Impact of Efficient Storage and Distribution System on Indian Food Grain Supply Chain

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INTRODUCTION

The Indian food grain supply chain is far more complex to manage as compared to other developed countries due to its unorganized nature and large number of intermediaries. Every year tons of food go waste due to its inefficient supply chain management. However, India grows enough food to meet the needs of its 1.2 billion people. It is estimated that about seven percent of food grains are wasted due to lack of storage space and inefficient transportation. The waste of food grain has raised concerns in a country where more than 40 percent of children are underweight. In the year of 2011 the Supreme Court ordered the government to supply more food grains to hungry people. This study is required to address this need of the nation. The investigation depends on secondary data related to the India's major crop production, present condition and capacity of grain storage structures, grain procurement and distribution system along with other published data associated to this area. The present study is to examine the necessary barriers of grain storage system and explore the different enablers of food grain distribution system in order to minimize the wastage.

OBJECTIVES

The main objectives of this research are:

- Identify and rank the barriers in food grain storage system to take responsible decision in food grain supply chain.
- Discover the inter relationship among the enablers of food grain distribution system.

METHODOLOGY

Interpretive Structural Modeling (ISM) methodology is an interactive learning process. ISM is intended for use when desired to utilize systematic and logical thinking to approach a complex issue under consideration. It can act as a tool for imposing order and direction on the complexity of relationships among the variables. ISM process transforms unclear, poorly articulated mental models of systems into visible, well-defined models useful for many purposes.

Decision Making Trail and Evaluation Laboratory (DEMATEL) is a Multi-Criteria Decision Making (MCDM) tool, used for selecting vital variables from a list of variables relevant to an issue. In DEMATEL method the criteria are divided into two groups; the cause group and the effect group. It can reduce the number of criteria for evaluating factor effectiveness.

National Science Day
10th Research Scholars' Day 2020
IIT Bhubaneswar

RESULTS

Table `1: Final Reachability Matrix

	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12	Driving Power
F1	1	1	1	1	1	1	1	1	1	1	1	1	**12**
F2	0	1	0	0	0	0	0	0	0	1	0	0	**2**
F3	0	0	1	0	0	0	0	0	0	1	0	0	**2**
F4	0	1	1	1	0	1	0	0	0	1	1	1	**7**
F5	0	1	1	1	1	1*	0	0	0	1	1	1*	**8**
F6	0	1	0	0	0	1	0	0	0	1	0	0	**3**
F7	0	1	1	1	0	1*	1	0	0	1	1*	1*	**8**
F8	0	1	1	1	0	1*	0	1	0	1	1	1	**8**
F9	0	1	1*	1	0	1	0	0	1	1	1	1	**8**
F10	0	0	0	0	0	0	0	0	0	1	0	0	**1**
F11	0	0	1	0	0	0	0	0	0	1	1	0	**3**
F12	0	1	0	0	0	0	0	0	0	1	0	1	**3**
Dependence	**1**	**9**	**8**	**6**	**2**	**7**	**2**	**2**	**2**	**12**	**7**	**7**	

