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Performance of Rice mills in India: A study of Literature Review

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Abstract:

The operation of Rice mills is generally focused on the process of converting rice grain into a form suitable for human consumption as well as certain byproducts of economic importance. Mysore is a leading district in rice milling operation in the state, due to its Cauvery river base and non-deltaic geographical regions, which are purely based on rain fed irrigation systems.

The present study primarily focused on the literature studies conducted by the researchers across the native state and other different parts of the country. The study is confined to understand the sequence of rice milling process, the problems and health care issues encountered by the laborers of the Rice mills across the state. Rice milling process is observed as a labor intensive industry which is proven to have both domestic and export potential. Hence Rice milling is viewed as an industry in the path ways of traditional establishments to transition and a total transformation as a modern technology based industry.

The present study also focusses on the various issues related financial feasibility of the rice milling process and even its eco-friendly aspects. The problems associated with the supply of electricity and the issues associated with supply of raw materials or purchase of paddy from the farmers and its storage related problems.

The present research article is descriptive in nature and broadly addresses the literature aspects of rice milling process and its further deeper insights so that the research gap is stated precisely.

Key words: *Rice mills, Human consumption, Geographical regions, Irrigation systems. Raw materials, Export potential, Financial feasibility. Eco-friendly.*

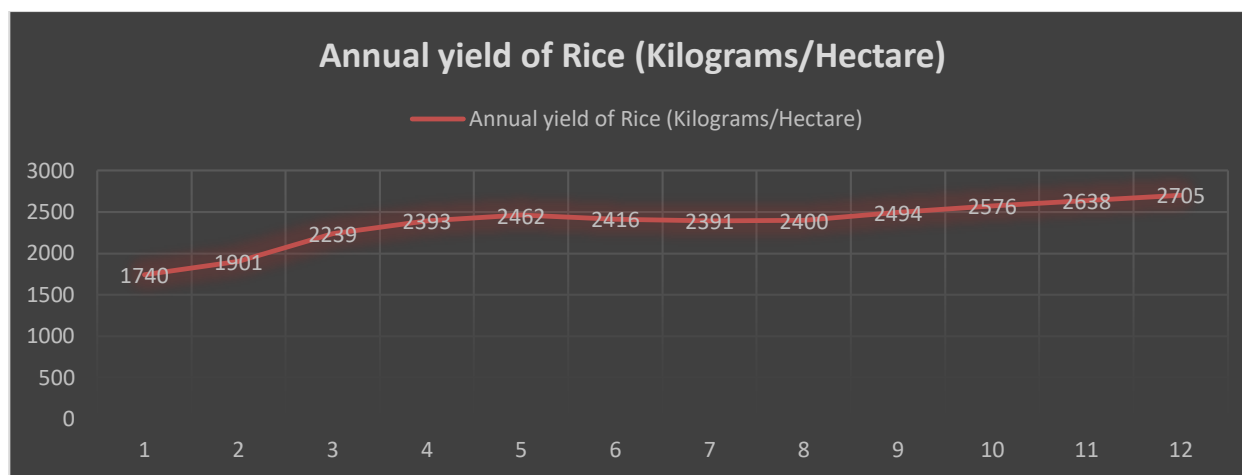
Introduction

Rice has been the staple food for more than half of humanity in the world. India is the second largest producer of rice in the world, consuming around 95% of what it produces. India is also the third largest exporter of rice in the world. Due to the high growth of population in recent years, there has been more pressure on arable land. This in turn has created a need for higher productivity in food crops. Concurrently, large quantities of food-grain were reported to be lost due to inefficient milling processes in the country.

In India rice is grown in 43.86 million ha, the production level is 104.80 million tones and the productivity is about 2390 kg/ha (Agricultural Statistics at a glance- 2015). It is grown under diverse soil and climatic conditions the productivity level of rice is low compared to the productivity levels of many countries in the world. Also about 90 % of the cultivated land belongs to Marginal, Small and Medium farmers which is another constrain in increasing the productivity of rice in the country. It is, therefore, there is ample scope to increase the productivity of rice in the country. The highest productivity is 6710kg per ha of China followed by Vietnam (5573 kg /ha), Indonesia (5152 kg/ha), Bangladesh (4375 kg/ha) etc There are improved technologies and various interventions which could be adapted to increase the productivity in the country. Cultivation of hybrid rice has potential to increase the productivity and needs to be promoted. Total production of Rice during 2019-20 is estimated at record 117.94 million tonnes. It is higher by 8.17 million tonnes than the five years' average production of 109.77 million tonnes.

