Inventory Planning and Management

Common Terms in Inventory Management

Bin Card	Document updated by the store keeper that tracks the inventory kept of a single product in a particular bin.
Buffer Stock	Amount of stock equivalent to the consumption during the standard replenishment period.
Committed Inventory	Particular items in the inventory which that committed to a particular order or transfer in the near future.
Demand Signal	Any form of request to remove stock from a warehouse or storage facility coming in any format.
Inventory	Any stored material, including both raw materials and finished goods. Also commonly referred as stock, though in the manufacturing sector, “stock” only comprises the finished products that are kept in the store.
Inventory Ledger	Accounting document or computer record that tracks inventory transactions (receptions and dispatches) in terms of quantity and value.
Lead Time	The time lapse between the moment when the order is placed and the moment of its reception.
Minimum Stock	The minimum quantity always available in stock to avoid shortage. This is important for products that are critical or difficult to re-supply, and where shortages can jeopardize a project plan. Minimum Stock = Buffer Stock + Safety Stock.
On Hand Inventory	Items in the stock that are available to be released.
Over-Stock	Situation in which too much inventory is kept in the store.
Physical Inventory	The process of physically counting and verifying goods in stock in order to reconcile data on record with reality.
Re-Ordering Cycle	Period of time between two successive regular orders for a particular item in stock.
Safety Stock	Level of extra stock that is kept to mitigate risk of stock-out caused by uncertainties in supply and demand.
Stock Card	Document updated by the store keeper that tracks the inventory kept of a single product in the storage facility.
Stock Keeping Unit (SKU)	A unique code or nomenclature that designates a single line item of a larger consignment. SKUs may be tied to a specific production run or expiration date, and may denote only a product of specific characteristics.
Stock-Out	Situation in which inventory levels cannot cope with the demand for a certain item and stock is fully depleted.
Vendor Managed Inventory (VMI)	Inventory management strategy in which suppliers manage physical inventory as part of their retailer’s inventory.

Introduction

Inventory management refers to the knowledge and practices of keeping the optimal amount of any amount of material in a given storage facility. When maintaining a storage facility, inventory management becomes an integral part of supply chain management. It is complementary to warehouse facility management and the physical management of stored material.

Correct inventory management helps ensure the timely delivery of supplies. Proper inventory management requires deep knowledge of both the acquisition process and consumption patterns, and is achieved broadly through three key activities:

- Accurate forecasting of demand.
- Close monitoring of stock levels and consumption.
- Timely ordering of the right amounts of goods.

In addition, the lack of inventory management can lead to increased holding costs, wasted stock or holding too much stock with the respective cost burden and risk increase.

Supply Chain Strategies

Inventory management is essential when relief supplies are transiting through a storage facility. There are several reasons why inventory management is key in the supply chain. The primary reason is to help deliver supplies in a timely manner. Managing the stock contributes to **coping with the uncertainty** acting as a buffer between demand and supply. This includes adjusting for **lead times** in the supply chain, which is particularly pertinent in international procurement. In addition, a well managed inventory can contribute to **economies of scale**: buying large quantities can reduce the cost per item, though ongoing storage costs must also be considered.

When keeping an inventory for relief operations, it is highly recommended to develop a “stock policy” aligned with the organisational supply chain strategy. Stock policies guide organisations on the decision process of keeping any type of stock in any location. Applying certain logic to stock management is the first concern for critical items in the relief operations and applicable to all types of storage facilities.

Stock policy is broadly defined by the following questions:

- Where should the inventory be located?
- What specific products should be available at each location, and in which quantities?
- When should inventory at a particular location be replenished?
- How much should be ordered to replace it?

The answers to these questions are dependent on two interrelated issues: the supply chain strategy and the type of stock.

Main Strategies

For the purpose of this guide, "supply chain strategy" refers to the logic behind the decision of moving goods through the supply chain. There are two main applicable strategies:

Push Strategy

In a "push strategy," need is anticipated before a real demand exists and supplies are “pushed” into the supply chain. The most typical examples of “push strategy” in relief operations are common in: contingency supplies as part of an emergency preparedness plan, the opening of a new program, or in the supply of seasonal items like winter kits or mosquito nets.

