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### Assessing constraints in Telangana's rice export supply chain from paddy fields to global markets

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#### Abstract

The present study entitled "Assessing Constraints in Telangana's Rice Export Supply Chain from Paddy Fields to Global Markets" was undertaken to analyse the major constraints affecting the rice export supply chain and to examine the role of different stakeholders involved in rice export activities in Telangana state. Rice is one of the most important cereal crops in India and contributes significantly to agricultural production, food security, employment generation and foreign exchange earnings. Telangana has emerged as one of the major rice-producing states in India due to increasing irrigation facilities, expansion in cultivated area and improved productivity levels. The study was conducted in selected districts of Telangana namely Warangal, Nalgonda and Karimnagar due to their significant contribution to rice production and export activities. The study mainly focused on analysing stakeholder-wise constraints in the rice export supply chain. Both primary and secondary data were used for the study. Primary data were collected from 120 respondents comprising 90 farmers, 10 rice millers, 10 exporters and 10 logistics handling personnel through personal interview method using a pre-tested structured schedule. Secondary data related to rice production, exports and export performance were collected from APEDA, DGCI&S, DES Telangana and published reports. Descriptive statistical tools such as percentages and mean were used for analysis, while Garrett's Ranking Technique was employed to identify and rank the major constraints faced by stakeholders involved in the rice export supply chain. The study revealed that farmers mainly faced constraints related to high cost of fertilizers and pesticides with a mean Garrett score of 84.36, labour shortage during peak season (81.54), high labour wages (78.63) and water scarcity for irrigation (75.82). Rice millers identified high electricity charges as the major constraint with a mean Garrett score of 82.46 followed by high transportation cost (79.84), labour shortage (76.25) and high processing cost (73.68). Exporters mainly faced high freight charges with a mean Garrett score of 84.72 followed by export policy uncertainty (81.56), container shortage (78.94) and delay in customs clearance (75.38), whereas logistics personnel identified high fuel cost as the most severe constraint with a mean Garrett score of 83.64 followed by poor road infrastructure (80.42), container shortage (77.85) and delay in cargo movement (74.63). The findings indicate that logistics-related, infrastructural and policy-related constraints significantly affect the efficiency and competitiveness of rice exports from Telangana. The study concluded that Telangana possesses strong potential for rice exports due to increasing production, exportable surplus and growing international demand for Indian rice. However, several operational, infrastructural and policy-related challenges continue to affect the smooth functioning of the rice export supply chain. Therefore, strengthening logistics infrastructure, ensuring stable export policies, improving transportation facilities and enhancing institutional support are essential for improving export competitiveness and supply chain efficiency.

**Keywords:** Rice exports, supply chain, constraints, Garrett ranking, Telangana, stakeholders, logistics

#### 1. Introduction

Agriculture plays a vital role in the Indian economy by contributing significantly towards employment generation, food security, rural livelihoods and economic development. A major proportion of the Indian population depends directly or indirectly on agriculture for income and sustenance. Among various agricultural commodities, rice occupies a prominent position as one of the most important cereal crops cultivated in the country. Rice serves as the

staple food for more than half of the population and contributes substantially towards nutritional security and agricultural trade. India is one of the leading producers and exporters of rice in the world due to favourable agro-climatic conditions, availability of diverse rice varieties, increasing production and strong international demand for Indian rice. Agricultural exports have emerged as an important source of foreign exchange earnings for the country, and rice constitutes a major share in India's

agricultural export basket. Both basmati and non-basmati rice exports contribute significantly towards export earnings and strengthen India's position in global agricultural trade.

In recent years, Telangana has emerged as one of the important rice-producing states in India due to expansion of irrigation facilities, increasing cultivated area under paddy and adoption of improved production technologies. Government initiatives such as irrigation projects, input support schemes and procurement policies have contributed towards rapid growth in rice production and productivity in the state. The increasing production levels and availability of exportable surplus have created substantial opportunities for rice exports from Telangana to international markets. Rice exports from the state are mainly facilitated through rice mills, export agencies, logistics operators and inland container depots such as ICD Hyderabad and ICD Thimmapur. The rice export supply chain involves a series of interconnected activities beginning from production and procurement to processing, storage, packaging, transportation, export documentation, customs clearance and international distribution. Efficient functioning of each stage in the supply chain is essential for maintaining product quality, reducing transaction cost and ensuring timely export movement.

