such as inadequate access to quality planting material, limited technical knowledge, low productivity, insufficient processing and storage infrastructure, quality-related issues, weak market linkages, limited access to credit and inadequate price information. Government programmes related to medicinal and aromatic plants, horticulture, institutional credit and agricultural marketing can support value-chain development when effectively converged at the local level.

The review suggests that women-led collective enterprises, local processing and distillation facilities, improved production technologies, skill development, quality certification, product diversification, digital marketing and stronger linkages with processors, retailers and herbal and cosmetic industries can strengthen the lemongrass value chain. An integrated value-chain approach, rather than focusing only on production, is therefore essential for improving value capture and creating sustainable income opportunities for women entrepreneurs in Jharkhand.

Keywords: Lemongrass, Value Chain Analysis, Women Entrepreneurs, Value Addition, Essential Oil, Livelihood, Income Enhancement

Introduction

Lemongrass is a tropical perennial plant which yields aromatic oil. The herb originated in Asia and Australia. Lemongrass was one of the herbs to travel along the spice route from Asia to Europe. Lemongrass oil of commerce is popularly known as Cochin oil in the world trade, since 90% of it is shipped from Cochin port. The state of Kerala in India had the monopoly in the production and export of lemongrass oil. The annual world production of lemongrass oil is around 1000 t from an area of 16000 ha. In India, it is cultivated in an area of 4000 ha and the annual production is around 250 t. The crop is extensively cultivated in the poor, marginal and waste lands and also along the bunds as live mulch. The well ramified root system of the plant helps in soil and water conservation.

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Context and methodology

Context

Lemon grass farming has been a successful innovative agricultural practice among the women farmers since it is easy to cultivate and fetches a good price in the market, given its many medicinal and curative properties. In the context of Jharkhand, where farming is a tough deal in the uplands, lemon grass farming, with little effort on the barren land, is providing good additional income. In Jharkhand, cultivation of Lemon Grass on commercial basis is being carried out in districts of Khunti, Gumla, Ranchi, Bokaro.

It requires very little care and maintenance. It can be grown as rain fed crop. It is a perennial crop. The life span of the grass is 8 years i.e. once planted it could go on yielding herb for 8 years giving scope for at least 3 to 4 cuttings per annum. It is also considered as non-browsing crop. As a result it would prevent soil erosion and can control landslides to certain extent. Lemongrass is an herb and is well known and utilized for its distinct lemon flavor and citrusy aroma. It is a tall, perennial grass which is native to India and tropical regions of Asia. It is a coarse and tufted plant with linear leaves that grows in thick bunches, emerging from a strong base and standing for about 3 meters in height with a meter-wide stretch. In addition to its culinary usage, lemongrass offers a wide array of medicinal benefits and is in extensive demand due to its antibacterial, anti-fungal and antimicrobial properties. Lemongrass is a tropical perennial plant which yields aromatic oil on steam distillation of the herbage. India contributes to about 85% of total world production.

Lemongrass oil market

Global scenario- Global Lemongrass Oil Market is estimated to reach USD 421.13 million by 2027, growing at a CAGR of 6.9% between 2019 and 2027.

The lemongrass market is expected to see immense revenue streams in Asia Pacific. Asian nations are the worldwide top cultivators. The Asia Pacific lemongrass market is expected to gain momentum from the fast growing body of research and development on essential oils for utilizing them for health benefits. Some of the key countries are Cambodia, India, Indonesia, China, Sri Lanka, Malaysia, and Guatemala. Market players in the region are eyeing colossal opportunities in North America and Europe. These regional markets have witnessed perceptible rise in the demand for essential oils among personal care industries. They are also witnessing new avenues in the Native America. Some of the key participating players in lemongrass oil market globally are Native American Nutritionals Essential Oils, Rocky Mountain Oils, Plant Therapy® Essential Oils, Aura Cacia® Essential Oils, Prime Natural Essential Oils, Mountain Rose Herbs® Essential Oils, Fabulous Frannie Essential Oils, Plant Guru™ Essential Oils, Kis Oils, ArtNaturals Essential Oils and Healing Solutions Essential Oils.

