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CRITICAL REVIEW ON SUPPLY CHAIN MANAGEMENT FOR SUGAR INDUSTRY

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Abstract: The Supply Chain Management as a tool for improving the total quality management and production in process industries like Sugar Plant. Sugar plant is a complex and repairable engineering unit, which comprises of various systems namely feeding, crushing, steam generation, crystallization and refining etc. Supply chain management is a central and important area of academic research due to its impact on process industries competing in today's global economy. In today's competitive environment, it is extremely difficult to successfully produce high quality, low cost products without considering a satisfactory set of suppliers. Suppliers form the first link in the supply chain of any organization. Suppliers selection is a multi-criteria problem, which includes both qualitative and quantitative factors, Intelligent supply chain results in reduction of inventory, production and distribution costs, when production of sugar is high, consumption of sugar in domestic market is increasing, and their potential for industries are to perform well. Consistent supply of quality raw materials (sugarcane) for agro processing industries is lacking in many countries of the Region, with inefficient handling and transportation systems. The various problems and challenges of Indian sugar industry have been faced over years. This review focused on inbound supply chain issues of Indian sugar industry as well as the framework for supply chain modeling.

Keywords: Supply Chain Management, Just in Time, Sugar Industry, Sugar Production

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INTRODUCTION

In recent years, the area of supply chain management (SCM) has become very popular. This is evidenced by marked increases in practitioner and academic publications, conferences, professional development programs and university courses in the area. While interest in SCM is immense, it is clear that much of the knowledge about SCM resides in narrow functional silos such as purchasing, logistics, IT and marketing. At least partly as a result of this, there appears to be little consensus on the conceptual and research methodological bases of SCM. This has contributed to the existence of a number of gaps in the knowledge base of the field. There is a literature base of sugar industry related issues like sugar cane quality, Simulation and optimization of sugar cane, logistics supply system, harvest planning and scheduling, production optimization etc. is carried out in Cuba, Brazil, Australia, France, South Africa. The literatures of sugar industry of these countries are available. This range of tools and techniques has several constraints with respect to decision support on organizational issues within poorly integrated sugarcane supply chains. Logistic modelling is hard to apply to complex interactions between independent growers and millers. Firstly, they need a detailed dataset, including field data. Because of the diverse range of growers of various cultures and economic situations, the lack of detailed field data, the need to provide an understandable model to stakeholders and to enhance discussion and negotiation capacities, simulation was preferred over optimization.

II. FUNDAMENTALTS OF SUPPLY CHAIN MANAGEMENT

The concept of Supply Chain Management (SCM) was developed in production management as the stream related to customer service, demand, flow, and distribution for making an improvement in process. It is an integration and coordination of business process that manages the flow of material distribution from supplier to customer. Supply Chain system deals with analysis of information from different points on the Supply Chain to reduce operational cost. SCM has traces from history like In 1776 Adam Smith suggested improvement in production methods by specializing workers in certain tasks. During 1859 to 1915 F. W. Taylor gave the concept of "Functional Management" which leads to Value Engineering technique developed by L.D. Miles in 1950 to solve resource allocation, inventory, Scheduling processing; location layout and control problems. In future introduction of Management Information System (MIS) and Decision Support System (DSS) will provide further impetus in Production Management. The processes involved in supply chain are shown in figure 1.

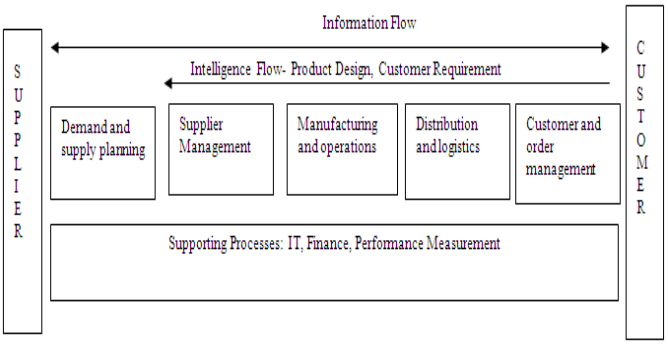

Fig.1 Supply Chain Process

Before 1970 SCM was known as "Distribution" that categorized itself the Sales Management organization, which is aimed at reducing inventories, managing efficient distribution and movement of inventories. But at the same time other departments related to same tasks were working autonomously that had only functional relationship. Also from 1980s the Japanese management technique was introduced to improve the productivity. At the same time rising cost of transportation and competition had compelled to reduce supply chain operating cost. In 1990 effect of globalization and decontrol brought in huge competition, which changed the dimension of SCM. Improvement of customer service became a new task of Supply Chain Management. The complete Supply Chain Management process is shown in figure 1 and it can also be defined as "the systematic, strategic coordination of the traditional business functions within a particular company and across business within the supply chain, for the purpose of improving the long–term performance of the individual companies and the supply chain as a whole.