Typically push systems operate when the demand is unknown in quantity or time. Quantities are usually based on estimations and driven by assumption on the situation that can generate the demand.

Pull Strategy

In a "pull strategy," the need is formally expressed by a consumer and the supplies are “pulled” into the supply chain. In relief operations the “pull strategy” is typically used during short term projects, construction or rehabilitation works or when supplying expensive equipment such as vehicles or telecoms material.

The pull system operates when the demand is known in time and quantity - quantities are clearly defined and the regular supply chain activities trigger demand signals trigged from the final end of the supply chain. Generally, the pull supply chain strategy allows agencies to manage small or individual units of inventory accurately.

Type of Stock Holding

The initial logic of a stock holding will also determine the inventory management system in place. The most common types of stock holding in relief operations are:

Buffer	Buffer stock is stock that acts as a buffer between supply and demand. It is impossible to plan perfect quantities, and buffer stocks help even out unanticipated demand. Most of the decisions in buffer stock are taken based on how much of these items should be kept in the organisation's warehouse.
Kitting	Consolidated supplies of different nature for further assembling is known as kitting. In kitting, supplies are dependent on each other for delivery. Imbalances of stock levels may lead to inefficiency as parallel inbound streams must be coordinated within the inventory. In addition, two different stocks need to be managed: one for the original supplies and one for the assembled kits.

Splitting	Splitting is when stock is split from large consignments in smaller lots to be delivered to different locations or consumers, sometimes at different moments. Splitting is mostly used to gain procurement efficiency and economies of scale. Planners only need to manage a single inbound stream, but respond to demand signals from multiple consumers with uneven demands. Consolidating these demands to calculate the amount to be ordered can be challenging, and larger buffer stocks may be required.
Contingency	Contingency stock is kept as part of a contingency plan. There is little inventory management as contingency stock suffers minimal rotation. Nevertheless, if perishables are part of the contingency stock, they may be included in a rotational stock system.
Vendor Managed	Vendor Managed Inventory (VMI) or virtual stock is kept in the vendor facilities until a release order is activated. The vendor reserves specific amount of supplies as part of its own inventory or grants certain manufacturing capacity with a specified delivery time. Although this type of stock can be used for many purposes, it is commonly used as part of certain contingency plans.

Other Stock Policy Considerations

In addition to the supply chain strategy and the type of stock holding, some extra considerations can be taken when defining a stock policy:

Financial Origin of The Product

The products in stock may have several financial origins:

- Procurement using donor funding.
- Procurement using organisational internal funds.
- In-kind donation from an International organisation, private sector, or NGO.
- Remaining materials from a particular project transferred to one or several on-going projects.

Depending on its origin, some management restrictions could be applicable: if products in stock are acquired with specific funding or for a specific purpose, the inventory levels must be managed accordingly. In some cases, these items can be considered committed inventory.

