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AGRO-INPUTS BUSINESS MANUAL – PART 4

METHODS OF DEMAND ESTIMATION, WAREHOUSING & INVENTORY MANAGEMENT

AGRICULTURAL GROWTH PROGRAM – AGRIBUSINESS AND MARKET DEVELOPMENT (AGP-AMDE ETHIOPIA)

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CHAPTER 1.

METHODS OF DEMAND ESTIMATION

INTRODUCTION

Estimating the demand of agricultural commodities (agro-inputs, crop produce, food products, etc.) is very important for business entrepreneurs, planners and agencies involved in agricultural development.

Small- and medium-sized enterprises (SMEs) must try to get an accurate assessment of the quantities of agro-commodities purchased by farmers in their market areas. Important questions to be answered are: What is the projected demand for the coming years, and what is the best estimated quantity of goods an agro-enterprise can sell? These are not easy to answer. The answers cannot be based on guesswork or wishful thinking.

Several statistical methods are used to estimate the demand. Most of the methods, when properly applied, provide accurate estimates (90-95 percent accuracy). Doing business without knowing the demand for the products can be risky and may lead to losses. It is, therefore, important for business enterprises to learn and apply the methods of demand forecasting for business planning.

By the end of this chapter, agro-enterprises should be able to enhance their knowledge and skills in the following areas:

- Definition of demand forecasting.
- Objectives of demand forecasting.
- Concept of demand.
- Basis of demand forecasting.
- Sources of information.
- Methods of demand estimation.
- Selection of a suitable demand forecasting method.
- Improving the accuracy of demand forecasting.

WHAT IS DEMAND FORECASTING?

Demand forecasting is the science and art of accurately converting the qualitative understanding of a market into quantitative data.

WHY IS DEMAND FORECASTING NEEDED?

- Determine the estimated requirement of agro-inputs in the target market.
- Estimate the volume of production of various crops in the area.
- Formulate the marketing strategy for future years.
- Determine the requirements of storage space.
- Formulate a promotional strategy.
- Determine the financial needs of the business.
- Prepare a business plan for the season/year.
- Estimate the profitability for the season/year.

OBJECTIVES OF DEMAND FORECASTING

A marketing enterprise tries to understand the demand, considering three objectives:

- Where to sell?
- When to sell?
- How much to sell?

A brief description of the three objectives is given below.

WHERE TO SELL?

This refers to the market area or the market territory. It is important for an agro-enterprise to determine the market area for the sale of agro-inputs, procurement of crop produce or marketing of other agro-based commodities. The market area may be comprised of the following:

- **Geographical area:** It can be a country, province, district or group of villages.
- **Type of customers:** For agro-commodities, customers may be commercial farmers, export growers, small-scale or communal farmers or local processing companies and producers of agro-commodities.

- **Product range:** An agro-enterprise owner should know what types of fertilizers, seeds and crop chemicals are likely to be in demand as well as the crops that can be purchased. These include cereal crops such as wheat, maize or rice; plantation crops such as sugarcane, tea, coffee or fiber; and cash crops such as cotton, horticultural crops or vegetables. It is necessary for agro-dealers to determine the product range they can trade.

  Individual geographical areas and clients have specific requirements. Therefore, agro-dealers can best decide their product range and marketing strategy when they have an accurate assessment of where they plan to sell and the special characteristics of that market.

WHEN TO SELL?

Determining when to sell depends on identifying the peak period and low period of demand. In agro-marketing, timing of sale of agro-commodities is very important. An agro-dealer must know when inputs, such as fertilizers (basal and top-dressing), seeds and crop chemicals, need to be applied by the farmers and when they are likely to be purchased by different groups of farmers. Similarly, agro-enterprise owners should know the harvesting period for various crops.

HOW MUCH TO SELL?

This refers to the estimation of the likely quantity of sales or purchases of goods. An agro-dealer should determine the volume of business he/she expects to handle during a particular cropping season. The sale or purchase targets should be based on the estimated demand and likely availability in the market area.

CONCEPTS OF DEMAND

Demand estimation is based on the following three concepts:

1. Total market demand.
2. Company demand.
3. Marketing balance.

Brief descriptions of the concepts are given below.

TOTAL MARKET DEMAND

Total market demand is the estimated volume of goods that may be purchased by all categories of customers in a specified period under the given economic and marketing

environment. In the case of agro-inputs, the total market demand will be the total quantity of seeds, fertilizers and crop chemicals that may be purchased by all groups of farmers in a specific area during a specified cropping season under a well-defined policy environment through a properly defined marketing strategy.

Total market demand takes into consideration all favorable as well as unfavorable factors that exist in the given marketing environment. For example, the total market demand for fertilizers for Province ABC can be defined as the total number of bags of fertilizers (50-kg bags) that would be purchased by commercial and smallholder farmers in the province during 2008 under a liberalized marketing strategy. Suppose it is 800,000 bags of ammonium nitrate and compound D. Therefore, the total market demand or market potential of Province ABC for 2008 will be 800,000 bags of fertilizers.

COMPANY DEMAND

Company demand refers to the "market share" of a particular company or agro-enterprise out of the total market demand. For example, the company demand for XY Company will be the quantity of fertilizers that it can sell out of the total estimated demand of 800,000 bags of fertilizers in Province ABC during 2008. If the company sells 320,000 bags of fertilizers, the company demand is 320,000 bags of fertilizers or 40 percent of the total fertilizer demand in the province. The company demand is always less than the total market demand and is generally quoted in percentage terms.