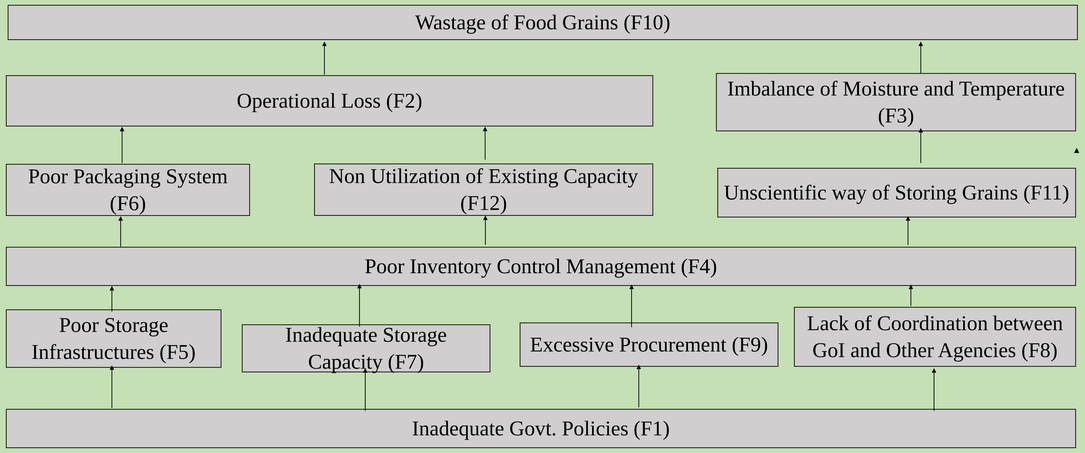

Figure 1: ISM Model

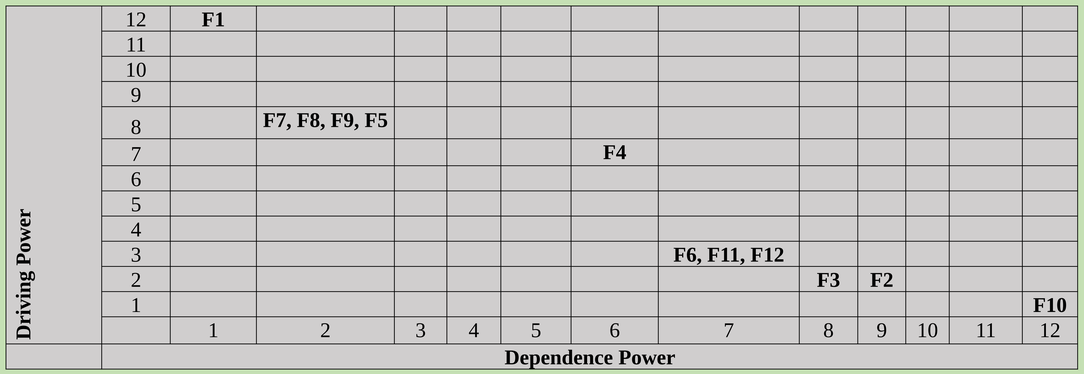

Figure 2: Driver Power and Dependence Power

Table 2: The Direct and Indirect Influence

Enablers of Efficient Food Grain Distribution System	R	C	R+C	R-C
Decentralized Procurement Policy (S1)	4.555	2.260	6.815	2.295
Willingness and commitment of top management and policymakers (S2)	5.609	3.676	9.284	1.933
Sufficient Storage Capacity (including cold storage) (S3)	3.765	4.208	7.973	-0.443
Maintain Optimum Buffer Stock (S4)	3.267	4.760	8.027	-1.492
Increased Accountability and Transparency (S5)	4.440	3.665	8.105	0.775
Availability of E-Governance system (S6)	3.921	3.522	7.443	0.400
Information Sharing among Stakeholders (S7)	3.021	2.853	5.874	0.168
General Awareness Building about PDS (S8)	2.618	3.649	6.267	-1.030
Establish Adequate Incentives and Reward System (S9)	2.618	3.669	6.287	-1.051
Use of advanced Technology for Tracking and traceability (S10)	4.774	4.327	9.101	0.447
Identification of the PDS Beneficiaries (S11)	3.425	3.680	7.105	-0.254
Material Handling System (S12)	3.014	4.164	7.178	-1.150
Efficient Transportation System (S13)	3.261	4.113	7.374	-0.852
Third party involvement for transportation and warehousing (S14)	4.616	4.348	8.964	0.269
Minimum Diversion (S15)	4.740	4.754	9.494	-0.013

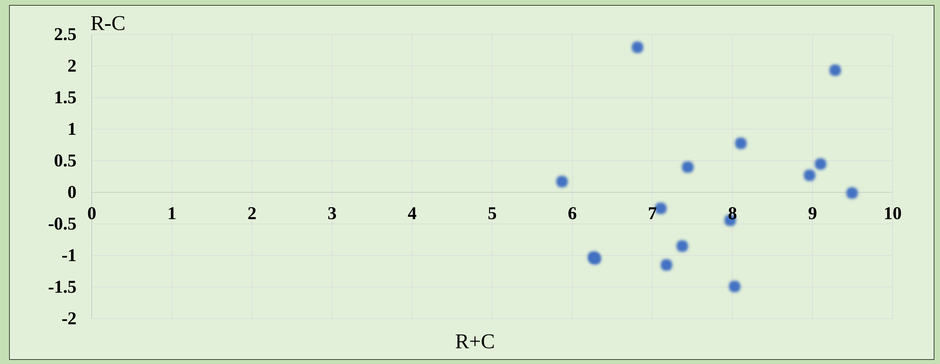

Figure 3: The Causal Diagram

DISCUSSION

- The findings of this study proponent that change in Government policies is the need of the hour along with the revamp of an existing storage system to minimize the post-harvest loss (PHL) during storage [2].
- Among all components in cause group, "Decentralized Procurement Policy"(S1) has the highest positive $r_i - c_i$ value, which implies that the enabler S6 dispatches more effects in food grain distribution system than it gets from different enablers.

CONCLUSION

- Grain storage capacity in India lacks to meet the requirement for holding stocks for future demand. Utilization of the existing storage facilities is commendably poor.
- An action plan needs to be put in the place to mitigate the issues. If need be, supply chain could be modified or else re-engineered to bring down the cost. Efforts need to be made by each stake holder in achieving an efficient and effective food grain supply chain.

REFERENCES

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