Nature of the Stored Goods

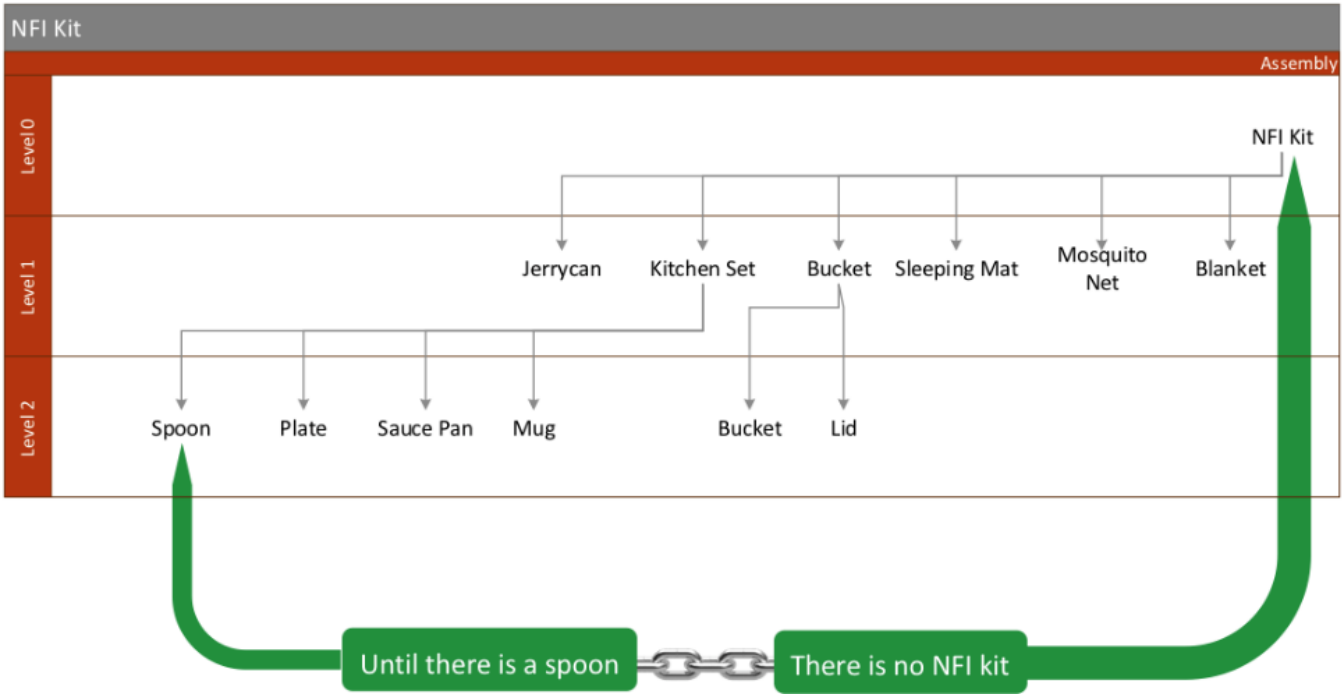
The type and nature of stock can also influence how inventory is managed. Particular considerations should be taken with perishables, consumables, or products that are essential to the program implementation such as drugs in a health program, food in a nutritional program, or fuel.

Dependency Between Stock Items

Storing products with dependent demand means that products in the stock are directly related to other stock items, including:

- **Kitting** - The consumption of one stock item entails the consumption of both.
- **Support Equipment** - Spare parts for machinery; the use of the generator requires the use of its replacement parts.

The demand for both products can either move in tandem (i.e., products belonging to a Non-food items kit) or in the opposite direction. Demand for a given product can be estimated based on the consumption of another supply.



Stock Value

Stock can be categorised according to its financial value, while stock management can be influenced by relative sock values. Understanding stock value can help to manage risks, plan expenditures on new and replacement stocks, or to prioritise resources on the areas of greatest value. However, low-cost items can be crucial to some relief operations and should not be neglected.

Level of Accounting

In the field of inventory management, a Stock Keeping Unit (SKU) refers to a specific product type stored in a specific location. The term SKU also refers to a code made of letters and numbers that identifies a product in the store. A SKU is not unique to each item (like bar-codes are), but the number used to identify each product type in the store. It designates a single item of a larger consignment. SKUs may be tied to a specific production run or expiration date and may denote only a product of specific characteristics.

The SKU is intended to be the most dis-aggregated level of dealing with inventory. An inventory with multiple SKUs will require very different handling procedures than an inventory with few SKUs.