MARKETING BALANCE

A marketing balance occurs when all marketing agencies in a given marketing environment strike a balance between the total demand and total supply. For example, if all the companies and/or agro-dealers operating in Province ABC arrange to supply a total quantity of the 800,000 bags of fertilizers (the total market demand), a marketing balance will have been created. The marketing balance therefore results in the satisfaction of the total effective demand for a product. No shortage or surplus will exist in the market area, and market satisfaction will prevail.

BASIS OF DEMAND FORECASTING

The estimation of demand should not be just guesswork. In most cases, guesswork is inaccurate and results in underestimation or overestimation of the demand. Wrong demand estimations lead to loss of sales resulting from either insufficient stock or low demand.

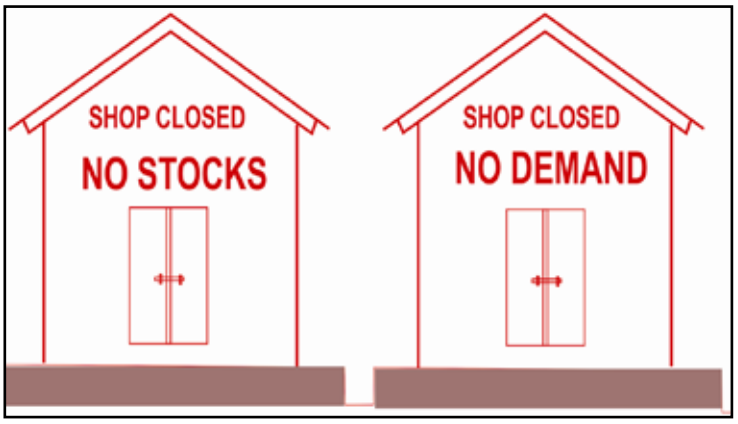

Figure 1. Effects of wrong demand estimation

To estimate demand, it is necessary to answer the related questions. For example, to estimate the demand of fertilizer in Province ABC, an agro-dealer must find correct answers to the following questions:

- Who are the buyers of the fertilizer?
- What uses do the consumers have for buying the fertilizer?
- What is the status of the fertilizer supply?
- What is the total market demand in the province?
- What is the marketing environment in the area?

SOURCES OF INFORMATION FOR DEMAND FORECASTING

To accurately forecast demand, it is necessary to know dependable sources of information. Demand estimation is based on the following three sources of information:

- What people have done.
- What people say.
- What people do.

WHAT PEOPLE HAVE DONE

This source of information takes into consideration past practices of customers, e.g., the yearly data of fertilizer quantities farmers purchased in the last 10 years. An example is shown in Table 1.

Table 1. Fertilizer Sales in Province ABC (1998–2007)

YEAR	NUMBER OF 50-KG BAGS PURCHASED
2004	760,500
2005	730,000
2006	710,300
2007	750,000
2008	760,000
2009	820,000
2010	810,500
2011	860,000
2012	830,500
Total	7,821,800
Average	782,180
Estimated Demand for 2013	782,180

WHAT PEOPLE SAY

It is believed that customers themselves are the best sources of information. Agro-entrepreneurs should obtain customers' views/opinions on their likely purchases for the coming year. Projections made by consumers are taken into consideration and used as a basis for determining demand estimates. For example, the consumers' replies to a question on how much fertilizer they expect to use in 2008 will become the source of information for demand estimation for fertilizer in the coming year.

WHAT PEOPLE DO

The actual performance of customers, notwithstanding what they say, is the third important basis of information. Many times, customers may express their unhappiness with the prevailing pricing system but will strive hard to pool resources to buy goods when they need them. Consumers may say that they cannot buy the required quantity of fertilizer because of economic reasons or supply constraints, but they may buy it when the time to eat the food arrives. Similarly, some farmers may say they will not use inputs in a larger area this year, but may actually do so at the time of planting. Therefore, the actual performance of consumers, rather than what they say, is taken as the basis of information.

STATISTICAL METHODS OF DEMAND FORECASTING

There are some tried and tested statistical methods that can be used to estimate the demand with a 90-95 percent level of accuracy. The following methods can be used:

1. Survey of buyers' intentions method.
2. Composite sales staff opinion method.
3. Expert opinion method.
4. Test market method.
5. Leading indicators method.
6. Growth rate method.
7. Time series analysis method and statistical demand analysis method.

SURVEY OF BUYERS' INTENTIONS METHOD

This method relies on the information base of 'What People Say.' It is believed that buyers are the most important sources of demand estimation. An agro-enterprise owner should prepare a list of potential buyers, i.e., wholesale dealers, retail dealers, large-scale and small-scale farmers, those dealing in agro-inputs and crop produce marketing and others located in the market territory.

A questionnaire should be designed for buyers to provide the required information. The required number of respondents should be interviewed to gather the information. The data collected should be consolidated and analyzed to draw conclusions.

A wholesale dealer can collect the required information from retail dealers. A large-scale agro-input manufacturer may organize a dealer conference to get information on the projected demand estimates of the buyers in their sales territories.

MERITS

The survey of the 'Buyers' Intentions' method is considered to be the most suitable method for estimation of the demand of agro-commodities. Agro-marketing organizations, including importers and agro-dealers, can adopt this method for estimating the demand of inputs for their market area. This method is easy, reliable and inexpensive and can yield demand estimates with up to 90 percent accuracy.

COMPOSITE SALES STAFF OPINION METHOD

This method relies on the basis of 'What People Say' and suggests that the sales personnel are the best source of demand estimation. The method of 'Composite Sales Staff Opinion' can be applied successfully in cases in which the number of customers, market territory and number of sales staff are large. The required information is collected from different categories of sales staff through a questionnaire. Information is normally collected by the corporate head office from the following sources:

- Sales representatives.
- Area offices.
- Regional offices.
- Head offices.