National scenario

India is the largest producer of lemon grass and about 80% of the produce is being exported. The current production of Lemongrass oil in the country is 500 MT per annum, whereas, demand is 800 MT per annum. This shows significant demand and export potential for lemon grass oil. Lemongrass oil is used in perfumery, fragrance cosmaceutical, aromatherapy and pharmaceutical industries. Citral is the main constituent of lemongrass oil, which used for production of fragrances for soaps & detergents, high quality perfumes. Citral is also used as a flavor and for fortifying lemon oil and also in many value added products like Ionone's and Vitamin A. Leaves of lemongrass are also used for making lemongrass tea

Contribution of lemongrass in the livelihood of the people in Jharkhand

Livelihood scenario in Jharkhand

Jharkhand accounts for 2.42 per cent of India's land area, 39.1% of its population is below the poverty line and 19.6% of children under five years of age are malnourished. Jharkhand is primarily rural, with about 24% of its population living in cities.¹ It is amongst the leading states in terms of economic growth. In 2017–18, the GDP growth rate of state was at 10.22%. The [gross domestic product](#) of Jharkhand is estimated at ₹3.83 lakh crore (US\$51 billion) in 2020–21. The per capita GDP of Jharkhand in 2018-19 was ₹82,430 (US\$1,100).

Employment and occupational status

Overall similar work participation was noticed across the control and treated area. Among Schedule Caste category 57.4 per cent in treated and 55.6 per cent in the control area is working. Among Schedule Tribe 55.7 per cent in treated and 57.1 per cent in the control area is working. Among OBC category 56.4 per cent in the treated and 55.4 per cent in the control area are working. Among others 58.0 per cent in the treated and 56.2 per cent in the control are working. Looking at work participation by gender, it is found that 72.5 per cent of the male population and 68.7 per cent of the female population are engaged in some kind of activity. At overall level 27.5 per cent of the population is not engaged in any activity. Thus, it may be summarised that there is still a significant proportion of qualified workforce that has remained out of the workforce. There is a need to offer suitable opportunities for gainful employment to those sections of the population in order to improve their livelihood status.

Agriculture is the main primary livelihood among the rural population as 71.9 per cent in the treated area mentioned agriculture as their main source of living and in the control area 71.6 per cent mentioned the same. Around 52 per cent of the populations are involved in some kind of secondary livelihood activity. In the treated area 27.8 per cent mentioned of working as agricultural labour whereas 39.3 per cent mentioned of non-agricultural work. Among the minority classes like Schedule caste and Schedule Tribe the tendency to work as casual labour as a means for secondary livelihood is more.

Lack of employment opportunities has pushed large number of population to other areas in search of employment. In-state migration is higher among Scheduled Tribe and Scheduled Caste. Migration outside the State is highest among Others Category and Other Backward Class. Looking across social category it is noticed that in the treated area among the Schedule Caste (37.8%) category a significantly higher proportion have mentioned out-migration. This is followed by OBC (31.8%), others (27.3%) and Schedule Tribe (25.7%). In the control area also significantly higher proportion of the Schedule Caste (47.3%) households have mentioned outmigration, followed by OBC (42.6%), others (39.2%) and Schedule Tribe (29.5%).

The livelihood of the people of this area depends primarily on land. It's not only the size of land but also the altitude (low, medium and high land) and the availability of irrigation matters in ensuring livelihood security. Though, cultivation is the primary source of their livelihood, they are mainly dependent on traditional mode of cultivation where the productivity is very low. They are still dependent on the traditional mode of cultivation where the productivity is very low. Though, about 82 percent of the households have agricultural land only 37 percent of them are irrigated. Leasing in and leasing out practice is prevalent here but, most of the people, who own agricultural land, cultivate it on their own. Agriculture is the primary occupation of the people in the state. And as it is the case, land is the major component of their livelihoods and a depiction of it. It's not only the size of land but also the altitude and the availability of irrigation matters in ensuring livelihood security.

Land holding pattern

The average size of land holding in the State is 1.17 hectares as against all India average of 1.16 hectares. Marginal category of farm households constitute 68.21 per cent of total households but own only about 24.13 per cent of land in the state. Their average size of land holdings is as low as 0.41 hectare. About 5.5 per cent of total farm holdings belong to medium and large categories of farm households but they own 22.14 per cent of cultivable land in the state. Scheduled tribes land holdings constitute 35.70 per cent of total land holdings but own 45.21 per cent of total cultivable area in the state. In Jharkhand, there are about 20 thousand large land holders (10 ha. And above) but 60 per cent of land holders belong to scheduled tribes. The State agriculture economy is characterized by the existence of a large number of small and marginal farmers (84%) Land distribution in the State is highly skewed, about 5.5 per cent of medium and large farmers own 22 per cent of cultivable land. The average size of land holdings is small and declining due increase in population. Per capita cultivable land is only 0.096 hectare.

Key actors in lemongrass value chain

The function of actors at various levels is important to implement strategies to design and deliver business development services to address the barriers and bottleneck at various nodes of the value chains.

