

# Improvement in the process and efficiency of Supply Chain in Seed Industry

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## ABSTRACT

*Agriculture as a market and a business model is firmly governed by nature and natural events. One of the key triggers is the monsoon and around 70-80% of Indian agriculture is directly or indirectly dependent on the monsoons and the precipitation that it brings. This impact of seasonality brings in significant challenges for businesses that it directly or indirectly impacts. Seed companies have a large chunk of its business completely dependent on the monsoons and have to face severe challenges on an account of the uncertainty that nature brings in. A key challenge is to ensure the timely availability of products to the farmers to slightly match demand supply. If supply is higher than demand, then there is a challenge of price drops and stock flows that will disrupt the market effort, if it is the other way round then it leads to lost sales opportunities. Given that the business is about going deep into rural, there is always a possibility of a demand-supply mismatch and hence we place in advance and in quantities that are higher than the estimated demand. If some of the placed stocks remain unsold then we incur additional costs in the reverse logistics of taking it back. The larger challenge is that while taking back inventory from trade, they get damaged and render the inventory unusable at a significant cost. The inability to effectively manage demand-supply mismatches creates a lot of systemic stress and requires constant calibration of effort. An efficient supply chain can effectively help manage mismatches as and when they occur at the same time significantly reducing reverse logistics costs.*

**Keywords:** Seed, Agriculture, Demand-Supply

## INTRODUCTION

Seed is the basic and most critical input for sustainable agriculture. The response of all other inputs depends on the quality of seeds to a large extent. It is estimated that the direct contribution of quality seed alone to the total production is about 15 – 20% depending upon the crop and it can be further raised up to 45% with efficient management of other inputs. The developments in the seed industry in India, particularly in the last 30 years, are very significant. A major restructuring of the seed industry by the government of India through the

National Seed Project was carried out, which strengthened the seed infrastructure that was most needed and relevant around those times. This could be termed as a first turning point in the shaping of an organized seed industry. Introduction of New Seed Development Policy was yet another significant milestone in the Indian Seed Industry, which transformed the character of the seed industry. The policy gave access to Indian farmers to the best of seed and planting material available anywhere in the world. The policy stimulated appreciable investments by private individuals, Indian Corporate and MNCs in the Indian seed sector.

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The Indian seed programme largely adheres to the limited generations' system for seed multiplication in a phased manner. The system recognizes three generations namely breeder, foundation and certified seeds and provides adequate safeguards for quality assurance in the seed multiplication chain to maintain the purity of the variety as it flows from the breeder to the farmer. Singh et al. (2008) studied the developments in the Indian seed industry and their impact on access and use of commercial seed by farmers. Dawit et al. (2010) reported the governance aspect of the system to be an important systemic bottleneck in improving the performance of the formal seed system. Thijssen et al. (2008) and Nishikawa et al. (2011) reported that public seed system usually tries to promote the use of certified seeds based on demand assessment following different approaches, which was generally a costly process whose efficacy was limited on the quality of the demand assessment. Gelaw (2012) studied the demand forecasting as a key management function. It is of vital importance especially for governments, producers, importers and distributors in terms of timely supplying seed and related inputs. Sharma et al. (2013) reported the practical issues which exist in the supply chain of rice. The study comprised of various issues related to collaboration at the downstream end of the supply chain, inventory management, demand consolidation and inventory reduction. Sisay et al. (2017) studied the role of Seed Producer Cooperatives (SPCs) in the Ethiopian seed sector and their contribution to seed supply improvement that received attention from researchers, policymakers, and development partners.

Current systems and processes involved in supply chains include from seed arrivals from producers, processing, packing and dispatch to the dealer point, identification of the bottlenecks in various steps and recommend ways to improve the efficiency and the processes with timelines.