Table 2. Sources and Methodology of Information Collection

SOURCE OF INFORMATION	METHODOLOGY OF INFORMATION COLLECTION
Field Representative	Sales representatives are asked to prepare demand estimates for their sales territories and advised to keep in mind past sales records, competition, product popularity, weather conditions and general financial state of the customers.
Area Office	Demand estimate given by field representatives is consolidated at the area office. Comparison is made with the past achievements of individual field representatives and the current estimates. Area manager uses own judgment to make adjustments. Consolidated area demand is determined taking into account all factors that may influence the demand.
Regional Office	Demand estimates submitted by area offices tabulated and consolidated at regional level and comparison made with the past sales of each area. At regional level, some factors such as political conditions and growth trends are also taken into consideration. Consolidated demand for region is prepared by taking into consideration all other factors that may influence demand, e.g., government policy, donor support, microfinance and socio-economic conditions.

Head Office	Demand of all regions is consolidated. Demand is compared with corporate plans and sales targets. National-level factors, e.g., changes in government policy, priority of the sector, financial situation, donor support and general business environment, are taken into consideration. CEO reviews regional plans and uses his own judgment based on various known factors.

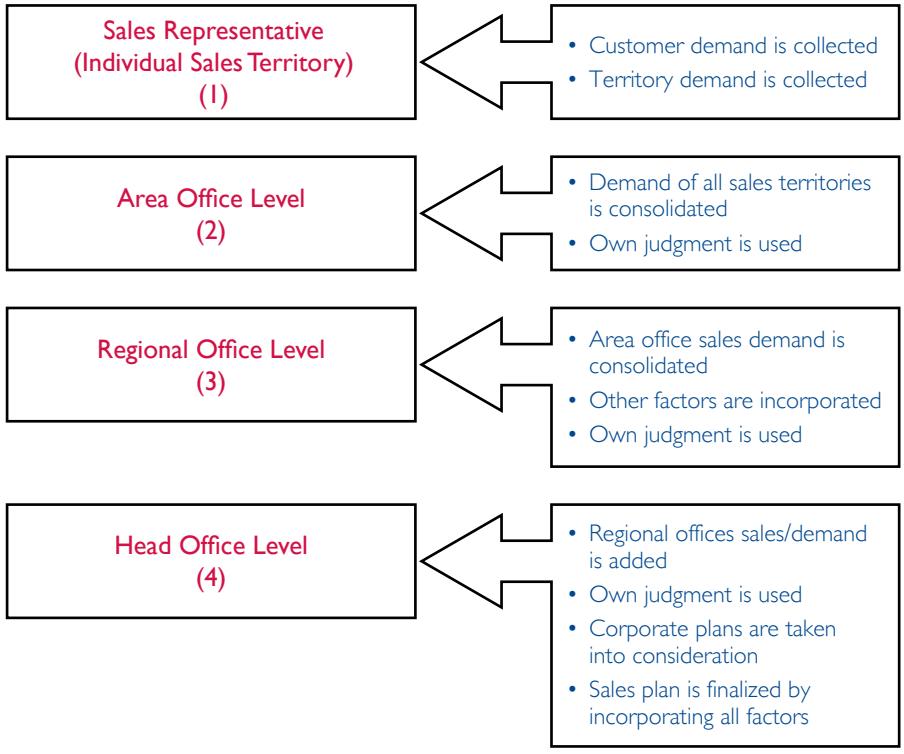

Figure 2. Flowchart of 'composite sales staff opinion' method

MERITS

Staff directly involved in sales are associated with demand estimation. Opinions of staff working at different levels become available. Data are analyzed and reviewed at various levels as shown in Figure 2. Information can be subdivided and used as needed.

THE 'EXPERT OPINION' METHOD

This method of demand estimation suggests that the experts, advisors, consultants and business executives are the best sources of demand estimation. It is believed that professionals keep themselves up to date on developments taking place in the market and maintain the latest market information.

Having the required information and experience, experts can forecast market trends with reasonable accuracy. Several research and development institutions and consultancy organizations provide information on the projected pattern of use of agricultural and food products.

When necessary, agro-enterprises can obtain expert opinions and utilize the information for sales forecasting and business planning. The accuracy of estimates depends on the expertise of the concerned person but is generally 90 percent.

MERITS

This is an easy and quick method to use. It is the best alternative when data are difficult to collect at the SME level. The method does not require data analysis and interpretation at the individual enterprise level. It is a most convenient method for small firms that do not have the required infrastructure and expertise for data collection and analysis.

THE TEST MARKET METHOD

This method is based on the principle of 'What People Do.' It suggests that the customer's response can be measured by launching the product directly in the target market. The following procedure is used in this method:

- A prototype sample of the product and its marketing strategy specifying the terms and conditions of sale are developed for testing purposes.
- The product and the marketing strategy are introduced directly in the market and exposed to actual consumers under the prevailing conditions.
- The views of the consumers and dealers on the performance and quality of the product and suitability of the sales terms are recorded through personal interviews.
- The data gathered are analyzed to determine the strengths and weaknesses of the product and the marketing strategy.
- Information gathered from customers and dealers is used as a base for estimating future demand of the product and suitability of the terms of sale.

MERITS

This method is very useful when new products or sales terms are to be introduced in the market. Generally, this method is adopted for household goods. The 'Test Market' method has the advantages of getting firsthand information from actual consumers. However, this method is expensive, and its failure can lead to losses.

