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PRODUCTION, PROCESSING AND MARKETING OF GREEN GRAM IN INDIA

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ABSTRACT

Green gram (*Vigna radiata* L.), commonly known as mung, is an important pulse crop in India, contributing significantly to the country's pulse production. This study investigates the global, national and regional status of green gram production, the cost of cultivation, processing techniques, and marketing strategies. India, as the largest producer and consumer of green gram, holds 30% of the global output. Green gram is a rich source of protein, making it crucial for food security in a predominantly vegetarian country. The crop also plays a vital role in sustainable agriculture by improving soil fertility through biological nitrogen fixation. The processing of green gram into dal and other value-added products is a key area of economic interest, with small, medium, and large-scale processing mills demonstrating varying levels of profitability. Marketing of green gram reveals significant private and institutional channels, with the latter, such as NAFED, offering support through Minimum Support Prices (MSP). The marketing efficiency varies across channels, with price spreads and marketing costs affecting the overall returns for farmers. This comprehensive analysis also highlights the challenges faced by green gram growers, including high input costs and fluctuating market rates, and emphasizes the need for enhanced technical support and better market facilities. Government initiatives, such as the National Food Security Mission (NFSM) and the International Mungbean Improvement Network (IMIN), are instrumental in promoting green gram cultivation and improving yields.

Key words : Green gram, Production, Processing, Marketing and Sustainable agriculture.

Introduction

Green gram (*Vigna radiata* L.) commonly known as "mung" or "mung bean" is a native of India and central Asia and has grown in these regions since prehistoric times. In 1986, De Candolle affirmed that green gram originated in India, supporting the long-held view of its deep historical roots in the region as stated by Singh *et al*. (2016). Green gram, the third most important pulse crop in India, is grown on nearly 17% of the country's total pulse area. As noted by Pandey *et al*. (2019), it plays a key role in Indian agriculture by fixing approximately 42 kg of nitrogen per hectare and preventing soil erosion through crop rotation. Green gram is rich in high-quality protein, consumed as whole grains, dal, or sprouts, and its husk and green plants serve as cattle feed. Awomi *et al*. (2012) found that soil nutrient deficiencies and imbalanced fertilization likely contribute to the low productivity of green gram in India. Khairnar *et al*. (2019) highlighted its drought tolerance and suitability for dryland farming, often grown as an intercrop. Phosphorus application boosts nitrogen fixation and productivity, as explained by Prasad *et al*. (2014). Bora and Kulshrestha (2015) emphasized its health benefits, particularly its low glycemic index and antioxidant properties, making it ideal for diabetic individuals. Sprouting, as discussed by Jeevarathinam and Shanmugalakshmi (2023), enhances protein content and bioavailability, aiding in malnutrition prevention. Mishra *et al*. (2020) suggested green gram bean cookies as a protein-rich option.

Green gram has traditionally been grown in Asia but has recently expanded to Africa and America. India leads globally in green gram production, consumption, import, and processing, with other major producers including

Myanmar, Pakistan, Bangladesh and Thailand, as noted by the Indian Institute of Pulses Research (2022). While its cultivation in Africa and the U.S. is relatively recent, it is spreading quickly worldwide. Currently grown on about six million hectares, primarily in South and Southeast Asia, green gram is also cultivated in Australia, Canada, Ethiopia, and the U.S. Nair *et al*. (2020) reported that the global cultivation area is around 7.3 million hectares, producing 5.3 million tonnes, with India and Myanmar each contributing 30% of this total. Other major producers include China, Indonesia, Kenya, Tanzania and Thailand.