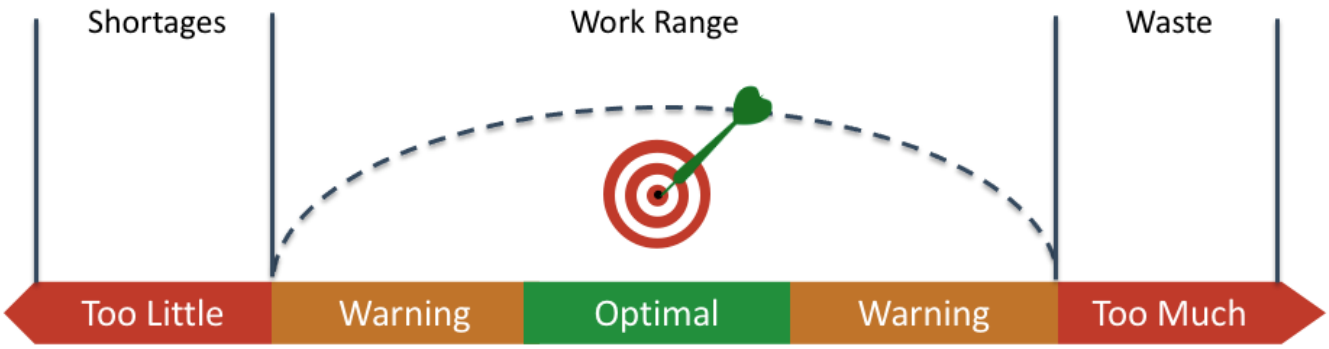
For example, when storing buckets a decision must be taken regarding the pertinent characteristics that will define it as a SKU. Is it appropriate to account for all buckets under the same SKU? Or is it pertinent to differentiate buckets by specific characteristics like: colour, size and material, thus creating three different SKUs? The correct SKU design will depend on the type of program and the product's intended use. If buckets are only used as part of an NFI kit, the colour of the bucket may not be important. If buckets are used to segregate waste in health care facilities, the colour of the bucket may be very important. Possible attributes for designation of a SKU:

- Type
- Colour
- Weight
- Volume
- Dimensions
- Packaging
- Technical information
- Anything else

While SKUs are designed to keep track of inventory to the level of a specific product, they can also help to reconcile stock levels, to analyse which products are more demanded, or to identify reorder point for products.

Managing Inventory Levels

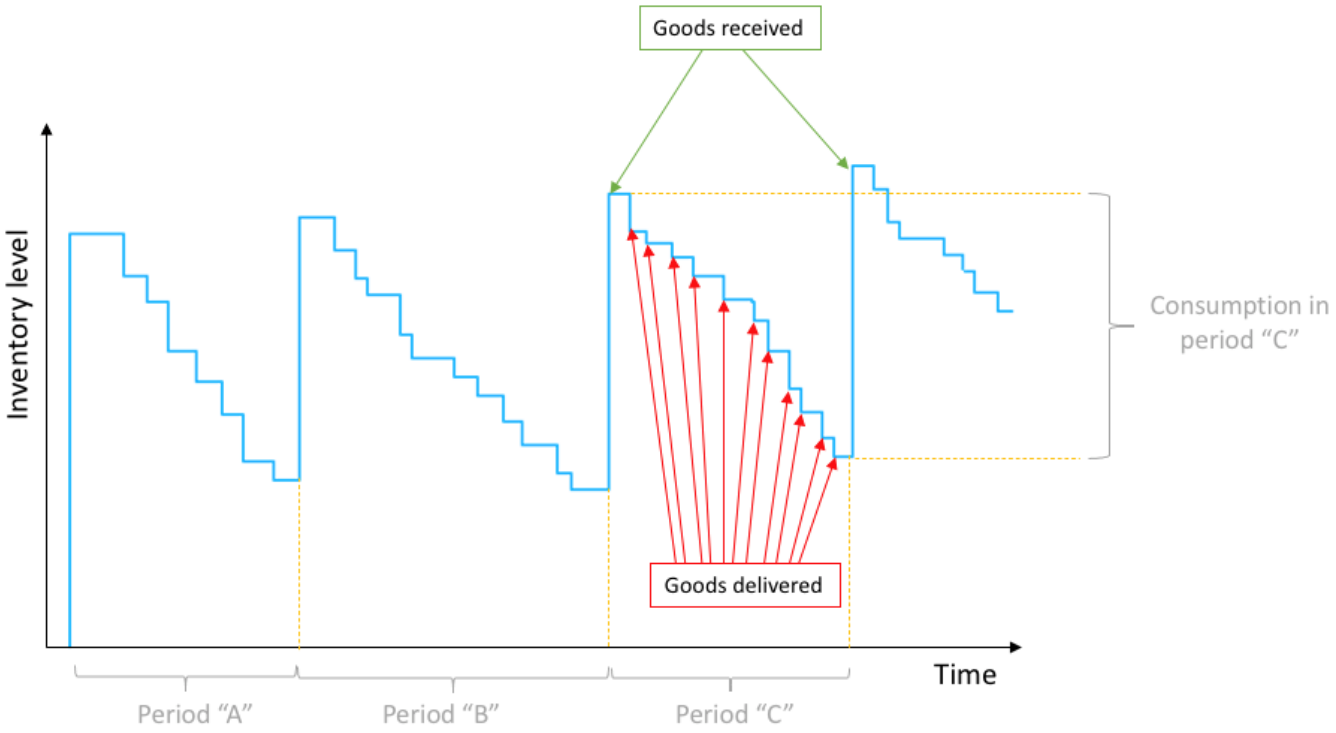
Keeping inventory levels optimal at all times is achieved when demand is fulfilled on time while resources such as time, space, effort, and expenditures are efficiently managed. Deciding what is the appropriate inventory level requires a good knowledge of demand patterns (forecast) and supply capacity (scheduling) - both are necessary to decide when to order and the period to be covered.