Value chain mapping

The value chain consists of all the functions that occur from input or raw material supply to producer to the final consumer of a finished product. The functions involved in value chain are input supply, production, collection, processing, storage, transport, marketing, and sale

. The producer is responsible for cultivation and/or harvesting. Depending on the product, storage, processing and transport (in no definite order) must then take place. These steps may be more or less complex depending on where the product is produced, the nature of the product, the degree of processing, and the consumer requirements.

Function	Key inputs/functions
Inputs supply	Lemongrass slips or Seedling, fertilize, labour
Preproduction	Field ploughing/tillage operations, manuring & fertilizers application, planting, seedling/ slip treatment.
Production	Inter-cultural operations such as weeding, re-planting for gap filling,application of fertilizers and pesticides.
Harvesting	labour, implements, transportation etc.
Post-Harvesting	Cleaning, drying, chopper machine to cut lemongrass leaves into pieces.
Marketing to Processors	Packing of dried leaves, storage of dried leaves, partial drying of lemon grass leaves for distillation.
Processing	Distillation process , grading of dried lemongrass leaves for tea purpose, packaging, storage
Value addition	
Marketing	Wholesale , Retailers , supermarket, selling lemongrass essential oil to herbal companies etc.

Value chain actors

Primary producers i.e. farmers -After single sowing, harvesting can be done for up to 5 years and that too 3-4 times per year. The first harvest is generally obtained after 4 to 6 months of transplanting seedlings. Lemongrass can be cultivated on all types of soil.

After growing a single plant of lemongrass, many plants can be prepared and cultivated from that. Transplantation can be done from July to September month and very less irrigation is required.

Subsequent harvests are done at intervals of 60-70 days depending upon the fertility of the soil and other seasonal factors. Under normal

conditions, three harvests are possible during the first year, and 3-4 in subsequent years, depending on the management practices followed. Harvesting is done with the help of sickles, the plants are cut 10 cm above ground-level and allowed to wilt in the field, before transporting to the distillation site.

Depending upon soil and climatic conditions, plantation lasts on an average, for 6-7 years only. The yield of oil is less during the first year but it increases in the second year and reaches a maximum in the third year; after this, the yield declines. On an average, 2 to 3 tonnes of fresh herbage are harvested per acre per annum from 3 -4 cuttings, which yields about 1litre of oil. Under irrigated conditions from newly bred varieties an oil yield of 100-150 kg/ha is obtained. The fresh herb contains on an average 0.3% oil and thick stems are removed before distillation as these are devoid of oil. Lemon grass can grow well over medium fertile soils and moderate irrigation. Well drained sandy loam is most suitable for the growth of the plant. It can be grown on a variety of soils ranging from loam to poor laterite. Calcareous and water logged soils should be avoided as they are unsuitable for cultivation.

Role of women in lemongrass production

In Jharkhand, Under Livelihood Mission, ladies started lemongrass cultivation. As the price of lemongrass oil is good in the market, so looking at this, *Gramin Seva Kendra* has also installed a distillation unit for Sakhi Mandal under livelihood mission, so that processing of lemongrass oil can also aid in good earning.

This initiative has increased self-confidence in Farmer ladies. Along with the farming lemongrass and processing and packaging of lemongrass oil, ladies are also cultivating other medicinal plants and selling them at good prices.

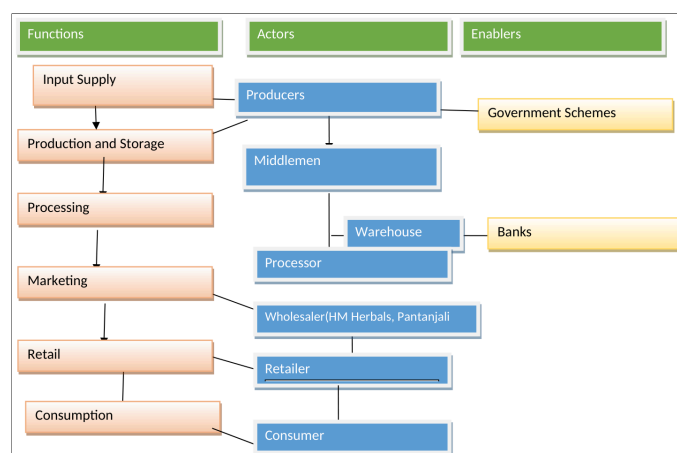
on average, for the cultivation of lemongrass on one acre of land, expenditure is about Rs. 20 to 25 thousand and after four months, when the crop is ready for harvesting, it is worth Rs. 1 lakh. In this way, around 77,000 can be earned from single harvesting. And stalks of lemongrass are used to extract oil and the cost of one stalk is about 20-30 paise. The cost of lemongrass oil is about Rs. 3000 per liter and is sold to wholesale traders at about Rs. 2000 per liter. Leaves of lemongrass are also sold at higher rates.