## Material and Methods

The whole study was divided into two portions. The first portion completely dealt with the analysis part of the seed processing at the back end channel. It involves the complete study of the various processes taking place at the seed processing plants and taking observations of the time involved in various

activities. The main focus was laid out on the calculation of the delays in various steps in the seed processing. The criteria set for the delay was the time elapsed between the two activities in the sequence so that major issues responsible for the delays at the processing part can be identified. The study of the forward channel of the supply chain was conducted by taking observations on qualitative and quantitative parameters from different players involved in the supply chain. The interviews conducted were both face to face and telephonic. The data was collected from the dealers and the sales team by the face to face interview. A designed interview was used to obtain information from the dealers to estimate the quality of the supply chain.

## Field survey

The field study was conducted in Raipur and Sarguja district of Chhattisgarh. The primary purpose of the study was to find the time taken in reaching the orders at the dealer's point. A second was the quality of consignments in terms of the consignment condition and cost involved in sending the material at the dealer's place. The other objectives were to have the insight of the activities taking place at the forward end of the supply chain. The dealer's opinion about the current practices of the supply chain in seed industries was also noted down during the field survey.

## Area of study

The study of the back end part of the supply chain was done at the owned and custom hired plants of the different companies in Hyderabad and Nizamabad districts of Telangana. The study of the forward portion of the supply chain was conducted at various locations in Raipur and Sarguja districts of Chhattisgarh.

## Importance of supply chain-

The main objectives and issues to be achieved through an efficient supply chain in the seed industry are discussed below:

## Right product-

This includes the identification of the markets by different crops and varieties where the seeds were to

be supplied. The factors that were considered in this case were-

- Optimum agronomic conditions for crop
- Distance between the end consumers and growers,
- Warehousing processing and logistics facilities
- Crop and variety wise market segmentation

### Right quantity-

The most important aspect in the seed industry is determining the actual quantity of the seeds required for cropping season for each variety. Since the seed can't be produced in a day so proper planning is required for the allocation of the land for each crop and variety. Demand forecasting is the key feature that is to be taken care of for the seed supply chain. The accuracy of the forecasted demand is crucial because of the buyback policy for the unsold seeds and the extra cost for maintaining inventory for the next season.

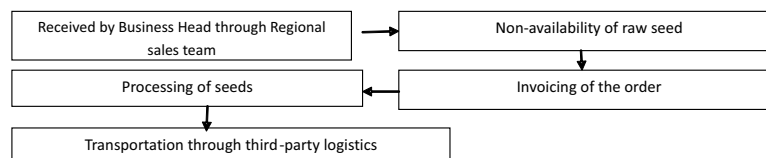
### Right quality-

The quality of the seeds has to be good. The traits considered for this factor are

- Varietal purity
- Physical purity
- Presence of any unwanted things like weeds seeds in packet
- Germination percentage
- Moisture content and viability.

### Right location, time and optimal cost-

The seeds should be delivered to the right places. This involves the identification of the effective sales



### Order receiving system-

Seed industry requires a lot of prior planning. The seed procured in the previous seasons is used as the raw seed for the next season. This seed is again processed and packed and then sent to the consumers. The seed could be either fresh (just

channel and sales operation. The sowing time of crops is limited to a short span of the time. The actual time in which the seeds of a crop are sown and can be sold is known as the seed window. The seed supply chain must be designed in such a manner which ensures minimum cost and lead time in meeting the demands. Thus, it helps the firms in getting an edge over their competitors.

### Distribution channels and its importance

A distribution channel is a set of interdependent organizations that help make a product available for use or consumption by the consumer or business user. Channel intermediaries are firms or individuals such as wholesalers, agents, brokers, or retailers who help move a product from the producer to the consumer or business user. Distribution channels perform a number of functions that allow the flow of goods from the producer to the customer. Distribution channels perform logistics or physical distribution functions that increase the efficiency of the flow of goods in the market. The transportation and storage of goods is a major physical distribution function. Channel intermediaries also perform a number of facilitating functions that make the purchase process easier for customers and manufacturers.