THE LEADING INDICATORS METHOD

This method is based on specific indicators that may change in advance and prior to the actual use of a product. Important factors such as climate, price, credit availability, interest rates and marketing strategies are factors that influence the pattern of use of the products.

In cases in which most of the above factors move in a negative direction, it is accurately estimated that the use of the related product will be low. When the above factors move in a positive direction, it is projected that the demand will have a higher growth rate. In the "Leading Indicators' method, personal judgment made on the basis of market knowledge and expertise is of great significance.

MERITS

This method can be used in estimating the demand of agro-inputs and crop production with 90 percent accuracy. The agro-enterprises can keep track of the leading indicators to draw their own preliminary estimates. The views of experts, however, must be taken in making final forecasts.

THE GROWTH RATE METHOD

This method relies on the information base of 'What People Have Done' and suggests that historical trends are useful indicators for making estimates of future demand. For example, if fertilizer demand in the last 10 years has maintained an average growth rate of 1.73 percent, it is estimated that the same growth rate will be maintained in the next year unless major changes have taken place in the marketing, political or climatic conditions. An example to support this view is given in Table 3.

Table 3. Historical Trends in Fertilizer Consumption Growth Rates in Province ABC

YEAR	ANNUAL CONSUMPTION	ANNUAL GROWTH
	(mt)	(%)
2003	25,000	–
2004	25,500	1.02
2005	26,000	1.90
2006	26,350	1.34
2007	26,850	1.89
2008	27,800	1.67
2009	28,300	1.79
2010	28,850	1.94
2011	29,200	1.21
2012	29,550	1.98
Average (10 years)	27,340	1.73
Projected 2007 Mean Average	27,797	1.67

On the basis of this average rate of growth, it can be estimated that fertilizer consumption in 2007 in Province ABC will increase by an average growth rate of 1.67 percent and is likely to be 26,230 metric tons (mt).

MERITS

This is a simple and easy method. Data on product consumption are generally available from statistical offices and agro-input producers. An agro-enterprise can also maintain its own record. The average rate of growth can be calculated and used to estimate the demand for the next year.

TIME SERIES ANALYSIS METHOD AND STATISTICAL DEMAND ANALYSIS METHOD

These two methods involve the use of complicated statistical formulas and require a lot of past data. They are also difficult to apply at the field level by agro-enterprises and extension workers and therefore have not been discussed.

SELECTION OF SUITABLE FORECASTING METHODS

It is not necessary to apply all the above methods to estimate the demand for agro-inputs and crop production products. The desired results can be achieved by using only two of the methods. A survey on sales forecasting practices conducted by Douglas J. Darymple revealed that the following three methods are most commonly used in estimating demand:

1. Composite sales staff opinion method.
2. Expert opinion method.
3. Survey of buyers' intentions method.

Depending on the available facilities, an agro-enterprise can select any two of the above three methods to estimate demand of agro-inputs.

IMPROVING ACCURACY OF DEMAND FORECASTING

To minimize the percentage of error and improve the accuracy of forecasting, the following should be kept in mind:

- Clearly define the objectives of demand forecasting and identify for what purpose the demand estimates are being made.
- Determine beforehand the level of accuracy required.
- The selection of appropriate methods is of great significance. Available facilities, necessary financial resources, etc., should be taken into consideration.
- Sources of data selected for demand estimation must be reliable and easily accessible.
- Personnel selected for analysis and interpretation of data should be competent with experience in similar activities.

CHAPTER 2.

EFFICIENT AND ECONOMICAL METHODS OF WAREHOUSING

WAREHOUSING

Most agro-inputs, particularly mineral fertilizers, are seasonal in demand. The production of fertilizers, on the contrary, is a regular process. The production in the no-demand season therefore needs to be stored in safe buildings and sheds; such buildings are widely known as warehouses and are essential to the marketing of agro-commodities.

Warehousing is the systematic storage of goods. It includes safe and secure storage of goods, their easy retrieval, keeping accurate records and maintenance of up-to-date stock information. Warehouses should be insured against risks of fire, theft, burglary, riots, floods, etc.

A warehouse for storing agricultural products.

Warehousing operations consist of four independent but interlinked components:

1. Handling
2. Storage.
3. Transportation.
4. Inventory management or record-keeping of stored goods.

HANDLING OF AGRO-PRODUCTS

Handling refers to the physical shifting of goods from one place to another, and from one mode of transportation to another. Handling precedes storage and continues until the goods reach the final consumer. A bag of imported fertilizer, for example, is handled 10-12 times before reaching the final consumer. The table below shows various locations for handling of an imported agricultural commodity.

Table 4. Stages of Handling an Imported Agricultural Product

LOCATION	HANDLING OPERATIONS	NUMBER OF OPERATIONS
Factory warehouse	Handling for shipment to port of dispatch	2
Port of dispatch	Loading into ships to destination port	1
Destination port	Unloading from ships; loading into rail wagons/ trucks	2
Buffer warehouse	Unloading, stacking and reloading for outward movement to field locations	2
Field warehouses	Unloading, stacking and reloading to wholesale suppliers/retailers	2
Wholesaler shops/ stores	Unloading, storage and loading into customer vehicles	2
Consumer location	Unloading and storage at place of use	2
Total		13

In most developing countries, the handling of agro-commodities is done largely by manual labor. Careless handling can damage the bags or containers resulting in leakage of contents and product loss.