The rice export supply chain involves the participation of multiple stakeholders including farmers, rice millers, exporters, logistics handling personnel and supporting institutions such as APEDA, DGFT, EIC, customs authorities, banks and transport agencies. Farmers act as the primary producers supplying paddy to procurement agencies and rice mills, while rice millers perform processing activities such as cleaning, drying, milling, polishing, grading and packaging to convert paddy into export-quality rice. Exporters coordinate export documentation, quality certification and shipment procedures, whereas logistics personnel manage transportation, warehousing, cargo handling and container movement from mills to export gateways. The efficiency of the supply chain largely depends on proper coordination among stakeholders, adequate infrastructure facilities, stable export policies and effective logistics management. Any disruption or inefficiency in the supply chain can adversely affect export competitiveness, profitability and timely delivery of consignments to international buyers.

Despite the increasing export potential of rice from Telangana, the rice export supply chain faces several operational, infrastructural, logistical and policy-related constraints. Farmers encounter problems related to high input cost, labour shortage, irrigation issues and price fluctuation. Rice millers face high electricity charges, increasing transportation cost, labour scarcity and difficulties in maintaining export quality standards. Exporters experience challenges such as high freight charges, container shortage, customs clearance delays, export policy uncertainty and international market fluctuations. Similarly, logistics handling personnel face constraints related to high fuel cost, poor road infrastructure, traffic congestion and delays in cargo movement. Frequent changes in export policies such as export restrictions, export duties and minimum export price regulations further create uncertainty in export operations and affect trade competitiveness. These constraints increase operational cost, reduce efficiency and negatively influence the overall

performance of the rice export supply chain.

Although several studies have examined rice production, agricultural exports and supply chain management in India, limited research has been carried out specifically on stakeholder-wise constraints in the rice export supply chain of Telangana. Understanding the nature and severity of constraints faced by different stakeholders is essential for developing effective policy measures and improving supply chain efficiency. In this context, the present study entitled "Assessing Constraints in Telangana's Rice Export Supply Chain from Paddy Fields to Global Markets" was undertaken to analyse the major constraints affecting the rice export supply chain and to identify stakeholder-wise challenges affecting rice export operations in Telangana.

## **2. Materials and Methods**

### **2.1 Study Area**

The present study was conducted in Telangana state, which has emerged as one of the major rice-producing states in India due to rapid expansion of irrigation facilities, increasing paddy cultivation area and higher productivity levels. Telangana possesses significant potential for rice production and exports owing to favourable agro-climatic conditions, availability of irrigation infrastructure and increasing marketable surplus. For the purpose of the study, three districts namely Warangal, Nalgonda and Karimnagar were purposively selected due to their significant contribution towards rice production, rice processing and export-related activities in the state. These districts have a large concentration of rice mills, procurement centres and export-oriented rice processing units, making them suitable for studying constraints in the rice export supply chain.

### **2.2 Sampling Procedure**

The study was primarily based on primary data collected from different stakeholders involved in rice export activities in Telangana. Primary data were collected through personal interview method using a structured and pre-tested questionnaire specifically designed for the study. The questionnaire included information related to stakeholder characteristics and constraints affecting rice export operations.

A total sample of 120 respondents was selected for the study comprising 90 farmers, 10 rice millers, 10 exporters and 10 logistics handling personnel. Farmers were selected from major rice-producing areas of the selected districts, while purposive sampling technique was used for selecting rice millers, exporters and logistics personnel due to their direct involvement in rice export activities and supply chain operations. The selected stakeholders represented different stages of the rice export supply chain including production, processing, transportation and export management.

### **2.3 Analytical Tools and Techniques**

The collected primary data were tabulated and analysed using appropriate statistical tools. Descriptive statistical tools such as percentages and mean were used to analyse stakeholder characteristics and supply chain-related parameters. Garrett's Ranking Technique was employed to identify and rank the major constraints faced by farmers, rice millers, exporters and logistics personnel involved in the rice export supply chain.

Under Garrett's Ranking Technique, respondents were

asked to rank the identified constraints based on their severity and importance. The ranks assigned by respondents were converted into percent positions using the following formula:

$$\text{Percent Position} = 100 \times (R_{ij} - 0.5) / N_j$$

Where,

$R_{ij}$  = Rank given for  $i$ th constraint by  $j$ th respondent  
 $N_j$  = Number of constraints ranked by  $j$ th respondent

The percent positions obtained were converted into Garrett scores using Garrett ranking conversion tables. The scores for each constraint were summed and average scores were calculated to identify the relative importance and ranking of constraints faced by stakeholders in the rice export supply chain.