Lemongrass value chain enablers

It is vital to understand the regulatory framework of value chains, who is responsible for setting them up, how they enforced and by whom , how they affect business and their transactions , and whether value chain actors are aware of them is crucial information for value chain development.

Value chain enablers

Actors
Functions
Enablers
Producers
Input Supply



Government Schemes
 Production and Storage
 Middlemen
 Processing
 Banks
 Processor
 Warehouse Operator
 Marketing
 Wholesaler (HM Herbals, Pantanjali)
 Retail
 Consumption
 Consumer

Value chain enablers

Central / state government schemes related to medicinal and aromatic plants

I. National mission on medicinal plants

Introduction:

National Mission on Medicinal plants is a Centrally Sponsored Scheme under National Medicinal Plant Board AYUSH Department in the Ministry of Health & Family Welfare Department., Govt. of India. The Scheme has been approved with a total outlay of Rs.630 crores to be implemented during 11th Plan period. Here in the 11th plan period the Central Govt. Contribution is 100%. The State Govt. Contribution proposed to be suitably enhanced in the 12th Plan period.

Objective:

1. To increase the area under cultivation of different Medicinal Plants Species.
2. Prioritizing zone wise species for commercial cultivation and contract farming.
3. Promoting large-scale cultivation of valuable herbs through farmers in their private land through cluster approach.
4. Providing facility for soil & water testing for the farmers before undertaking large-scale cultivation of medicinal plants..
5. Devising proper post harvest management methods for handling of raw produce during storage & transportation.
6. Developing marketing strategies after proper assessment of demand supply relationship with users & produces.
7. Strengthening the training & extension activities regarding medicinal plant at State, District, Zonal & Block level and utilizing the infrastructure of the line department Agriculture, Horticulture, DRDA etc, for promoting the programme.

Implementation:

The scheme is proposed to be implemented in a mission mode. So, it has been decided by the State Govt. that the NMMP scheme will be implemented in the state of Orissa through Orissa Horticulture Development Society in the Directorate of Horticulture, Orissa, Bhubaneswar since the year 2009-10.

II. Mission for integrated development of horticulture (MIDH)

Launch Year: 2014

Nodal Ministry: Ministry of Agriculture and Farmers Welfare

Aim: Holistic growth of the horticulture sector covering fruits, vegetables, root & tuber crops, mushrooms, spices, flowers, aromatic plants, coconut, cashew, cocoa and bamboo.

Target: To achieve a growth rate of 7.2 percent in the horticulture sector during the 12th Plan, besides generating skilled and unskilled employment opportunities in rural and urban areas.

Objectives:

1. Promote holistic growth of horticulture sector, including bamboo and coconut through area based regionally differentiated strategies.

2. Research, technology promotion, extension, post-harvest management, processing and marketing .
3. Encourage aggregation of farmers into farmer groups like FIGs/FPOs and FPCs to bring economy of scale and scope.
4. Enhance horticulture production, augment farmers, income and strengthen nutritional security;
5. Improve productivity by way of quality germ plasm, planting material and water use efficiency through Micro Irrigation.
6. Support skill development and create employment generation opportunities for rural youth in horticulture and post-harvest management, especially in the cold chain sector.

Sub-schemes/Missions MIDH

There are 5 schemes under MIDH –

- I. National Horticulture Mission (NHM)
- II. Horticulture Mission for North East and Himalayan States (HMNEH)
- III. National Horticulture Board (NHB)
- IV. Coconut Development Board (CDB)
- V. Central Institute of Horticulture (CIH), Nagaland.

III. National horticulture mission (NHM)

Launch Year: 2005

Nodal Ministry: Ministry of Agriculture and Farmers Welfare

Aim: It aims at the holistic development of horticulture sector by ensuring forward and backward linkages through cluster approach with the active participation of all stakeholders.

- National Horticulture Mission (NHM) is the sub-scheme of Mission for Integrated Development of Horticulture, which is being implemented by the National Horticulture Board (NHB)
- National horticulture mission is an indian horticultural scheme ptomoted by Government of India.
- It was launched under the 10th five year plan in the year 2005-06.
- Government of India contributes 85%, and state contributes 15% .
- The mission was mainly developed to promote the growth of the horticulture sector covering vegetables, fruits, root & tuber crops, spices, mushroom, flowers, aromatic plants, cashew and cocoa.