Therefore, appropriate handling methods should be applied to avoid or minimize such damage. Some guidelines on safe handling of agro-commodities are as follows:

- While loading and unloading, laborers should wear gum boots and hand gloves.
- Hooks should not be used when handling fertilizers because they pierce and damage the packaging, causing loss of the contents.
- **Damaged bags should be repaired on the spot.** Cut and torn bags received at the railway yard or port should be repaired immediately. On-the-spot repairs significantly reduce handling losses.

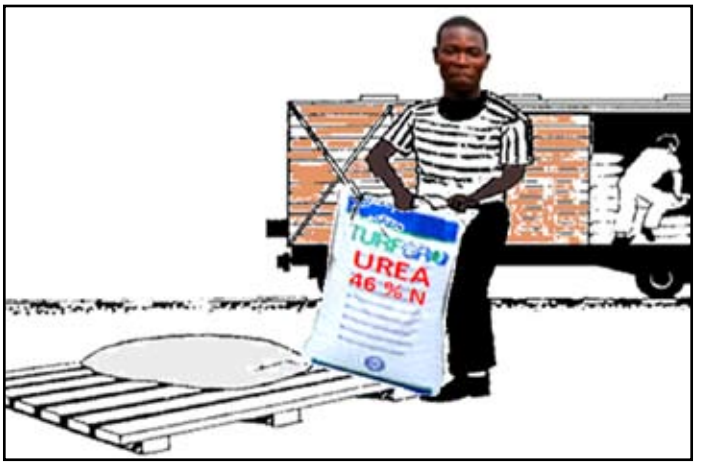

Figure 3. On-the-spot repair before re-loading to next destination reduces losses

- If the goods must be left at railway platforms, the bags should be carefully stacked and must be covered with tarpaulins, particularly in the rainy season.
- If possible, handling agro-inputs and food products should be avoided during rain, particularly if the products are not under covered sheds.

STORAGE OF AGRO-INPUTS

Storage is an organized method of safe placement, holding and protection of goods for future use and is an essential part of the agro-marketing system. The adoption of an efficient and safe system of storage is equally important for large warehouses as well as for small and medium agro-dealers.

Storage involves a number of activities as follows:

1. Selection of suitable building for storage.
2. Organize stacking within the warehouse.
3. Spacing stacks.
4. Adopt recommended methods of stacking.
5. Keep damaged bags separately.
6. Always keep a stack card.
7. Take precautions to prevent fire.
8. Store in the open.
9. Moving goods out of the warehouse.

SELECTION OF A SUITABLE BUILDING FOR STORAGE

- The building should be on a high plinth location; it should not be in a low-lying, flood-prone area.
- It should be a leak-proof structure; if leaking occurs, it should be repaired promptly.
- The building should also be well-ventilated.
- The building should not be located in a busy residential area.
- Approach to the building should permit free movement of trucks and other delivery vehicles.
- A signboard with the complete address of the owner/manager should be displayed prominently on the warehouse as shown in Figure 4.

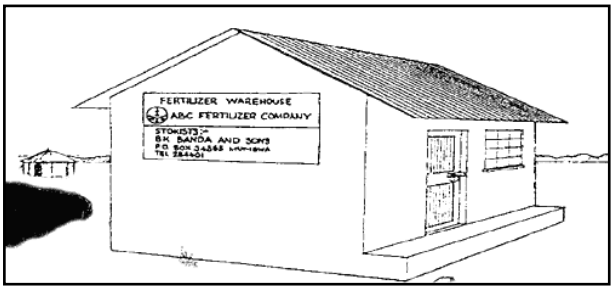

Figure 4. A properly marked storage building or warehouse

A leak-proof warehouse building. Note the high plinth to protect against flooding.

ORGANIZING STACKING WITHIN THE WAREHOUSE

Proper stacking methods must be followed to ensure that stacks do not fall and that bags can be accurately counted and safely stored. The following methods are suggested for making stacks of fertilizer bags:

- **Demarcate the storage area:** Taking into consideration the size of the floor and the number of bags to be stored, divide the floor area into small rectangular blocks.
- **Always use dunnage:** Spread a polyvinyl chloride (PVC) sheet or place wooden crates on the floor. The basic objective of dunnage is to break the direct contact between the floor and the bottom layer of bags (see Figure 5). Dunnage stops the upward seepage of moisture from the floor. Using dunnage is therefore very important and should not be overlooked.

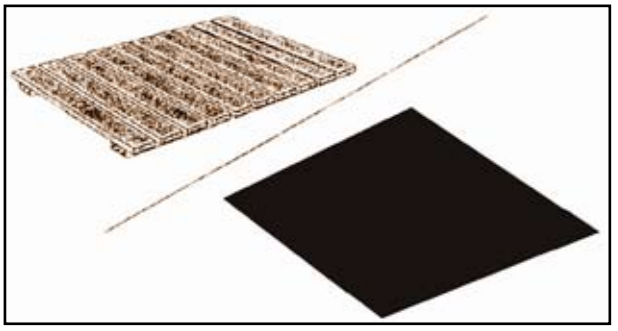

Figure 5. Lay dunnage material on floor ahead of stacking

SPACING BETWEEN AND AROUND STACKS

While making stacks of fertilizer, leave a 12- to 18-inch space between walls and stacks as shown in Figure 6. This prevents the seepage of moisture from the walls.