Production of green gram in India

According to DES, DA&FW (2022), India, with over 35 million hectares of pulse cultivation, is the largest global producer, contributing 37% of the world's pulse area and 29% of total production. Green gram occupies 48.52 lakh hectares, with production of 26.48 lakh tons and the yield is 546 kg per hectare. Green gram contributes 17 per cent to the total area under pulse cultivation and 11 per cent to the total pulse production (Oganja *et al.*, 2024a). Rajasthan leads with 48% of the area and 42% of production. More than 90% of green gram production comes from 10 states, including Madhya Pradesh, Maharashtra, and Karnataka. The MSP for green gram has risen by 72% from 4500 Rs/quintal in 2013-14 to 7755 Rs/quintal in 2022-23, as reported by the Commission for Agricultural Costs & Prices (2022). Bamboriya *et al.* (2022) highlighted the effectiveness of the front-line demonstration program in improving farmers' knowledge and productivity. Sah *et al.* (2022) emphasize the entrepreneurial potential of green gram due to its premium value, while Chandra (2012) calls for enhanced collaboration among stakeholders to boost the adoption of recommended practices for better production.

According to the Ministry of Commerce & Industry (2022), the major importing countries of green gram are Mozambique (32 per cent), Tanzania (16 per cent) and Myanmar (16 per cent) are the 3 major importing countries of green gram in India together contributing 64 per cent of total imports. Other countries are Afghanistan (11 per cent), Brazil (7 per cent), Argentina (4 per cent), UAE (3 per cent), Kenya (3 per cent), South Africa (3 per cent). The export destinations of green gram from India are China (44 per cent), Nepal (14 per cent) and the USA (13 per cent) are 3 major export destinations for the export of green gram from India. 71 per cent of the total export of green gram from India is done to these 3 countries. Other export countries are Canada (9 per cent), the UK (6 per cent), Qatar (2 per cent), UAE (2 per cent), Netherlands (2 per cent), Djibouti (1 per cent), and Singapore (1 per cent). This reflects India's crucial role as both a major importer and exporter in the global market. To strengthen its position, India can focus on reducing import dependency through increased domestic production and expanding its export reach by improving agricultural infrastructure and productivity.

Processing of green gram in India

Processing green gram is vital for enhancing its nutritional value and increasing its market value. Naik *et al*. (2020) stated that over 75% of legumes in India, including green gram, are processed into dal, with dal milling being the second-largest food processing industry. However, traditional methods cause a 10-17% yield loss. Besides dal, green gram is used to produce various value-added products such as flakes, puffs, sprouts, noodles, papads, and flour. Thirumaran and Seralathan (1988) highlighted the high protein content of green gram vermicelli. Ready-to-Eat (RTE) products made from green gram include dal, sprouts, flakes, roasted green gram, and burfee. Ready-to-cook (RTC) products include instant mixes like idli, dosa, halwa, and pakora mixes. Despite its many uses, Anonymous (2017) suggested that outdated processing technology leads to a 1% loss, recommending the adoption of PLC-controlled equipment and subsidies for value addition at the farmer level. Singh and Kaur (2018) emphasized the need for better infrastructure for storage, marketing, and processing to boost green gram production and processing efficiency.

Khorne *et al*. (2022) analyzed the economics of green gram processing mills in Maharashtra, focusing on four randomly selected districts: Akola, Latur, Amravati, and Buldhana. Data were collected from 10 processing units, categorized by size: small (5-30 q/day), medium (30-60 q/day) and large (60-120 q/day). The study calculated costs and returns using simple tabular analysis and benefit-cost ratios. The total costs for processing were Rs. 6156.72, Rs. 5933.37, and Rs. 5913.34 per quintal for small, medium, and large units, respectively. Processing costs were highest for small units at Rs. 307.57 per quintal and lowest for large units at Rs. 177.43 per quintal. Net returns over total costs were Rs. 187.40, Rs. 193.91, and Rs. 218.49 for small, medium, and large mills, indicating that large mills are more efficient in minimizing costs. The benefit-cost ratios were 1.030, 1.033 and 1.037 for small, medium and large units, respectively, with large mills showing the highest efficiency.