Annual yield of Rice in India from 1991-2020 (Kilograms/Hectare)

Sl.no	Financial Year	Annual yield of Rice(Kilograms/Hectare)
1	1991	1740
2	2001	1901
3	2011	2239
4	2012	2393
5	2013	2462
6	2014	2416
7	2015	2391
8	2016	2400
9	2017	2494
10	2018	2576
11	2019	2638
12	2020	2705



Source: Agriculture statistics of India 2019-20

Rice Growing Regions:

The rice growing areas in the country can be broadly grouped into five regions as given below:

North-Eastern Region: This region comprises of Assam and North eastern states. In Assam rice is grown in the Basin of Brahmaputra River. This region receives very heavy rainfall and rice is grown under rain fed condition.

Eastern Region: It region comprises of Bihar, Chhattisgarh, Jharkhand, Madhya Pradesh, Orissa, Eastern Uttar Pradesh and West Bengal. In this region rice is grown in the basins of Ganga and Mahanadi rivers and has the highest intensity of rice cultivation in the country. This region receives heavy rainfall and rice is grown mainly underdrain fed conditions.

Northern Region: This region comprises of Haryana, Punjab, Western Uttar Pradesh, Uttarakhand, Himachal Pradesh and Jammu & Kashmir. The region experiences low winter temperature and single crop of rice from May-July to September to December is grown.

Western Region: This region comprises of Gujarat, Maharashtra and Rajasthan. Rice is largely grown under rain fed condition during June-August to October- December.

Southern Region: This region comprises of Andhra Pradesh, Karnataka, Kerala and Tamil Nadu. Rice is mainly grown in deltaic tracts of Godavari, Krishna and Cauvery Rivers and the non-deltaic rain fed area of Tamil Nadu and Andhra Pradesh. Rice is grown under irrigated condition in deltaic tracts.

Rice production estimates in India highlight the fact that

- India's rice production has risen from 69.35 Million Tons in the year 2005-06 to 102.19 in 2018-19 and registering a CAGR of 3.03 percent during 2005-06 and 2018-19.
- China was the leading rice producer followed by India, Indonesia and Bangladesh in 2018-19. These countries continue to remain the top producers of Rice in the year 2019-20 as well.

- Iran was the leading importing country for Basmati rice from India followed by Saudi and Iraq. In the period 2019-20 (Apr-Sep) Iran, Saudi Arabia, Iraq and Kuwait remained the leading export destinations of Basmati Rice.
- For Non-Basmati Rice, during the 2019-20 (Apr-Sep), Berlin and Nepal remained the top exporting destination, a trend which continued from the previous year 2018-19.
- The exports of non-basmati rice have declined in the 2019-20 (Apr-Sep) on account of increased government procurement under MSP and significant slowdown of non-Basmati sales

Source: Agriculture statistics of India 2019-20

Though different studies provide slightly different figures, one thing is certain that post-harvest loss of paddy was quite significant, especially due to the inefficient processing or poor milling techniques. Therefore, efficient milling technique is one of the measures which can prevent post-harvest loss of paddy to a large extent. Also, milling performance is largely measured by head rice yield or quality of the rice yield. Quality of finished rice/polished rice is also determined by the quality of raw paddy used for conversion, technical knowhow, quality of the mills.

Therefore Employing sophisticated milling techniques and marketing strategies the organizational performance may further increase the efficiency of operating rice mills in India which will be much appreciated by the farming community as well as the rice mill industry.

2.2 Indian scenario:

Sannamelam Murali Mohan et al (2018) identified the marketing problems of the agro based industries in Chittoor district. Agro based industry is regarded as the sunrise sector of Indian economy. Approximately 14% of total work force is engaged in agro processing sector directly and indirectly.