### Analysis of supply chain

The backend part of the supply chain includes the activities right from the arrival of the raw seeds from the fields until the final loading of the processed and packed seed material in the trucks. The whole is depicted in the line diagram below-

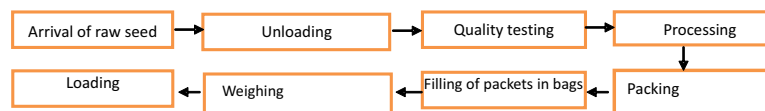
harvested from the previous season) or may be taken from the refrigerated warehouses. The sales division is responsible for figuring out the estimated demand of each crop and variety in their respective areas. This demand is first made by respective territory in charges which is forwarded to the respective regional sales in charge of the various geographical

regions. The demand is finally received by the business head of the seed division which, in turn, formulate the annual sales plan for the season. The packaging material which includes the crop and variety name is printed well in advance and stored in the stocks.

### Process-

The processing is done both in owned and custom hired plants. The plant owners were responsible to provide all the resources like labour (hamali and general), alternative energy resources like generator, packet printing & sealing machines etc.

The processing in the plant is shown in the line diagram below-



The seed company is responsible for arranging the raw seed, packaging material, sampling and quality checking equipment etc. The input material is either grown under the technical expertise of seed production division of the companies or purchased from other agents. The cross purchased raw material is then checked for the various parameters viz. germination purity, moisture percentage, ODV etc. This check is done once the material arrives at the processing plant. If the consignment is found to be not matching with the set standards of the predefined attributes then the whole consignment is rejected and transport charges for sending the material back to the supplier's godown is bearded by the supplier. An extra amount is also paid to the supplier if the moisture content is found to be in the optimum range.

### Seed processing-

The raw seeds were brought to the plant from the places where they were stored. The processing plants were built under large sheds which provide both the processing and warehousing facility for seeds. The raw seeds are loaded into the processor and were passed through the mechanical separator which separates the small-sized grains from the lot. Then the seeds move to the gravity separator where the light weighted impurities were removed and then the seed treater treats seeds with the polymer and fungicide. From this stage, the seed moves to the

packing stage where the seeds are packed in different sizes and sealed on the conveyor belt.

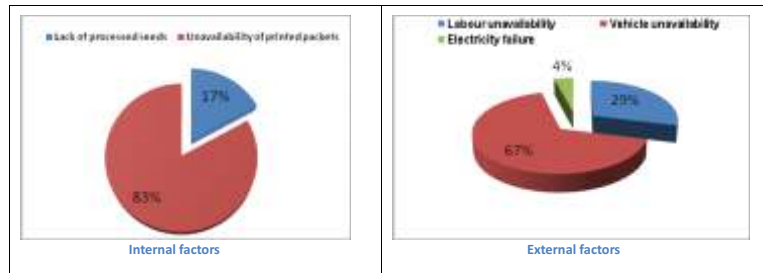
### Logistics-

The logistics are important for the on-time delivery of the seeds to the dealers. The logistics manager invites the bids for the various destinations. It also gives information on the freight load to be shipped. The companies quote its prices and the logistics manager compiles them and forwards it to the head of the operations. The role of the operational head here is to check the rates and to give the confirmation for the bid that has been approved.

## RESULT AND DISCUSSION

### Backend channel

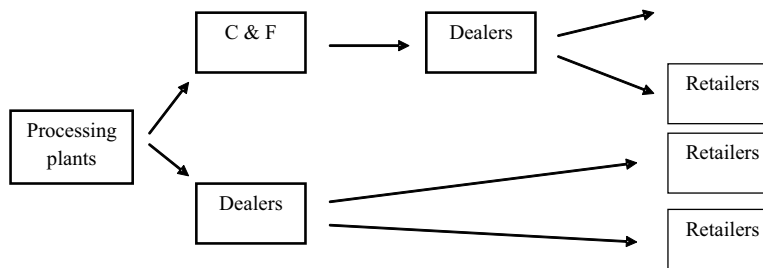
The factors responsible for the delay at the backend have been divided primarily into two parts that are internal and external factors. The internal factors were due to the inefficiency of the operations team of seed companies while the external factors were because of the outsourced units. The internal factors were the unavailability of printed packets and chemicals and lack of processed seeds. The external factors were unavailability of vehicles, labour issues and electricity issues. The share of external and internal factors in the delay or time lapse in the supply chain was 6% and 94%, respectively.