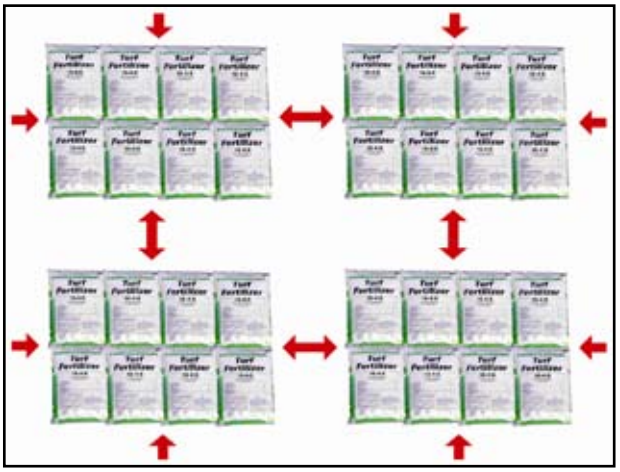

Figure 6. Leave space around the stacks

ADOPT RECOMMENDED METHODS OF STACKING

Stacks should be constructed systematically and according to recommended methods. Stacking bags haphazardly and dumping them indiscriminately could expose the bags to bleeding and result in quality deterioration.

The following three stacking methods are recommended for agro-commodities:

1. Simple stacking.
2. Crisscross stacking.
3. Block system.

SIMPLE STACKING

Using this method, bags are arranged one over the other without following a specific pattern as shown in Figure 7. Simple stacking is easy, and stacks can be constructed relatively quickly. Such stacks, however, are not compact or strong and may break and collapse at the slightest disturbance. It also takes longer to calculate the number of bags in a stack. Simple stacking should be used only when goods are to be stored for a short period.

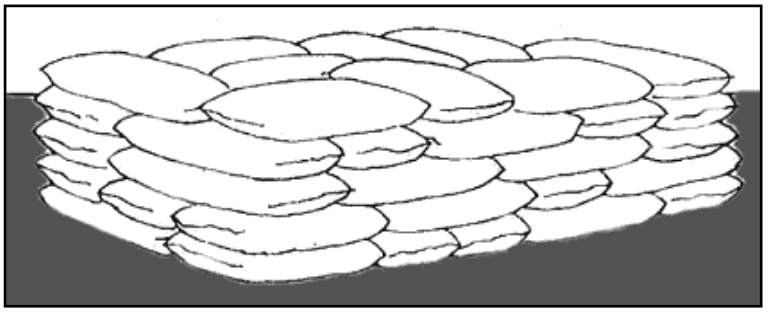

Figure 7. Simple stacking

CRISSCROSS STACKING

Using this method, the first layer of bags should be placed lengthwise and the second layer should be placed breadthwise. The subsequent layers are constructed by placing the bags in alternate directions. In some cases, the direction of the bags is changed after each row. Each layer is made by placing the bags in the opposite direction.

The process of alternating the position of bags in each layer is continued until the entire stack is completed. The process of constructing the layers is the same except that each layer of bags should be placed in the opposite direction to the bags in the lower layer.

This system makes the stacks strong and firm and allows them to be counted easily. Bags cannot be easily removed from within the stacks. This system is also good for security reasons. But in such stacks, part delivery becomes difficult. The crisscross method is recommended for warehouses where storage is for longer periods.

BLOCK STACKING SYSTEM

The block system is similar to the crisscross method. The difference is that the stack base is divided into a number of blocks as shown in Figure 8. Each block is made up of different commodities of desired sizes.

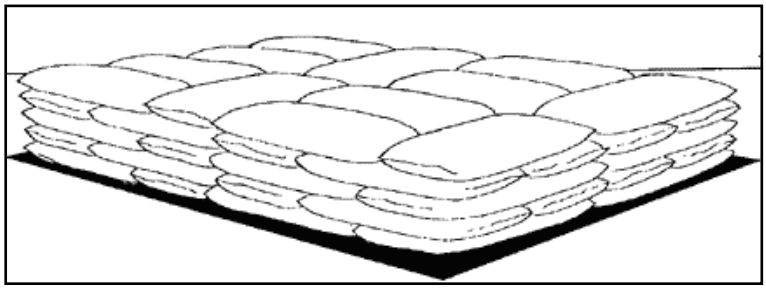

Figure 8. Block stacking

The block makes stacks strong and firm. The counting of bags is convenient and physical checking is easy. A block can be removed without affecting the strength of the whole stack. The block system is recommended for medium-size sheds and agro-dealer shops where stacks are stored for only a short time. This system is also suitable when different products are to be stored in the same building, as is particularly the case for rural general traders.

DO NOT MAKE TALL STACKS!

Fertilizer stacks should not be more than 15-20 bags high. If the stored goods are likely to move fast, a stack of up to 20 bags high may be constructed. Very tall stacks put pressure on the bottom layers and cause the bags at the bottom to rupture.

Warehouse showing fertilizer bags stacked high.

NEVER MIX AGRO-CHEMICALS WITH FOOD PRODUCTS!

In small warehouses, the available space should be divided into segments, and different goods should be stored in separate stacks. Fertilizer and crop chemicals must be stored away from food products such as sugar, flour, etc. The stored goods should also be clearly marked by writing the name of the product in bold letters.

STORING DAMAGED BAGS

Damaged bags and containers must be kept separately and not mixed with sound bags. Short-weight and leaking containers should be marked as damaged stock.

MAINTAINING STACK CARDS

A stack card is a document that provides information about the stack and includes the number of bags or containers and name of the product (Figure 9). The stack card should be updated every time goods are taken out or added to the stack.