Especially in rural based industries it has been served that rice mill industry in Patiala district is in the crisis and facing the various marketing problems regarding lack of financial assistance, improper marketing channel, high degree of breakdown of finished products and non-availability of research lab for quality control. In this study using primary data covers 218 small and medium agro based units. In the study it is identified the problems like competition, high cost production, credit sale, lack of brand good will, inadequate irregular supply of power, low demand, heavy taxes etc. The objective of the study was to analyze the impact of marketing practices followed by agro based units by the industrial units.

P.V. Gopinatan et .al (2017) stated that many studies in the past have reported the overall supply of rice could be augmented substantially with additional conversion of paddy to rice through modernization of the existing paddy processing techniques. The Thrissur district is one of the major rice zones in Kerala and is in third in the rank in respect of area of cultivation and production of paddy in the state. Paddy marketing and

processing co-operative society limited established in 1993. The main aim of the society was to save the farmers from the exploitation of the middle men, millers and their agents in paddy marketing by ensuring remunerative price to the growers for their produce during the harvesting seasons.

From the study it is found that the hulling to milling ratio analysis is the reasons for poor performance of existing plant were analyzed. Modernization of current plant was suggested to improve the organizational performance of rice mills.

Jagbir Rehal et.al (2017) reviewed the various studies conducted affected the rice yield, it gives a detailed outline of various post-harvest processes, milling treatments, factors and latest technologies used in improving quality and production of rice.

Shri S.K Chawla Explained solar energy significant savings in rice mills. Energy is fundamental requirement for life and prosperity. Rice milling is an energy intensive industry that is located over India and is a major contribution national export earnings. Huge amount of power is required at every stage. If it goes well rice husk and solar power two very unlike entities will together to provide solution to energy was for rice mills more over the evolving system promises zero emission of pollutants as well. Therefore it is the need of the hour to make rice mills energy self-sufficient.

Mohan et.al (2016) Explains prevalence of musculoskeletal disorder among the rice mill workers in Karimnagar. Rice mill industry is the oldest and largest agro based industry. Load handling, lifting, and carrying are the major job component.

One of the most common work related injuries is the development of musculoskeletal disorders caused by heavy lifting and performing the task that required respective motions. This made use to study the prevalence of musculoskeletal disorder among the rice mill workers.

Among the total study was conducted on 273 rice mills workers in 20 rice mills it was found that 201 workers were males(73.3%) and 72 (26.7%) were female workers. Majority of the study subjects 183 (67%) were in age group of 28 to 47 years. Religion wise 194(34%) are Hindus. Total 179 (66%) rice mill workers live in the rural area and 94 (34%) were living in urban area. The study observed that the workers drinking alcohol, smokers related to their working experience.

Vijay R. Bhosle (2016) explained the priority given to agro industries in India in the context of their role in rural and small farmer development. The study was conducted in the state Haryana (India). A list of small scale agro processing entrepreneurs was prepared for each of four districts in consultation with officials of department development of industry of the concerned districts.

A total number of 120 entrepreneurs constituted the sample for the study. The objective to assess the impact of agro based industries on cropping pattern and employment and effects of the agro based industries on rural development. It is suggested that the agro based industrial sector in India contributes a large share of overall employment in industry as well as value addition and income generation role of promoting development and reducing poverty and promoting economic entity in the rural India.

2.3 Properties and Industrial Application of Rice Husk

Bhavna Mistry (2016) discussed a preliminary analysis of the numerous repeated properties and uses of rice husk and its ash. Attempt has been made to collect data and information from various research work related to RH and RHA. Recent studies in literature have been covered in the past on rice husk. Rice husk has been used directly or in the form of ash either as a value added material or as allows cost substitute material for modifying the properties of existing products.

The use of rice husk as electricity generation in efficient manner is likely to transformation this agricultural waste material into a valuable fuel for industrial sectors. Systematic approaches to this material can give birth to a new industrial sector of rice husk processing and thermal energy generation.