The above statistics show that the primary reason for the delays in reaching the consignments in time is the unavailability of the vehicles. This is a major issue that is spotted in the case of the external factors influencing the supply chain. While the lack of processed seeds refers to the condition when the vehicle is ready to be loaded and the material is not ready in the desired form. Other minor reasons that are responsible for the delay are lack of raw seeds & delay due to waving bills. The reconstitution of the orders taking place at the plants due to the unavailability of the raw seeds also hinder in the dispatching the orders in time.

**Forward end**

The forward end study includes the study of the process of the movement of the seeds from the plant



until it reaches the dealers' points. This study becomes very useful as it helps out in finding out the actual lead time required to move the material from the plant to the dealers' place. The small size of the sales window also adds to the criticality of this study.

Seed companies operate through a set of dealers and retailers whose primary function is to push the product in the market. The demand of the dealers is met either through the direct consignments to the dealers or through the consignments from the carry and forward facility of that particular region. The detailed structure of the supply chain is given below-

**Observations**

- Average number of orders in Kharif season for Maize and Paddy were 2 and 3 respectively
- Lead time i.e. the time elapsed from ordering till the reaching of the material at the dealer's point varies from 5 to 16 days
- The ordering point of dealers is when the inventory level is sufficient to meet the demand for 4-5 days
- Maize orders are received well in time before the starting of seed window
- Serious delays are seen in fulfilling the paddy orders
- Advance paddy seed bookings are not delivered even 2 weeks after the onset of the seed window
- Second dispatches in paddy which are generally ordered after the onset of seed window take 10 to 16 days for delivery
- 25% of the dealers interviewed complained about the damage in the consignments
- Damage was caused due to use of the hooks by hamali and rat bites in the bags
- Delivery time of the material from the Raipur to Ambikapur is one day

- Serious delay of 3-4 days was observed in transporting the material from Ambikapur to dealers at the adjoining areas.

## Bottlenecks

### Back end-

- Reconstitution of orders resulting in sending the quantity which is not actually desired
- Arrangement of vehicle before every consignment consumes huge time and energy
- Unnecessary time and labour is required to weight the bags

### Forward end-

- Huge delays in meeting the advance orders of paddy
- Damaged condition of the packets, delay in dispatch during the seed window of paddy resulting in customer loss for the seed company
- High cost of transport during the peak season thus hampering the financial profitability
- Poor efficiency of the forward linkages of the supply chain
- Time required for transporting the seeds to different destinations is not proportional to distance and high delivery charge paid by the dealer at the time of delivery
- Difference between the transport allowance in the invoice and the transporter bill

## Recommendations

### Transportation of material through containers

The container freight movement in India is done by the Container Corporation of India (CONCOR). Sealed containers are moved from one location to others across the world. CONCOR also provides end to end logistic support. To help the acquisition of the business CONCOR also works through some business associates. The business associates charge a fee of 2% over the total cost of every consignment send through them. They ensure the guarantee of reaching the material safely to the destinations. A loading receipt (LR) is generated when the materials are loaded in the containers and these consignments can only be unloaded when the same LR copy is shown at the destinations. The facilities for transporting the containers from the yard to the C and F will also be provided by them. There is also an

option of multiple delivery points to cater to the needs of various dealers. It has been successfully transporting various agricultural commodities like turmeric, rice, wheat, pulses etc. Unlike tradition railway transportation through wagons, it is quite convenient to send small consignments.