Objectives

The NHM's key objective is to develop horticulture to the maximum potential available in the state and to augment production of all horticultural products

(fruits, vegetables, flowers, coco, cashew nut, plantation crops, spices, medicinal aromatic plants) in the state. Other objectives include:

1. To provide holistic growth of the horticulture sector through an area based regionally differentiated strategies
2. To enhance horticulture production, improve nutritional security and income support to farm households
3. To establish convergence and synergy among multiple on-going and planned programmes for horticulture development
4. To promote, develop and disseminate technologies, through a seamless blend of traditional wisdom and modern scientific knowledge

V. Kisan credit card scheme

Launch Year: 1998

• The model scheme was prepared by the National Bank for Agriculture and Rural Development (NABARD) on the recommendations of R.V.GUPTA committee.

Nodal Ministry: Ministry of Finance

Aim: The scheme aims at providing adequate and timely credit for the comprehensive credit requirements of farmers under single window for their cultivation and other needs given below –

- To meet the **short-term credit requirements for cultivation of crops**
- Post-harvest expenses .
- Produce marketing loan.
- Consumption requirements of farmer household .
- Working capital for maintenance of farm assets and activities allied to agriculture.
- Investment credit requirement for agriculture and allied activities.

Applicability of the scheme: It is to be implemented by Commercial Banks, RRBs, Small Finance Banks and Cooperatives.

Target Beneficiaries/Eligibility:

- Farmers - individual/joint borrowers who are owner cultivators
- Tenant farmers, oral lessees & share croppers
- Self Help Groups (SHGs) or Joint Liability Groups (JLGs) of farmers including tenant farmers, share croppers etc.
- KCC has now been extended to fisheries and animal husbandry farmers to help them meet their working capital needs.

Key Features:

Eligible farmers to be provided with a Kisan Credit Card and a pass book or card-cum-pass book.

VII. National agriculture market scheme (e-NAM)

Launch Year: 2016

Nodal Ministry: Ministry of Agriculture and Farmers Welfare

Implementing Agency: Small Farmers Agribusiness Consortium

Aim: To promote uniformity in agriculture marketing by streamlining of procedures across the integrated markets, removing information asymmetry between buyers and sellers and promoting real time price discovery based on actual demand and supply.

Objectives: To integrate markets first at the level of the States and eventually across the country through a common online market platform, to facilitate pan-India trade in agricultural commodities. To streamline marketing / transaction procedures and make them uniform across all markets to promote efficient **Key Features:**

- a. It is a pan-India electronic trading portal which networks the existing APMC mandis to create a unified national market for agricultural commodities.
- b. It is a single window service for all APMC related information and services including commodity arrivals & prices, buy & sell trade offers, provision to respond to trade offers etc.
- c. It will enable farmers to showcase their produce through their nearby markets and facilitate traders from anywhere to quote price.
- d. It provides for a national e-market platform for transparent sale transactions. States desirous to join has to accordingly enact suitable provisions in their APMC Act.
- e. Liberal licensing of traders / buyers and commission agents by State authorities. There are no pre-conditions asking for physical presence or possession of shop /premises in the market yard. One license for a trader will be valid across all the markets in that State.

The Lemongrass essential oil from MSA. pvt Ltd industries is extracted organically through steam distillation of dried lemongrass. Citronellal, nerol, myrcene, geranyl acetate, geraniol, citral, limonene, and neral are the main constituents of Lemongrass essential oil. The oil is well recognized for its number of beneficial properties like antiseptic, antidepressant, analgesic, deodorant, febrifuge, astringent,

carminative, bactericidal, fungicidal, nervine, sedative, antipyretic, insecticidal, galactagogue, and antimicrobial.

• Distillation

- Oil is obtained through steam distillation. The oil has a strong lemon like odour. The oil is yellowish in colour having 75-85% citral and small amount of other minor aroma compounds. The recovery of oil from the grass ranges from 0.5 - 0.8 per cent. It takes about 4 hours for complete recovery of the oil.

Extraction

Lemongrass oil is extracted by the method of steam distillation from fresh or partly dried leaves.

Constituents

Main Constituents : Citral

Other: Myrcene, nerol, Citronellal, terpineol, methyl heptenone, dipentene, farnesol, and limonene.



Distillation method

1. Lemongrass oil distillation takes around 3 to 4 hours for complete recovery of oil. Still distillation is preferred for lemongrass oil extraction.
2. Lemongrass oil is yellowish in colour Having 75 to 85% citral.
3. The recovery of oil from the grass is between 0.5 % to 0.8 percent.
4. There are two types of distillation methods Hydro distillation and steam distillation.
5. Hydro distillation is cheaper but steam distillation is more effective.