Removal, lime, ferric, Sulfates, alum, ferric chloride and poly aluminum chloride were used independently. The result shows that precipitation with simple coagulations and aeration system are quite promising treatment to the small scale parboiled rice mill unit.

Vishal Sharma et.al (2013) analysed Supply chain management of rice in India: in the perspective of rice processing companies. The study deals with the practical issues which exist in the supply chain of rice and discusses various issues related to collaboration at downstream end of the supply chain, inventory management, demand consolidation and inventory reduction. While dealing with the supply chain issue it also gets into deal with the various procurement issues and a re-designed supply chain model has been proposed. Finally the study consider the various small and big players at every stage of the supply chain, and rather than using the same supply chain practices and strategies regardless of their size and area of operations.

The study suggested various structures and strategies for sourcing, procurement, collaboration and distribution including the logistics strategies for the supply chain member at every stage according to their nature, type, size, and format of working.

2.3 Rice mills in Karnataka:

A.S. Pavitra et.al (2018) evaluated comparative economic analysis of rice value chain in Bihar and Karnataka states in India. An effort has been made to analyze the value addition to rice in various marketing channels. The present study was taken in east Champaran district of Bihar and Devanagari district of Karnataka.

There is a limited scope of value addition it was also observed that in the area under the study rice milling system was not developed. Most of the rice millers were of traditional in east Champaran district and only few were modern large rice mills and most of the rice mills were economically sound and realize the full benefit of the value added.

In Davangere district it was found that a number of large scale mills as well as traditional were operating. The presence of large number of rice mills was due to the high production of rice in the stater and it is grown in the season.

The district were purposively selected because these districts were leading producer of rice in their respective states. Value addition activities are mainly concentrated with the changes of utilities of economics, the sum of the unit profit. The unit depreciation cost and the unit labor cost is the unit value added. It is concluded that the farmers were the major contributing factors in rice value chain, but they failed to receive fair price.

Ramakrishna B et al (2016) analyzed the trends and variability of rice export, asses the prospects of rice export and the various problems / constraints of rice export from India to various countries in the world.

The study time series data on export of rice from India for the period of 2001-2002 to 2013-2014. This study indicates that there is good market for some Indian rice varieties especially Basmati rice in the world market. Pakistani basmati as a sole competitor of India does not have the unique aroma and taste as the Indian varieties.

The share of India in world rice export is very low which can attributed to the average productivity of rice of the country is low and even in some rice producing states. The reasons are less quantity of chemical fertilizer, pesticides, more area under traditional varieties and more dependence on rain with less exposure modern methods of agriculture.

Nagendra Prasad M.N et al (2011) Analyzed health benefits of rice bran along with germ is an inherent part of whole grain which consists of phytonutrients like oryzanols, tocopherols, tocotrienols, phytosterols, and importantly dietary fibers. The complete exploitation of its potential has not been realized due to problems associated with rancidity. Rice bran has been used to develop many health promoting products which have hypolipidemic anti-tumor, anti-oxidant, ergogenic and laxative properties.

An important consumer product from rice bran is the rice bran oil which is obtained by a series of refining steps that can be categorized as chemical and physical refining. When compared it was found that physical refining relatively a greater percentage of phytonutrients. Advanced technology like super critical fluid extraction can be effectively implemented in developing futuristic nutraceutical and pharmaceutical products to combat the present higher incidence of coronary heart diseases and many other ailments.

2.5 Utilization of rice husk and their ash:

Kumar S et.al (2013) analysed various industrial and domestic application of rice husk and rice husk ash are discussed. Rice husk act as absorbent for removing heavy metals from waste water. In mostly, countries of the world ligno cellulosic biomass used for bioethanol production. Because it's a renewable and environmental friendly fuel. Utilization of rice husk could solve the disposal problem and reduce the cost of waste treatment. Rice husk and its ash are used directly for manufacturing and synthesizing new materials.

It is used as a fuel, fertilizer, substrate and it also used in preparation of activated carbon, pet food fiber, silica and silicon compounds, bricks etc. Rice husk ash used in steel, cement, and construction industries. Multiple benefits of rice husk and rice husk ash can be achieved by future critical research efforts to provide new impetus for local and regional sustainable development.