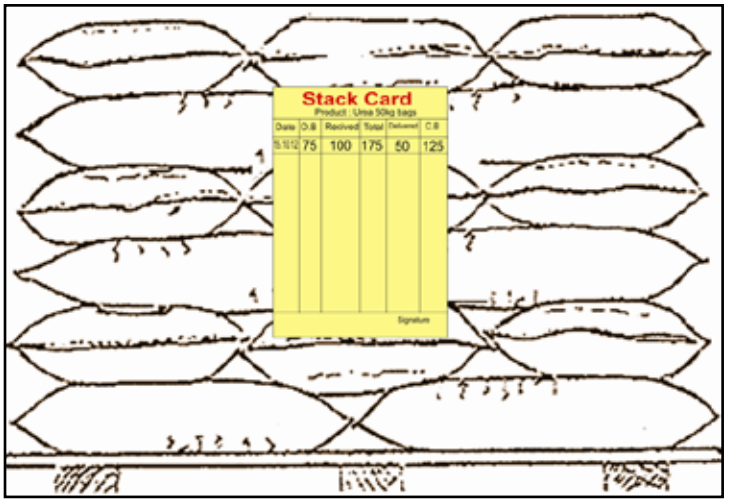

Figure 9. Always display a stack card on stored commodities

PRECAUTIONS TO PREVENT FIRE

To protect against the risk of fire, fire extinguishers should be installed at conspicuous locations in the warehouse and staff should be trained to use them. Buckets filled with sand and water can be kept in the warehouses as an alternative (Figure 10). The electric fittings should be checked regularly to avoid short-circuits. Smoking should be prohibited in the warehouse.

Figure 10. Be prepared for fire

STORAGE IN THE OPEN

It is sometimes unavoidable to store fertilizers, seeds and crop produce in the open. In such cases, stacking should be done very carefully. The following procedure is recommended for storing in the open:

- Select a high-plinth area, preferably a raised concrete platform.
- Spread a PVC sheet or use wooden crates as dunnage. Dunnage *must* be used for open storage.
- Construct the stack using the crisscross method.
- Cover the stacks thoroughly with a thick, strong PVC sheet (Figure 11). The bottom ends of the covering PVC sheet should be properly sealed to the floor. Tie the sheets with ropes or place heavy items on the ends to prevent them from being blown away by strong winds or storms. Pegging of the PVC sheets is a better choice.
- The open stacks should be inspected regularly and moved into covered sheds as soon as possible.
- The security of goods stored in open stacks should also be carefully monitored, because they are more prone to theft.

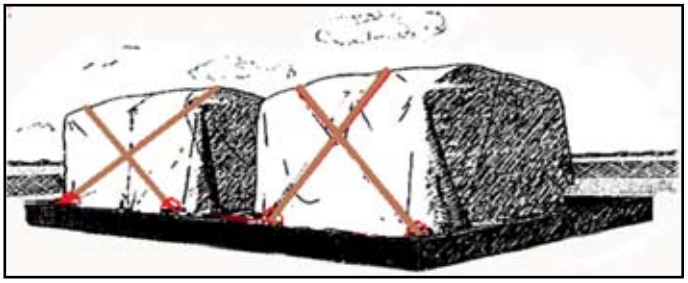

Figure 11. When storing agro-commodities in the open, cover well with strong PVC

MOVING GOODS OUT OF THE WAREHOUSE

When moving the stored goods out of the warehouse, follow the 'first-in, first-out' principle (Figure 12). Transporting older stacks first prevents them from further aging and damage.

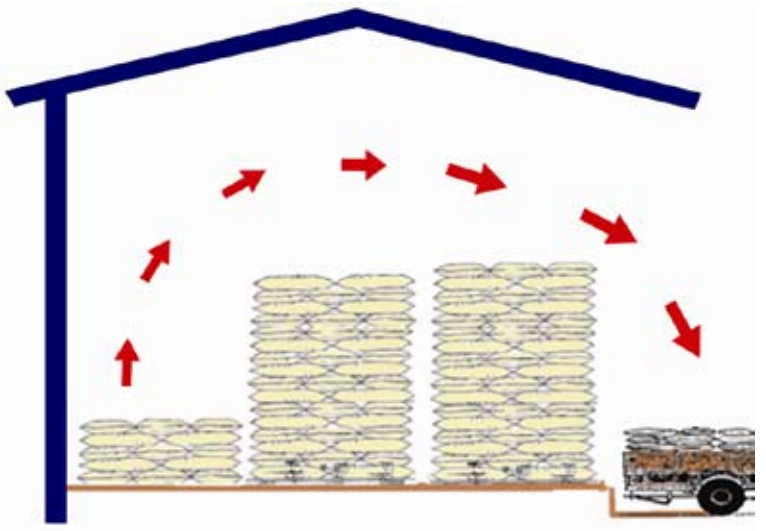

Figure 12. First-in, first-out principle

TRANSPORTATION OF AGRO-INPUTS

Transportation of agro-commodities, particularly inputs and crop produce, from the point of production to the point of consumption is an important function of agribusiness. In landlocked countries where rail and road networks are not fully developed, careful movement of goods becomes very important. Efficiency and economy in transport depends on a variety of factors such as the channels of distribution, availability of rail wagons and trucks, lead time and government policies on the movement of commodities (i.e., fertilizers and food grains).

To serve rural markets, all available modes of transportation must be used. The logistics planning and adoption of a transport mix should therefore be given due priority.

Many times, using traditional modes of transportation is very economical. An example of a transport mix adopted in moving the agro-commodities is shown in Table 5.

A truck with its tarpaulin covering folded up for unloading a shipment of fertilizer.