III. REVIEW OF PAPERS

• **Chellaswamy** (2013) 34 companies were included for this study among 119 universal companies. The data were appropriately tabulated and classified to analyze the tools like Annual compound growth rate, trend analysis by method of least squares. The productivity ratios and the production function were computed by Solow model. Multiple Regression analysis was used to ascertain its impact on variables and they were tested by 5% level of significance. The analysis reveals that the relationship between Raw Materials and other independent variables i.e. the Capital, Labour and Sales has contributed 99 percent on dependent variable of the companies which started after green revolution period. The growth of the northern region has positive growth in terms of output, capital employed and also there is better rainfall and irrigation in this region than that of the southern region. The average

growth of sugar industry was slower in the southern region than that of northern region due to poor irrigation and rainfall. There is a need for improving the productivity and it can be done by improving the quality of labour compensation.

Critical comments:

In this study, brings out the fact that the production of sugar in the companies started after green revolution is more effective than the sugar companies started before green revolution. It is due to the effective utilization and modernization of its resources. The analysis reveals that the relationship between Raw Materials and other independent variables i.e. the Capital, Labour and Sales has contributed 99 percent on dependent variable of the companies which started after green revolution period.

• **Mangal** (2013) Supply Chain Management is a systematic approach to improve the total productivity of the sugar industries by optimizing the timing, location and quantity of material flow from sugar cane to sugar at consumer's site using IT infrastructure and interacting with all the related intermediates and that is expected approach for implementing TQM philosophy to improve organization. SCM and TQM are the ways to cost optimization one all along the chain while other related to total business, but both starting from customer order to the delivery of goods to him.

Critical comments:

In this work, it proved Supply Chain Management is a systematic approach to improve the total productivity of the sugar industries by optimizing the timing, location and quantity of material flow from sugar cane to sugar at consumer's site using IT infrastructure and interacting with all the related intermediates and that is expected approach for implementing TQM philosophy to improve organization.

• **Sethanan** (2012) Thai sugar production has been confronted with various problems, especially the inbound logistics management system. From the field survey we conducted, we found that the logistics patterns of each growing region were different in terms of their production costs, harvesting and transportation time, and quality of sugarcane supplied to the mill. Thai sugar industry has maintained its strength so far, but improvements are still necessary to meet new challenges. Redesign the sugar supply chains will help to drive growth and increase efficiency in the near future.

Critical comments:

In this model, we found that even though some growing regions have similar inbound logistics chain, they have different efficiency resulting different inbound production costs. This means not only the pattern of inbound logistics chain impacts to the efficiency, but the management system of the sugarcane inbound operations in each growing region as well.

• **Deshmukh** (2012) study has focused on the relationship between sugarcane growers and millers at a specific management level, the mill supply area. The relationship will be analyzed through the management of cane flows from the growers' fields to the mill as a way to enhance the mill area profitability. In the proposed Supply Chain Methodology an attempt will be made to minimize harvesting to crushing time to obtain the maximum possible sugar recovery to enhance the profitability of an organization. For this purpose, cane growers and millers are needs to be treated as an inter-dependent enterprise and make an attempt to develop a systematic approach for analyzing the interfaces between the sugar industry and the farmers.

Critical comments:

In this model, Supply Chain Methodology an attempt will be made to minimize harvesting to crushing time to obtain the maximum possible sugar recovery to enhance the profitability of an organization. For this purpose, cane growers and millers are needs to be treated as an inter-dependent enterprise.

• **Pisal** (2011) stated that industry faces the problem of excess sugar in the consecutive years when the sugarcane production is higher, the sugarcane harvesting needs to be well planned so the sugar mills can get the matured and fresh cane and the sugar growers can be benefited by timely harvesting of their sugarcane which will affect for better sugar cane yield, the losses occurred duly by non-harvesting of sugarcane in proper time can have a big loss to sugarcane grower, as well as sugar mills because of unsecured environmental factors changing day by day which ultimately change the mind-set of sugarcane grower and attract to different cash crops . The post-harvest sugar lose is one of the most vexing problems of sugar industry and has attracted widespread attention in the recent years.