Vasant Gandhi et.al (2011) examines the priority given to agro industries in India in the context of their role in rural and small farmer development. The main focus on history of policy and programs approaches to agro industry development and the current structure and characteristics of agro industry in India. The study discussed major models for organizing Indian agro industry that have been experiment with or proposed recently in India. The findings of this study is that there is a need for new indigenous models for the organization of agro industry. Government models alone do not show a good record of performance rather it should be based on public private partnership.

The study finds that the agro industrial sector in India contributes a large share of overall employment in industry as well as value addition and income generation. Its contributed role of producing development and rural employment particularly among the landless poor.

Mrs P Nalini (2011) analyzed the problems and prospects of rice mills entrepreneurs with special reference to Tamilnadu. The conceptual framework identifies the problems which are experienced by rice mill entrepreneurs from the stage of procuring paddy till the end of process of rice and also the rice mill entrepreneur has been obtaining business prospects from the rice mills.

It is indicated that all the states of rice milling units have cited problems like production, technology, credit market issues etc. Finally focuses on common problems focused by entrepreneur and individual characteristics required for entrepreneurship and external supports need from external environment.

Srivastava et.al (2011) Treatment of rice mill effluents for pollution control analyzed the complete treatment procedure of rice mills manufacturing.

Parboiled variety of rice are heavily concentrated in various districts at Chhattisgarh. The rice mill effluents carry high load of suspended and dissolved organic matters carrying serious environmental pollution. Anaerobic digestion which produces biogas is one possible solution. The process of manufacturing the parboiled varieties of rice involves hot water treatment of paddy in a series of cylindrical steel containers followed by steaming. After a baking period of 5-6 hours the waste water is discharged from the containers and let of in the surrounding areas around the mill.

This matter cause prime source of environmental pollution and adversely affects the alkalinity of the soil. Over long period the rice mill effluents may cause irreversible changes in the soil and underground water sources thus affected both humans and plant lives. The study suggested that the method of chemical dosing may be used in appropriate quantities, so as to control vital pollution parameters like foul smell and total dissolved solid PH.

A Profile of the Flaked Rice Industry in India (2007) analyzed flaked rice industry was surveyed in the Indian states Tamil Nadu, Kerala, Karnataka and Gujarat. The researcher investigated various processes used to produce flaked rice and identified the problems faced in the field. The working parameter that was studied includes the moisture content changes in the paddy. Roasting temperature. Temperature changes in the paddy and yields details. Other recommendations include providing suction facilities for collecting husk and bran powder from the flakers to reduce pollution and making seating arrangements for the laborers for reduce the drudgery and increase quality of life at present flaked rice production needs to be standardized since the current process is traditional future entrepreneurs must be culturally aware and scientific process control methods must be involved.

Abanti Pradhan et.al (2004) the study examines the processes details and effluent characteristics of a rice mill in the district Sambalpur, Orissa. The milling capacity of rice mill was 10MT/day. The rice mill generate effluents in an average 10kl/day from the paddy soaking, parboiling and boiler blow down operations.

The physio-chemical characteristics of the effluent revealed an alkaline PH(8.0), with low concentration of DO(0.5mg/L), nitrate (0.5mg/L), phosphate (21mg/l) and Sulphate (40mg/L) and moderate concentration of COD (630mg/L) chloride (140mg/L) and TDS (670 mg/L) moreover the effluent was rich in sodium (235 mg/L) conclude that the treatment of the rice mill effluent is highly essentials to reduce the effluent suitable for discharge into surface water or an land for irrigation.

2.5 Research gap:

The present study is purely based on the literature survey of the performance Rice mills in terms of production, export, import and the problems associated with pre/post harvesting conditions. From the study it is identified that the production of Rice and milling process is largely associated with export and import potential.

From the study it is found that there are minimal studies and research has been reported in **Southern Region:** mainly in Cauvery River belt and its non-deltaic rain fed area which is irrigated by using non-conventional methods.

It is suggested to modernize the organizational performance of Rice mills and to minimise the problems associated with both pre/post harvesting conditions may be by using public, partnership business models.

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