Using lemongrass oil

The oil can be used for internal and topical applications. The oil can be consumed in diluted form for its hormonal modulating and anti-inflammatory properties. It can also be added to beverages like tea for flavor. Externally, you can apply the oil to the skin to prevent acne and skin irritation.

Purification of oil

The insoluble particles present in the oil are removed by simple filtration method after mixing it with anhydrous sodium sulphate and keeping it overnight or for 4-5 hours. In case the colour of the oil changes due to rusting then it should be cleaned by steam rectification process.

Storage and packing of oil

The oil can be stored in glass bottles/ plastic bottles or containers made up of stainless steel or aluminium or galvanized iron, depending upon the quantity of oil to be stored. The oil should be filled up to the brim and the containers should be kept away from direct heat and sunlight in cool/shaded places.

To get a lemongrass cultivation project report we need to figure out the lemongrass cost per acre then reduce it from lemongrass profit thus we can find an assumption of lemongrass project report.

Sl. No.	Component	Amount
1	Cultivation Expenses	
(i)	Cost of planting material	1800
(ii)	Input Cost	1000
(iv)	Cost of Labour	2000
(v)	Miscellaneous	500
	Total	5300
2	Irrigation	
(ii)	Pump & Electrical Installation	4000
(iii)	Others, if any	300
	Total	4300
3	Infrastructure	
(i)	Store & Pump House	2000
(ii)	Labour room	300
(iii)	Agriculture Equipments	6100
(iii)	Others, if any, (Drying platform)	300
	Total	8700
	Grand Total	18300

Lemongrass cost per acre

- Cost of lemongrass plant - 30 paise to Rs 5
- No off grass slips per acre 18,000 to 26,000 (according to spacing)

Harvesting and yield

The crop is perennial in nature and gives good yields for 5 years. Harvesting is done by cutting the grass 10 cm above the ground level. During the first year of planting 3 cuttings are obtained and subsequently, 5-6 cuttings per year are taken subject to weather conditions. The harvesting season begins in May and continues till the end of January. The first harvest is done about 90 days after planting. The interval from sowing to harvest exerts a considerable influence on the yield and the quality of oil. Both immature and over mature grass gives a lower quantity of oil. For the local type of lemon grass, the optimum interval is 40-50 days. The optimum period of harvesting, when grown on hill tops and low lying areas are 60 and 55 days, respectively. Herbage yield 15t/harvest and oil

recovery about 0.3 – 0.5% from fresh grass can be expected. The oil is obtained by steam distillation.

Oil yield of about 350- 400 kg/ha from the second year onwards is considered satisfactory. quality and productivity.

Post harvest management

Lemongrass is commonly used in Asian cooking. When Thai food was embraced in the US, lemongrass became a household name. A little experimentation with this delightfully fragrant herb is all it takes to

realize that it can be used in many more ways than just in Asian dishes

Essential oil

Lemongrass is cultivated for its oil which is used in culinary flavoring. It is used in most major categories of food including alcoholic and non-alcoholic beverages, frozen dairy desserts, candy baked foods, gelatins and puddings, meat and meat product, and fat.

Herbal teas

Dried lemongrass leaves are widely used as a lemon flavour ingredient in herbal teas, prepared either by decoction or infusion of 2-3 leaves in 250 or 500 ml of water (Wannmacher *et al*, 1990) and other formulations. Lemongrass tea is a diuretic and imparts no biochemical changes to the body in comparison with the ordinary tea. Lemongrass iced tea is prepared by steeping several stalks in a few quarts of boiling water. This can also be combined with green or black teas.

Lemon grass herbal tea packet

Barriers and bottlenecks in lemongrass value chain

The major constraints affecting the lemongrass can be analysed from three viewpoint i.e. Production, Processing and Marketing

Production- Low productivity due to poor fertility of soil, poor input supply, farmers don't use improved varieties or slips for propagation. Improper agronomical practices, Infestation of disease and pest, Imbalanced use of fertilizer all these results in low yield of lemongrass, if there is low foliage growth then the production of oil will be less.

Processing- Lack of warehouse to store the lemongrass leaves invites pest and rodent attack, lemongrass stored in gunny bags may get spoiled if stored for longer period of time.

Marketing- quality matters in term of marketing. If the leaves production is low it leads to less lemongrass oil content fetches low price. Lemongrass dried leaves for herbal tea should have nutritional value.

Recommendations and way forward

Agricultural growths holds the key to the overall development of the state by way of creating employment, generating income, providing raw material to the industrial sector and last but not least ensuring self-reliance in the food production and food security to the deprived sections.

Enhance productivity of lemongrass

- Improved Agronomic practices to produce lemongrass.
- Propagate high quality plant material/ variety.