### 3. Results and Discussion

**Table 3.1:** Constraints Faced by Farmers in the Rice Export Supply Chain in Telangana

| S. No | Constraints Faced by Farmers            | Mean Garrett Score | Rank |
|-------|-----------------------------------------|--------------------|------|
| 1     | High cost of fertilizers and pesticides | 84.36              | I    |
| 2     | Labour shortage during peak season      | 81.54              | II   |
| 3     | High labour wages                       | 78.63              | III  |
| 4     | Water scarcity for irrigation           | 75.82              | IV   |
| 5     | Pest and disease incidence              | 72.47              | V    |
| 6     | Fluctuation in paddy prices             | 69.58              | VI   |
| 7     | Delay in procurement                    | 66.94              | VII  |
| 8     | Delay in payment                        | 63.85              | VIII |
| 9     | High transportation cost                | 60.72              | IX   |
| 10    | Lack of market information              | 57.64              | X    |
| 11    | High cost of machinery                  | 54.91              | XI   |
| 12    | Storage-related problems                | 51.38              | XII  |

**Table 3.2:** Constraints Faced by Rice Millers in the Rice Export Supply Chain in Telangana

| S. No | Constraints Faced by Rice Millers                    | Mean Garrett Score | Rank |
|-------|------------------------------------------------------|--------------------|------|
| 1     | High electricity charges                             | 82.46              | I    |
| 2     | High transportation cost                             | 79.84              | II   |
| 3     | Labour shortage                                      | 76.25              | III  |
| 4     | High processing cost                                 | 73.68              | IV   |
| 5     | Moisture variation in paddy                          | 71.42              | V    |
| 6     | Poor quality paddy received from procurement centres | 68.95              | VI   |
| 7     | Storage and warehouse problems                       | 66.37              | VII  |
| 8     | Machinery maintenance and repair cost                | 63.84              | VIII |
| 9     | Frequent power interruptions                         | 60.52              | IX   |
| 10    | Difficulty in maintaining export quality standards   | 57.91              | X    |
| 11    | Fluctuation in paddy prices                          | 54.76              | XI   |
| 12    | Delay in procurement and movement of stocks          | 51.48              | XII  |

The results presented in Table 3.2 indicated that rice millers faced several operational and infrastructural constraints affecting processing efficiency and export competitiveness. High electricity charges emerged as the most severe constraint with a mean Garrett score of 82.46 and ranked first among the identified problems. Rice milling operations involve continuous use of machinery for cleaning, drying, milling and polishing activities, which require substantial electricity consumption. Increasing electricity tariffs significantly raised operational expenses and reduced profit margins of rice mills.

High transportation cost was ranked second with a mean Garrett score of 79.84. Transportation of paddy from procurement centres to mills and movement of processed rice to export points increased overall processing expenses.

The results presented in Table 3.1 revealed that farmers faced several production and marketing-related constraints affecting rice cultivation and supply chain efficiency. Among the identified constraints, high cost of fertilizers and pesticides emerged as the most severe problem with a mean Garrett score of 84.36 and was ranked first. The increasing prices of fertilizers, pesticides and other agricultural inputs significantly increased the cost of cultivation and reduced profitability of rice farming. Labour shortage during peak agricultural operations was ranked second with a mean Garrett score of 81.54. Non-availability of labour during transplanting and harvesting periods created operational difficulties and delayed farm activities. High labour wages ranked third with a mean Garrett score of 78.63, indicating rising labour expenses in rice cultivation due to increasing rural wage rates and migration of agricultural labourers towards non-farm sectors.

Water scarcity for irrigation was ranked fourth with a mean Garrett score of 75.82. Although irrigation facilities have improved in Telangana, farmers still experience irregular water availability in certain regions during critical crop growth stages. Pest and disease incidence, fluctuation in paddy prices and delays in procurement and payment were also identified as important constraints affecting farmers. Price fluctuations reduced income stability and created uncertainty regarding returns from rice cultivation. Delay in procurement and payment affected farmers' liquidity position and increased dependence on informal credit sources. These findings indicate that increasing production cost, labour scarcity and marketing-related inefficiencies adversely affect the regular supply of quality paddy to rice mills and export channels.

Labour shortage ranked third with a mean Garrett score of 76.25, indicating difficulties in availability of skilled and unskilled labour required for milling and handling operations. High processing cost ranked fourth with a mean Garrett score of 73.68 due to increasing fuel charges, machinery expenses and labour cost. Moisture variation in paddy and poor quality paddy received from procurement centres also affected milling efficiency and rice quality. Storage and warehouse-related problems created difficulties in maintaining quality of processed rice during storage periods. The findings indicate that increasing operational expenses and infrastructural limitations adversely affect profitability and create difficulties in maintaining export quality standards.