(Adapted from Ptak, Smith, 2016)

The Order Cycle

Movements of goods within a storage facility can be summarised in “INs” (when goods are received) and “OUTs” (when goods are delivered). The balance between inbound and outbound movements in the warehouse determines the inventory level. The quantity of stock delivered during a certain period of time is defined as consumption, normally measured in items/time. The period of time between two successive regular orders for a particular item in stock is called "*re-ordering cycle*."

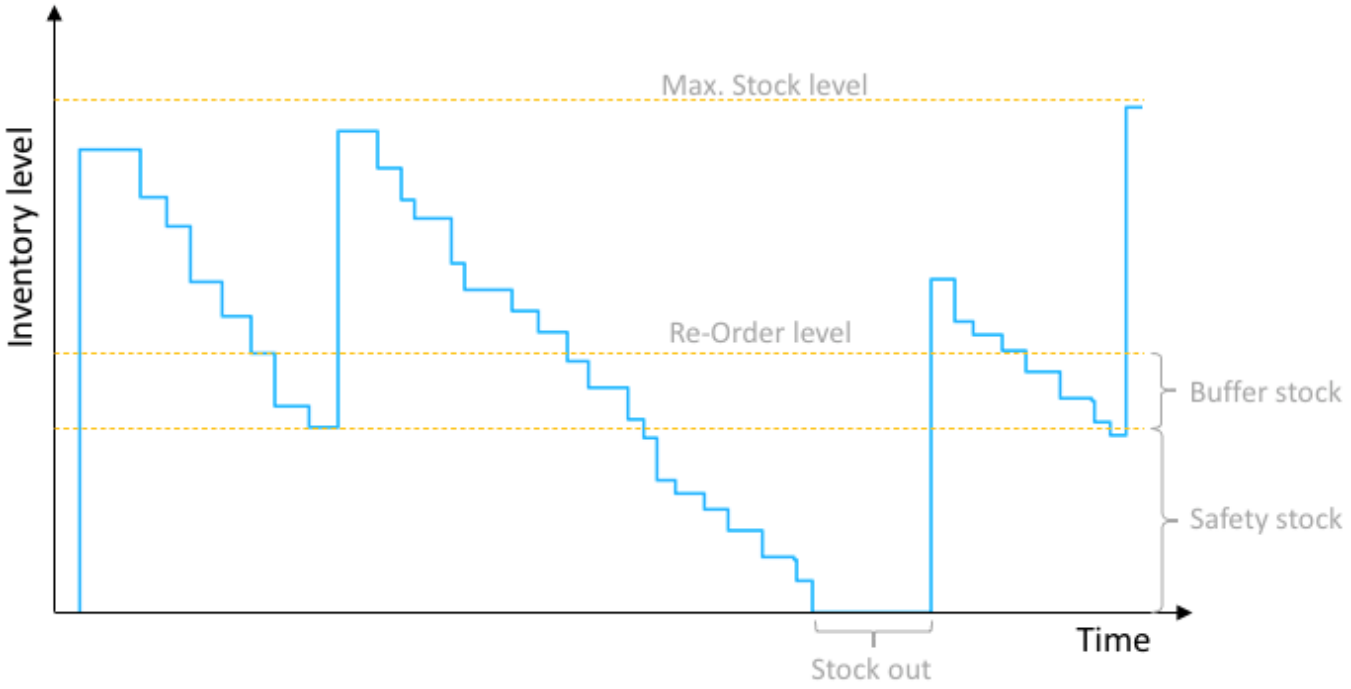


Goods are not automatically restored in the warehouse - a re-ordering process must take place. Agencies must place an order of a certain quantity and wait for its reception. The time lapse between the moment when the order is placed and the moment of its reception is known as “lead time”. The amount of stock consumed during a standard lead time is known as “buffer stock”.

The lead time for the critical items in the storage facility must be well known. The balance between consumption and lead time will allow defining the optimal buffer stock.

Buffer stock = [Lead Time for replenishment (in days)] x [daily consumption of the item]

Despite keeping a buffer stock, "stock-outs" may occur. Stock-outs are defined as stock of one or more items being fully depleted. Stock-outs occur when anticipated orders are long-overdue, when actual lead times are longer than expected lead times, or when consumption is significantly increased. To prevent stock-outs from occurring, a safety stock should be maintained. “Safety Stock” is a quantity of extra stock that is kept to mitigate risk of stock-outs caused by uncertainties in supply and demand. Common examples uncertainties in relief operations might include access constraints, harsh climate events, or increased needs due to changing social conditions. Awareness changing situations and the associated potential supply chain bottlenecks can help planners design a safety stock appropriate to the operational context.



Once buffer stock and safety stock levels are defined, a “reorder level” should be established. Reorder level (or Re-Order Point - ROP) is the minimum stock level of any given item before another order is placed. Reorder levels must be sufficiently high to allow regular replenishment of stock before reaching a critical situation and a potential stock out. The reorder level is calculated by adding the safety stock to the buffer stock.