Marketing of green gram in India

A marketing channel consists of the people, organizations and activities necessary to transfer the ownership of goods from the point of production to the

point of consumption Katariya *et al.* (2016), Sulthana *et al*. (2019), Vasoya *et al*. (2024). According to the DA&FW, GOI (2021), green gram marketing in India follows both private and institutional channels. In the private marketing channel, the crop moves through intermediaries such as producers, dal millers, village traders, wholesalers, commission agents and retailers before reaching consumers. The marketing routes range from simple, like direct sales from producers to dal millers, to more complex chains involving multiple intermediaries, including village traders and commission agents in the institutional channel, organizations like NAFED procure green gram from producers at minimum support prices. The produce then moves through dal millers, wholesalers, and retailers before reaching consumers, providing price stability.

Angadi and Patil (2019) conducted a study on the marketing channels of green gram in the Gadag district of Karnataka. To examine the marketing aspects, three markets—Gadag, Shirahatti, and Ron were selected based on their size. In each market, 45 village merchants, 45 wholesalers, 45 retailers and 45 dal millers were personally interviewed to gather the necessary information. The study identified four main marketing channels that farmers used when selling their green gram outputs as shown below in the Fig. 1.

Channel–I: Producer→ Village Merchant → Wholesaler → Retailer → Consumer
Channel–II: Producer → Commission Agent/trader → Wholesaler → Retailer → Consumer
Channel–III: Producer → Village Merchant → Commission Agent/ trader → Dal miller (Processor) → Wholesaler → Retailer → Consumer
Channel–IV: Producer → Commission Agent/trader → Dal miller (Processor) → Wholesaler → Retailer → Consumer

Fig. 1 : Marketing channels of green gram in Karnataka.

When comparing Channel-I and Channel-II in terms of green gram (whole) marketing, Channel-II provides a greater producer's share of the consumer's rupee at 75.90 per cent compared to 72.97 per cent for Channel-I. Additionally, the price spread is lower in Channel-II than in Channel-I, indicating that Channel-II is more efficient. Similarly, when comparing Channel-III and Channel-IV for green gram (split dal) marketing, Channel-IV offers a higher producer's share in the consumer's rupee at 66.89 per cent, while Channel-III offers 64.31 per cent. The price spread is also lower in Channel-IV than in Channel-III, demonstrating that Channel-IV is more efficient than Channel-III.

Another study on green gram marketing channels was conducted by Kumar *et al.* (2022) in the Madurai district of Tamil Nadu. The study utilized a survey method with a structured interview schedule to collect data from Farmer Producer Organizations (FPOs) registered with the Madurai Agribusiness Incubation Forum (MABIF). A random sampling technique selected 60 FPO board members and company representatives. Data focused on various marketing aspects, including costs, channels, price spread, efficiency and constraints during the agricultural year 2021–2022. The study identified two primary marketing channels for green gram, as shown in Fig. 2.

Channel I: Producer → FPO → Consumer
Channel II: Producer → FPO → Wholesaler → Retailer → Consumer

Fig. 2 : Marketing channels of green gram in Karnataka

The study analyzed marketing costs, including transportation, loading/unloading, packing, promotion, and processing, and calculated the marketing margin, defined as the difference between the consumer price and the net price received by the producer. Marketing efficiency was assessed using Shepherd's method. The findings showed that the marketing cost and margin for FPOs were Rs. 19 and Rs. 26, while wholesalers had costs and margins of Rs. 15 and Rs. 7, and retailers had Rs. 5 and Rs. 20. The price spreads were Rs. 45 for channel I and Rs. 60 for channel II, indicating a higher spread in channel II, while channel I was more cost-effective for green gram farmers. The marketing efficiencies were 5.26 for channel I and 4.42 for channel II, demonstrating that channel I had higher marketing efficiency.

Encouraging direct sales through FPOs or local markets can increase farmers' share of consumer prices and cut intermediary costs. Strengthening FPOs with training and support will enhance market access while reducing intermediaries improves price realization. Expanding MSP procurement through organizations like NAFED ensures price stability for farmers.