**Table 3.3:** Constraints Faced by Exporters in the Rice Export Supply Chain in Telangana

| S. No | Constraints Faced by Exporters             | Mean Garrett Score | Rank |
|-------|--------------------------------------------|--------------------|------|
| 1     | High freight charges                       | 84.72              | I    |
| 2     | Export policy uncertainty                  | 81.56              | II   |
| 3     | Container shortage                         | 78.94              | III  |
| 4     | Delay in customs clearance                 | 75.38              | IV   |
| 5     | Documentation complexity                   | 72.41              | V    |
| 6     | International price fluctuations           | 69.87              | VI   |
| 7     | Stringent quality standards                | 66.92              | VII  |
| 8     | Delay in shipment                          | 63.74              | VIII |
| 9     | Residue and pesticide compliance issues    | 60.58              | IX   |
| 10    | Competition from other exporting countries | 57.36              | X    |

The results presented in Table 3.3 revealed that exporters encountered several logistics-related, policy-related and international trade-related constraints affecting rice export operations. High freight charges emerged as the most severe constraint with a mean Garrett score of 84.72 and ranked first among all identified constraints. Increasing international shipping charges and inland transportation expenses substantially increased export cost and reduced export competitiveness in global markets.

Export policy uncertainty ranked second with a mean Garrett score of 81.56. Frequent changes in export policies such as export bans, export duties and minimum export price regulations created uncertainty among exporters and affected export planning and market commitments.

Container shortage ranked third with a mean Garrett score of 78.94, indicating inadequate availability of export containers during peak export periods. Delay in customs clearance ranked fourth with a mean Garrett score of 75.38 due to lengthy documentation procedures and administrative formalities at export points. Documentation complexity, international price fluctuations and stringent quality standards also affected export operations and profitability. Exporters additionally faced challenges related to residue and pesticide compliance issues in international markets. These findings indicate that policy instability, logistics bottlenecks and increasing export cost significantly affect the efficiency and competitiveness of rice exports from Telangana.

**Table 3.4:** Constraints Faced by Logistics Personnel in the Rice Export Supply Chain in Telangana

| S. No | Constraints Faced by Logistics Personnel          | Mean Garrett Score | Rank |
|-------|---------------------------------------------------|--------------------|------|
| 1     | High fuel cost                                    | 83.64              | I    |
| 2     | Poor road infrastructure                          | 80.42              | II   |
| 3     | Container shortage                                | 77.85              | III  |
| 4     | Delay in cargo movement                           | 74.63              | IV   |
| 5     | Traffic congestion                                | 71.58              | V    |
| 6     | Port handling delays                              | 68.94              | VI   |
| 7     | Warehouse shortage                                | 65.72              | VII  |
| 8     | Loading and unloading delays                      | 62.48              | VIII |
| 9     | Labour shortage                                   | 59.81              | IX   |
| 10    | Lack of timely availability of transport vehicles | 56.37              | X    |

The results presented in Table 3.4 showed that logistics handling personnel mainly faced transportation and infrastructure-related constraints affecting movement of export consignments. High fuel cost emerged as the most severe constraint with a mean Garrett score of 83.64 and ranked first among all identified problems. Increasing diesel and fuel prices substantially raised transportation expenses and logistics cost in rice export operations.

Poor road infrastructure ranked second with a mean Garrett score of 80.42. Inadequate road connectivity, damaged roads and traffic bottlenecks delayed transportation of paddy and processed rice to export destinations. Container shortage ranked third with a mean Garrett score of 77.85, indicating insufficient availability of containers for export movement during peak periods. Delay in cargo movement ranked fourth with a mean Garrett score of 74.63 due to traffic congestion, loading delays and inefficient transportation management. Traffic congestion, warehouse shortage and delays in loading and unloading operations also affected timely delivery of export consignments. Labour shortage further created operational difficulties

during cargo handling and transportation activities. The findings clearly indicate that inadequate logistics infrastructure and increasing transportation expenses significantly affect supply chain efficiency, increase export cost and reduce timely movement of rice consignments to international markets.

#### 4. Conclusion

The present study concluded that the rice export supply chain in Telangana is significantly affected by several production, operational, logistics-related and policy-related constraints faced by different stakeholders involved in export activities. Farmers mainly faced high cost of fertilizers and pesticides (84.36), labour shortage (81.54) and high labour wages (78.63), while rice millers experienced major problems related to high electricity charges (82.46), transportation cost (79.84) and processing cost (73.68). Exporters identified high freight charges (84.72), export policy uncertainty (81.56) and container shortage (78.94) as major constraints affecting export competitiveness, whereas logistics personnel mainly faced

high fuel cost (83.64), poor road infrastructure (80.42) and delays in cargo movement (74.63). These constraints adversely affected supply chain efficiency, increased operational cost and reduced export competitiveness of rice exports from Telangana. Therefore, strengthening logistics infrastructure, ensuring stable export policies, improving transportation and storage facilities and enhancing institutional support are essential for improving the efficiency and sustainability of the rice export supply chain from Telangana to global markets.

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