Re-Order Level = Buffer stock + Safety stock

When defining reorder levels, agencies should consider that storage facilities have a limited capacity. Planners should define the maximum space available for each of the stored items and establish a maximum stock level for each item. This is especially critical when storing items requiring specific storage conditions, such as temperature sensitive goods or dangerous materials, for which allocating extra space may not be immediately available. To allow a certain degree of manoeuvrability, the “maximum stock” level should not be reached.

Inventory Components

Correct inventory management requires a broader vision than just inbound and outbound movements. Understanding different ways to visually manage inventory is important in supply chains with long transport periods, limited storage capacity, or high rotation of items or where different orders overlap in time.

From the moment an item is ordered until the moment the item is received and dispatched, the item passes through different states:

- **On hand/Running Inventory** - The current stock in the storage facility. It is the number of available units of a certain SKU for running operations.
- **In transit Inventory** - The stock being transported between two locations. Although not in a warehouse, supplies in transit remain property of the organisation and should be recorded/accounted. It is common for senders to deduct an item from inventory controls before the receiver accepts it. In transit tracking is particularly important when transit between facilities or to a delivery location may take long periods.
- **Committed inventory** - Stock that is committed to a particular order or transfer. While “on hand” inventory is the number of available units, “committed” inventory are items which are physically in the warehouse but are not technically available.
- **Ordered Inventory** - Stock that has been ordered to replenish the inventory but is not yet received. If an order is partially received, the remaining quantity is called back-order. If inventory back-orders are a frequent occurrence, it may be necessary to evaluate the inventory control procedures.

Demand Forecasting

"Demand forecasting" is the process of attempting to predict future demand as accurately as possible using available data. Demand forecasting can be a simple task, but it becomes more complex when managing many different products and/or when multiple customers with differing demand cycles place orders concurrently.