### How the seed company can use it?

- Initial non-urgent/ advance booking consignments can be sent to the various C& F through the containers
- Easy transportation in containers if the moisture level is within the prescribed range
- Ventilated containers for the transportation of the seeds
- Temperature inside a ventilated container is 3-40 C lower than the maximum temperature of 450C inside the ordinary containers
- Cost of sending the material is significantly lower than the surface transport
- Direct business could be easily done with the business associates to avoid any problems in following lengthy government procedures
- Packed materials can be directly loaded from the company's facility and then directly unloaded at the various C& F and dealers
- No damage due to the hooks as both loading and unloading will be under the supervision of the company's official
- Initial orders of the paddy that are sent during mid-May and October can be easily transported in a cost-efficient manner with the help of containers
- Adaptation of a similar container logistics model for exports in the international market

### Advantages-

- Cost-efficient method for sending the large orders (Approximately Re. 1/kg)
- Presence at all major C&F locations of seed company
- Ensures the security of material
- Remove the chances of damage due to hooks
- Easy available even during peak dispatch season of May and October unlike the road transport
- Suitable to meet the demands of C&F
- Facility of the reimbursement for case
- No loss or theft of material during the transportation

### **Development of small depots**

A major issue that has been identified on interviewing the distributors of Seed Company is the delay in the order delivery. This delay is quite crucial due to the small size of the seed window. Primary reasons for delay were material unavailability at C&F, order consolidation at C&F and material remains stored at the warehouse of the transporters. This delay was observed to be exceeding up to 4 days in some cases.

### **Proposed solutions-**

Seed Company can go for maintaining small storage house. These kinds of facilities are widely used in the case of the beverage industry like Coke & Pepsi. The location of the warehouse should be such that the distance between the dealer/distributors and the warehouse can be covered in a day.

### **Features of the proposed facility-**

The storage facility may be a big shop with the capacity not exceeding more than 15 tones with the minimum capacity of at least 10 tones, well protected and must be free from rodents to avoid damage and should be well connected by road.

Functions of the proposed facility-

- Act as a primary feeder to the dealers
- Storage facility for the inventory and consolidation of the orders
- Must not be used for the sales return
- Amount of material to be stored but should be at disposal of the regional sales incharge depending on the basis of predicted demand
- Consignment to be sent to the dealers through small vehicles and should not be used as a point to dump the material by the sales team

### **Direct packing of seeds**

In a seed plant, once a packet is sealed then it is left as it is. The packets were then filled in the bags and then the bag is stitched. The weighing process takes place after it to ensure the proper amount of weight of the bags. Problems identified include damage to packets as they lie on the floor before filling in bags. Unnecessary labour is wasted in filling and weighing of the bags and hindrance in the movement of labour in the plant when the packets pile up in huge number.

### **Proposed solutions-**

After sealing the packets could be directly put in the bag. This could be done either by using a plank or

directly putting the packets in the bags. These bags will be placed on the weighing machine. The labour will check the bag weight. If OK then the bags will be ready for the dispatch while the underweight bags are put aside. The packets of these underweight bags have to be checked separately afterward and the defective one has to reject.

### **Advantages-**

- Labour requirement is reduced
- Total time requirement for order completion is reduced by 5 hours
- No need to do separate weighing of the bags thus decreasing labour requirement
- Checks the confusing situation when the materials have to be loaded directly after weighing

### **Logistics issues**

A major problem has been identified that the time elapsed in reaching the vehicle from one place to another is not proportional to the distance. Variation of around 12 to 20 hours has been observed for reaching the consignment from Hyderabad to different destinations. Such delays during the peak season disturb the whole supply chain resulting in the late delivery of the material at the dealer's place.

### **Proposed solutions –**

- Delivery time to different major destinations on the basis of demand will be set prior to the discussion between the company officials and transporters This time will also include a margin time
- Transporter will be penalized if the vehicle does not arrive in time
- Time will be calculated from the time of filling the LR copy until it reaches its destination
- If the vehicle is delayed then the transporter will be liable to pay the damage to the seed company
- Concession in case of delays will only be given in case of any natural calamity or unavoidable circumstances. Transporter will also be responsible for any kind of damage or loss during the transportation of the material
- Transporter can be given some advance for the trip
- Seed Company places the requirement of vehicle at least 3 days before loading time
- Payments can be made online once the consignment is delivered

## CONCLUSION

- Primary focus should be made on dispatch of orders booked in advance
- Advance payment policy for the reliable transporters could be followed
- Packet design and printing should be done well in advance
- Target should be set to complete the seed processing well in time and ensure free delivery at the dealer's place

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