Enhance awareness

- Some section of people are still unknown to the economic importance and utilization of lemon grass products. The lemongrass oil market can be segmented as Pharmaceutical, Cosmetics & Personal Care, and Food & Beverages. As Lemongrass oil have high medicinal value and used in numerous treatments since history market demand in pharmaceutical segment is significantly high. Cosmetic & personal care product segment is used in soaps, deodorants, shampoos, conditioner, body lotion, air freshener and tonics. It's vital vitamin contents as well as skin healing properties are driving lemongrass oil market demand in personal care market segment.

Lemongrass oil popularity as taste and fragrance, its demand in food and beverage market segment has developed over the time. It is used in various culinary delights, added to ready-made curries, paired with beef, fish, poultry and seafood's, it is also used for flavouring tea and soups.

Discussion

The review indicates that lemongrass has considerable potential for strengthening rural livelihoods and promoting women-led entrepreneurship in Jharkhand. The crop possesses several characteristics that make it suitable for resource-constrained farming households, including perennial growth, relatively low maintenance requirements, adaptability to rainfed and marginal lands, and the possibility of repeated harvesting. These characteristics reduce the need for frequent re-establishment of the crop and provide opportunities for relatively regular returns from the same land resource. The suitability of lemongrass for upland and less productive areas is particularly relevant in Jharkhand, where small and marginal holdings constitute a major proportion of farm households and access to irrigation remains limited.

The analysis of the value chain demonstrates that income generation from lemongrass depends not only on production but also on the efficiency of activities beyond the farm gate. The chain extends from the supply of planting material and cultivation to harvesting, cleaning, drying, storage, processing, value addition, transportation and marketing. Thus, farmers who remain confined to the sale of raw or minimally processed herbage may capture only a limited portion of the total value generated by the product. In contrast, participation in processing and value addition can create additional income opportunities and strengthen the bargaining position of producers. The review therefore supports a shift from a production-oriented approach towards an integrated value-chain perspective.

A major opportunity identified in the review is the development of decentralized processing and distillation facilities. Lemongrass oil is obtained through steam distillation, and the review reports an oil recovery of approximately 0.5–0.8 per cent from the grass. Processing at the local level can reduce the dependence of farmers on external processors and enable producer groups to retain a larger share of the value generated from essential oil. This is particularly important for women entrepreneurs because collective ownership or management of small-scale distillation units can transform women from primary producers into processors and enterprise managers. The example of a distillation unit established for a Sakhi Mandal under a livelihood initiative illustrates the potential for linking women's collective institutions with local value addition. The findings further suggest that value addition and product diversification represent important pathways for increasing returns. Apart from essential oil, lemongrass can be marketed as dried leaves and processed into herbal tea and other products. Such diversification can reduce dependence on a single market outlet and allow women entrepreneurs to target different consumer segments, including food and beverage, personal care, pharmaceutical and cosmetic industries. The review identifies essential oil, herbal tea and dried leaves as particularly relevant value-added products. Consequently, entrepreneurial development should focus not only on increasing production but also on developing processing skills, product quality, packaging, branding and market-oriented product development.

However, several constraints limit the ability of producers and women entrepreneurs to capture these opportunities. At the production level, inadequate access to quality planting material, poor soil fertility, inappropriate agronomic practices, pest and disease problems and imbalanced fertilizer use can reduce herbage yield and consequently oil output. Since oil production is closely associated with the quantity and quality of harvested biomass, productivity constraints at the farm level can have repercussions throughout the value chain. Improving planting material, agronomic management and harvesting practices is therefore essential for improving both physical productivity and the economic returns from processing.

Post-harvest and processing constraints constitute another important bottleneck. Inadequate storage facilities can expose dried lemongrass to pest and rodent damage, thereby affecting product quality and marketability. The absence of appropriate local processing infrastructure can also force producers to sell their produce before substantial value addition takes place. Establishing suitable drying, storage, chopping and distillation facilities near production clusters could reduce post-

harvest losses and facilitate greater participation of women in higher-value activities.

Marketing-related constraints are equally significant. Product quality, oil content and price information influence the returns obtained by producers. Weak market linkages may increase farmers' dependence on intermediaries and reduce their ability to negotiate favourable prices. The review therefore indicates the importance of direct linkages between women producer groups and processors, retailers, herbal-product companies, cosmetic industries and other institutional buyers. Digital marketing and improved access to market information could further reduce information asymmetry and support better price discovery. The role envisaged for e-NAM in improving market information and price discovery provides an institutional avenue, although the extent to which such platforms can be effectively used for lemongrass would depend on commodity-specific market participation and infrastructure.