Critical comments:

In this study, it is recommended that right time to start the crushing season is also important for timely harvesting of the sugarcane which will reduce the cost of production cycle. Maturated sugarcane of good variety which has more recovery should be selected for plantation and harvesting should be done as hand to mouth for crushing. The new system will

give justice to the sugarcane growers who are not been covered in the previous system which will help to timely harvesting of the sugarcane. The system shows both the excess of sugarcane in the crushing season and the shortage of sugarcane in the crushing season this will improve in proper utilization of resources which will be cost effective to the sugar factory.

• **Wamalwa** (2014) the effects of lean manufacturing techniques implementation on factory time efficiency in Mumias Sugar Company limited in Kenya. The study was a case study of Mumias Sugar Company Limited, in Western Kenya. Purposive sampling was used to select a sample of 95 employees from Human Resources, Engineering, Production, Quality Assurance, Sales and Distribution sections. Data was collected using a structured questionnaire consisting mainly with closed ended questions and was analyzed using descriptive and inferential statistics. Lean tool and techniques examined were total productive maintenance, Just in time, kanban, Production smoothing, Total Quality management, Standardization of work, Visual systems and 5S.There has been no research done on lean manufacturing tools and techniques in Mumias Sugar company. It is recommended that implementation of lean manufacturing practices should support the overall company business strategy and should be in line with cooperate vision, mission, and values.

Critical comments:

In this study, it is concluded that lean manufacturing technology has significant impact on Factory Time Efficiency depending on the manner of implementation of the practice. Mumias Sugar Company has not implemented Lean manufacturing tools and technology holistically. Piece meal implementation of lean techniques has had insignificant effects on factory time efficiency and no resultant benefits.

• **Simon** (2013) the application of a diagnosis method in a Brazilian company from the sugar and ethanol industry to identify the level of supply chain integration. The diagnosis method is based on Cooper, Lambert and Pagh reference model for SCM. The method involves nine referential axes established from the eighth key business processes of the reference model. Is important to stress that technology, information and measurement systems strongly support the integration of business processes, however, the successful SCM depends also on the culture, confidence, and the collaborative environment.

Critical comments:

In this analysis indicates that efforts should be dedicated in relationship improvement and supply chain integration mainly due to the establishment of international agreements for the

export of ethanol and where higher level of cooperation is required. The new relationships that are being developed will require concentrate efforts on other business processes that currently have an apparent degree of simplification. Cite as an example the processes demand management, customer service management, manufacturing flow management and product development and commercialization that are becoming more complex and more critical to the success of companies that make up the supply chain.

• **Ondiek** (2013) sought to examine the extent to which lean manufacturing tools and techniques are adopted by sugar processing industries in Kenya and their impact on factory time efficiency. The study was a survey covering five sugar processing industries which approved the study and those that have been in operation for more than three years. Purposive sampling was used to select a sample of 135 employees from production, engineering and quality assurance departments.

Critical comments:

In this study, it is shown that the respondent companies are "low to moderate" adopters of lean manufacturing and the degree of implementation has varied significantly among the three categories of companies; government, public and private. In addition, regression analysis shows that few lean practices have significant impact on factory time efficiency dependent on the extent of implementation of the practice. It is hoped that the information accrued from this research paper will trigger more studies to be conducted in lean manufacturing not only in the sugar sector but other areas of the Kenyan economy.

IV. CONCLUSIONS

Number of papers published so far have been surveyed, reviewed and analysed. A substantial amount of work has been conducted to minimize the inbound time and cost generated for supply of sugar cane to sugar industries and increase production. Among these works some were adopted the method of SCM modelling which one is very feasible. Most of the researchers carried out the work by considering field survey, questionnaires, interviews, time study on harvesting and transport operation. This work will make an attempt to develop a systematic approach for analysing the interfaces between the sugar industry and the farmers. This work has focused on the relationship between sugarcane growers and millers at a specific management level, the mill supply area. The relationship will be analysed through the management of cane flows from the growers' fields to the mill as a way to enhance the mill area profitability. The work would be beneficial for growers as well as the millers.

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