Table 5. Transport Mix for Movement of Fertilizer and Food Grains

FROM	TO	MODE OF TRANSPORT
Main city warehouse	Town warehouse	Truck lorries, tractor trolleys and scotch carts
Town warehouse	Wholesale dealers	Truck lorries, tractor trolleys, scotch carts and pickup vans
Wholesale dealers	Retail dealers	Truck lorries, tractor trolleys, pickup vans, bullock carts, etc.
Retail dealers	Farmers' fields	Scotch carts, bicycles, tractor trolleys and human backs

CARE DURING TRANSPORTATION

Proper logistics planning and care help reduce transportation losses and result in products being delivered in good condition. The following actions are recommended for proper care:

- Maintain regular contact with the transport agencies to know the estimated time of arrival of goods.
- Avoid accepting the delivery of fertilizers and food products during inclement weather.
- Utilize all available modes of transportation in the most efficient manner.
- Clean trucks or tractor trolleys before loading.
- Cover trucks or pickup vans with tarpaulins, particularly during the rainy season.
- Maintain a road plan showing destinations connected by road, conditions of roads and the distance from warehouses as well as freight charges and applicable levies in the area.
- Keep movement plans handy and avoid haphazard dispatches.
- Buy a transit insurance policy.

STANDARDIZATION AND DEBAGGING

In spite of best efforts, the receipt of cut, torn and damaged bags/containers is unavoidable. Some bags/containers may become short weight, resulting from leakage in transit. Loose fertilizer products, lying in the open and exposed to the atmosphere, become discolored and lose their nutrient value.

Damaged bags/containers must be standardized and reconditioned before being offered for sale. The process of standardization involves refilling the good material into a standard bag/container with proper weight ensured.

Some of the items needed for debagging include a stitching machine, a weighing machine, shovels and empty new bags/containers.

INVENTORY MANAGEMENT

Keeping an up-to-date, accurate and verifiable record of goods received, stored and delivered is an important aspect of warehousing (Figure 13). An agro-enterprise owner must learn to maintain books of account, even if the quantities stored are small. Record-keeping helps prevent losses that may result from inaccurate recording. Record-keeping also enables the review of the past pattern of movement of goods from warehouses and thereby facilitates the estimation of future demand for agro-commodities.

Figure 13. Inventory management

The following record-keeping books are recommended for agro-enterprises dealing in agro-inputs and crop produce:

- Receipt register.
- Damaged stock register.
- Stack card.
- Re-bagging and standardization register.
- Dispatch register.

RECEIPT REGISTER

A receipt register is a document for recording relevant details of stocks entering a warehouse. A printed receipt register (or a plain register made by drawing columns with ink, as shown below) can be used for this purpose. Depending on the volume of receipts, a single register with entries of different products on separate pages can be used. If required, a product-wise register can also be maintained.

Table 6. Sample Receipt Register

PRODUCT	DATE OF RECEIPT	UNIT SIZE	QUANTITY RECEIVED	RECEIVED FROM	ORDER REFERENCE NO.	REMARKS
			(units)			
Fertilizer	10/10/2007	50-kg bag	450 bags	ABC Company	Akhan/wt/30 20/9/07	Stored in shed 5, stack number 20, date: ----- Two bags in damaged condition

PRODUCT STACK CARD

A stack card is what is displayed on each stack stored in the warehouse awaiting dispatch. The information that should be entered on the stack card is shown in Figure 14. Normally, information is entered on the stack card when goods are added or removed from the stacks. If there is no activity relating to a particular stack, there is no need to update the information.

Product Fertilizers Pack Size 50-kg bags

Received from ABC Date of Receipt 10/10/2007

Quantity/No. of Bags 200 Condition Good

Figure 14. Sample stack card

DAMAGED STOCK REGISTER

This document records the details of cut and torn, damaged and short receipt of goods (Table 7). One register with different segments for various products may be sufficient. It is important to separate the damaged bags/containers and enter the details as soon as the goods are received in the warehouse.

Table 7. Damaged Material Register

DATE	PRODUCT	NO. OF DAMAGED UNITS RECEIVED	WEIGHT/VOLUME OF DAMAGED GOODS	RECEIVED FROM

RE-BAGGING AND STANDARDIZATION REGISTER

This document is used only when the re-bagging or standardization takes place. This document helps record losses from stocks received in a damaged condition.

Table 8. Re-Bagging and Standardization Register

PRODUCT	QUANTITY TAKEN FOR STANDARDIZATION		STANDARD PRODUCT			NEW BAGS/ CONTAINERS USED	LOSS	NET LOSS
	Units	Volume/Weight	Units	Weight/Unit	Total	(No.)	(%)	(kg/lts)

DISPATCH REGISTER

Like the receipt register, a dispatch register is essential to recording relevant details of outgoing stocks. It is important to record information in a dispatch register when goods are taken out of the warehouse. All columns provided in the register must be completed as shown in Table 9.

Table 9. Dispatch Register

PRODUCT	DATE OF DISPATCH	QUANTITY DISPATCHED		SHED & STOCK N°.	CONSIGNEE DESTINATION	DISPATCH ORDER N°. & VEHICLE N°.	REMARKS
		Pack Size	Units				

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❖ FICHE DE SUIVI-CONTRÔLE DANS LES MA

Commune : SAVALOU
Zone / Secteur N° : 1
Magasin central N° : KANNANHOUN
Village de :

Etats des stocks

Spéculations	Stocks de départ		Premier suivi Date :		Deuxième su Date :	
	Quantités	Qualité	Quantités	Qualité	Quantités	Qu
R17	8T400	Bonne	8T400	Bonne		

OBSERVATIONS
Premier suivi 05/04/2011
8T400 de départ sont trouvées
Aucun facteur pouvant affecte
n'est identifié

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