Constraints faced by green gram growers

Key constraints to agricultural productivity in India include low availability of improved or hybrid seed, lack of seed multiplication capacity, low profitability and efficiency of organic fertilizer, fertilizer, bio-fertilizer and plant growth regulator adoption and use due to the lack of complimentary improved practices and seed Ghangale *et al.* (2018), Sathish *et al*. (2019), Sathish *et al.* (2022), Kumar *et al*. (2024a), Kumar *et al*. (2024b), poor adoption of recommended insecticide and bio-pesticide Pithiya *et al.* (2024), Oganja *et al.* (2024b). Salunkhe *et al*. (2020) conducted study in Navsari district to find out constraints of green gram growers. Total twelve villages from the four talukas were randomly selected, and 120

green gram farmers with a minimum of 3 years of cultivation experience were randomly chosen as respondents. These 120 farmers were considered the sample for the study. More than 85 percent of farmers reported significant challenges, such as the high cost of inputs, fluctuating market prices, and limited access to healthy seedlings. Other common constraints included labor shortages, expensive transportation, insufficient technical support, high labor costs, lack of timely credit, inadequate market facilities, and irregular irrigation supply. To address these challenges, farmers suggested the need for timely technical guidance, access to quality seedlings, stable pricing for agricultural products, training on modern technologies, and consistent visits from agricultural officers.

Institutional and Governmental initiatives

In recent years, the government has implemented various measures to enhance pulse production and reduce import dependence. As a result, production increased from 18.24 million metric tonnes (MMT) in 2010-11 to a record 26.96 MMT in 2021-22, a growth of about 48%. To stabilize prices and improve availability, the government allowed the free import of tur, urad, and moong from May 15 to October 31, 2021, leading to a significant rise in imports. Import dependency, which was around 9% in 2020-21, is projected to drop to 3.6% by 2030-31, with an increase in production by 1.5-2 MMT potentially neutralizing the need for imports, as reported by the DA and FW, GOI (2022). Key initiatives include the National Food Security Mission (NFSM)-pulses, launched in 2007 to promote pulse cultivation through farmer assistance and seed distribution. The 2016 mission on pulses aimed to increase production and consumption, providing support for seed production and market infrastructure for green gram. The International Mungbean Improvement Network (IMIN), established in 2016, promotes international cooperation in mungbean breeding research, supported by the Australian Centre For International Agricultural Research (ACIAR). The 2024 International Mungbean Congress brought together 110 stakeholders from 23 countries to discuss research priorities. Additionally, a pilot project initiated by Vaagdhara in 2016-17 in collaboration with Rajasthan's tribal area development department supported 1,000 women farmers with seeds and technical knowledge, improving seed germination and crop yields. To boost pulse production and reduce imports, the government can promote precision farming, improve irrigation, and support public-private partnerships for seed development. Expanding research on resilient varieties, enhancing FPO market access, and providing farmer training, especially for women, will improve yields. Strengthening MSP procurement can further stabilize prices.

Conclusion

The review paper provides a comprehensive analysis of green gram (*Vigna radiata* L.), a vital pulse crop in India, which contributes 30% of global production which amounts to 1.59 million tonnes. Green gram is one of the key sources of protein in a predominantly vegetarian country but also plays a crucial role in sustainable agriculture by enhancing soil fertility through nitrogen fixation. India's green gram cultivation is widespread, with states like Rajasthan and Madhya Pradesh leading in production. However, farmers face challenges such as high input costs, market price fluctuations, and labor shortages. Government initiatives like the National Food Security Mission (NFSM) and the International Mungbean Improvement Network (IMIN) have supported farmers and boosted yields. The paper also examines the economic impact of processing green gram into dal and other value-added products. Larger processing units are more cost-efficient, but the industry suffers from outdated technology, leading to processing losses. Upgrading this technology could significantly improve profitability for farmers and processors. In terms of marketing, institutional channels like NAFED, which support farmers through minimum support prices (MSP) are more efficient than private channels, though the latter remains dominant. Overall, the paper highlights the need for better technical support, improved market infrastructure and modern processing technology to maximize the potential of green gram in India's agricultural economy.

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