Women's participation across multiple stages of the chain is particularly important from an empowerment perspective. The review shows that women are involved not only in cultivation but also in processing, packaging and the marketing of lemongrass products. Participation in these activities can potentially expand women's economic roles beyond unpaid or low-return agricultural work. Collective institutions such as Self-Help Groups and Sakhi Mandals can provide a platform for pooling resources, accessing training, sharing processing infrastructure and improving bargaining power. The movement from individual production towards women-led collective enterprises may therefore help overcome some of the scale-related constraints faced by small producers.

Institutional support is another important component of the value-chain development process. Existing programmes relating to medicinal and aromatic plants, horticulture, agricultural credit and agricultural marketing provide potential mechanisms for addressing different constraints simultaneously. For example, horticultural programmes emphasize technology, post-harvest management, processing, marketing and farmer aggregation, while the Kisan Credit Card framework provides access to credit for cultivation, post-harvest expenses and marketing-related requirements. Such interventions can become more effective when implemented through convergence at the local level and linked with women's producer groups. The economic potential of lemongrass, therefore, should be assessed in terms of **value capture rather than production alone**. Expansion of cultivated area without addressing processing, quality, storage and marketing constraints may not proportionately increase women's income. In contrast, strengthening the downstream segments of the chain can create opportunities for women entrepreneurs to capture additional margins. Local distillation, standardized drying, improved packaging, branding and diversified products can collectively increase the economic value generated from the same quantity of raw material.

Overall, the review suggests that the development of a women-oriented lemongrass value chain in Jharkhand requires coordinated interventions across the entire chain. Improving planting material and production technology should be complemented by decentralized processing infrastructure, skill development, quality assurance, institutional finance, collective marketing and direct buyer linkages. The evidence presented in the review also suggests that women's participation in processing and value addition can provide a pathway towards greater income diversification and entrepreneurship. Hence, a women-led, cluster-based and value-addition-oriented approach appears central to strengthening the economic potential of lemongrass in Jharkhand.

For future empirical research, these observations provide a basis for measuring the distribution of value and margins among different actors in the lemongrass chain. A detailed farm-level study could estimate production costs, marketing costs, gross and net margins, producer's share in consumer price, value addition at each stage, and the determinants of women's participation in processing and marketing. Such analysis would help move beyond a descriptive value-chain assessment and provide quantitative evidence on the mechanisms

through which lemongrass can contribute to women's income enhancement in Jharkhand.

Conclusion

The review highlights that lemongrass has considerable potential to emerge as a sustainable livelihood and women-led entrepreneurial activity in Jharkhand. Its perennial nature, relatively low maintenance requirement, suitability for rainfed and marginal lands, and multiple applications in essential oils, herbal teas, food, cosmetics and pharmaceutical products provide opportunities for income diversification among rural households. The existing value chain encompasses input supply, cultivation, harvesting, post-harvest handling, processing, value addition, storage and marketing, with women increasingly participating not only in production but also in processing and packaging activities.

However, the review indicates that the major share of value cannot be captured at the farm level unless production and post-production constraints are addressed simultaneously. Low productivity, inadequate access to quality planting material, inappropriate agronomic practices, insufficient storage and processing infrastructure, quality problems, limited access to credit, weak market linkages and inadequate price information remain important bottlenecks in the value chain.

The greatest opportunity for women entrepreneurs lies in moving from the sale of raw lemongrass towards **value-added products** such as essential oil, dried leaves and herbal tea. Decentralized steam-distillation facilities owned or managed by women's groups can enable greater value capture at the local level. The participation of women through livelihood missions and collective institutions, including distillation facilities established for Sakhi Mandals, demonstrates the potential for developing women-led enterprises beyond primary production.

Therefore, enhancing women's income from lemongrass requires an integrated value-chain strategy comprising improved varieties and planting material, scientific production practices, better harvesting and post-harvest management, accessible processing and distillation infrastructure, quality improvement, appropriate packaging and branding, skill development, institutional credit and stronger direct linkages with processors, retailers and herbal, cosmetic and pharmaceutical industries. Existing institutional mechanisms related to horticulture, medicinal and aromatic plants, agricultural credit and market integration can further support these interventions.

In conclusion, doubling the income of women entrepreneurs should be approached through greater value capture rather than production expansion alone. Strengthening women-led collectives, promoting local processing and product diversification, improving market access and ensuring access to technology, finance and market information can create a more inclusive and remunerative lemongrass value chain in Jharkhand. Such an approach can contribute not only to higher and more diversified incomes but also to employment generation, entrepreneurship development and sustainable rural livelihoods.

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