A good forecast can be achieved by reviewing historical orders and consumption patterns. Consumption data is normally arranged in discrete time slots. Different time slots can be used depending on the frequency of outbound movements from the inventory: years, quarters, months, weeks, days. Though the time period granularity has to be defined according the context, “monthly consumption” is the most commonly used. A monthly consumption is the quantity of a particular item leaving the warehouse per month.

Recording and monitoring consumption figures is the key activity to forecast. The simplest way to calculate monthly consumption is by counting the deliveries recorded on stock cards or other tracking systems. The more records are available on historical consumption, the more accurate and reliable the forecast will be. Between three and ten previous “time slot” previous periods can provide reasonable results for demand forecasting.

STOCK CARD

Ampicillin - Capusel 250 mg (Totapen ")

N Rack:		Min stock:	100.000	Max stock:	
Date	Origin or Destination	Incoming	Outgoing	Stock	Remarks
4/1/20	UNICEF	130.000		130.000	
5/1/20	Béboro		30.000	100.000	
5/1/20	Koumra		5.000	95.000	
6/1/20	Motsala		25.000	70.000	
30/1/20	Inventory			70.000	
1/2/20	UNICEF				Ordered 150.000
2/2/20	Béboro		20.000	50.000	
5/2/20	Goundi		35.000	15.000	
4/3/20	UNICEF	150.000		165.000	
7/3/20	Béboro		20.000	145.000	
9/3/20	Motsala		10.000	135.000	
12/3/20	Goundi		15.000	120.000	
12/3/20	Koumra		8.000	112.000	

Monthly consumptions

January: 60.000

February: 55.000

March: 53.000

Average monthly consumption: 56.000

Demand (D) can be established based on the average consumption of previous records. Average consumption is calculated by adding a number of consumption (C_1– C_N) figures and dividing by the number (N) of figures used:

$$D = \frac{C1 + C2 + C3 + ... + CN}{N}$$

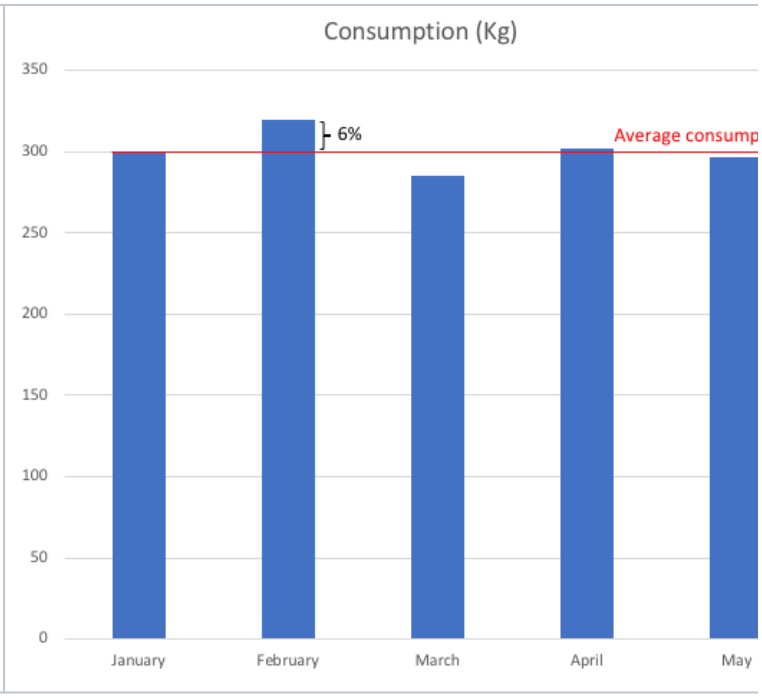
Consumption can be calculated by reviewing historical periods of time in relation to key destinations or areas of intervention. In relief operations, consumption during the kick-off of an activity may be higher than in subsequent orders. This is commonly due to:

- Push style inventory system.
- Lack of coherent demand signals.
- Planners sending supplies based on worst case scenarios.

Stock managers should not consider forecast figures as a certainty. For critical items it is recommended to define alternative scenarios which reflect different possible future developments. The typical exercise to deal with uncertainty consists of designing a best and a worst-case scenario in addition to an average case forecast.

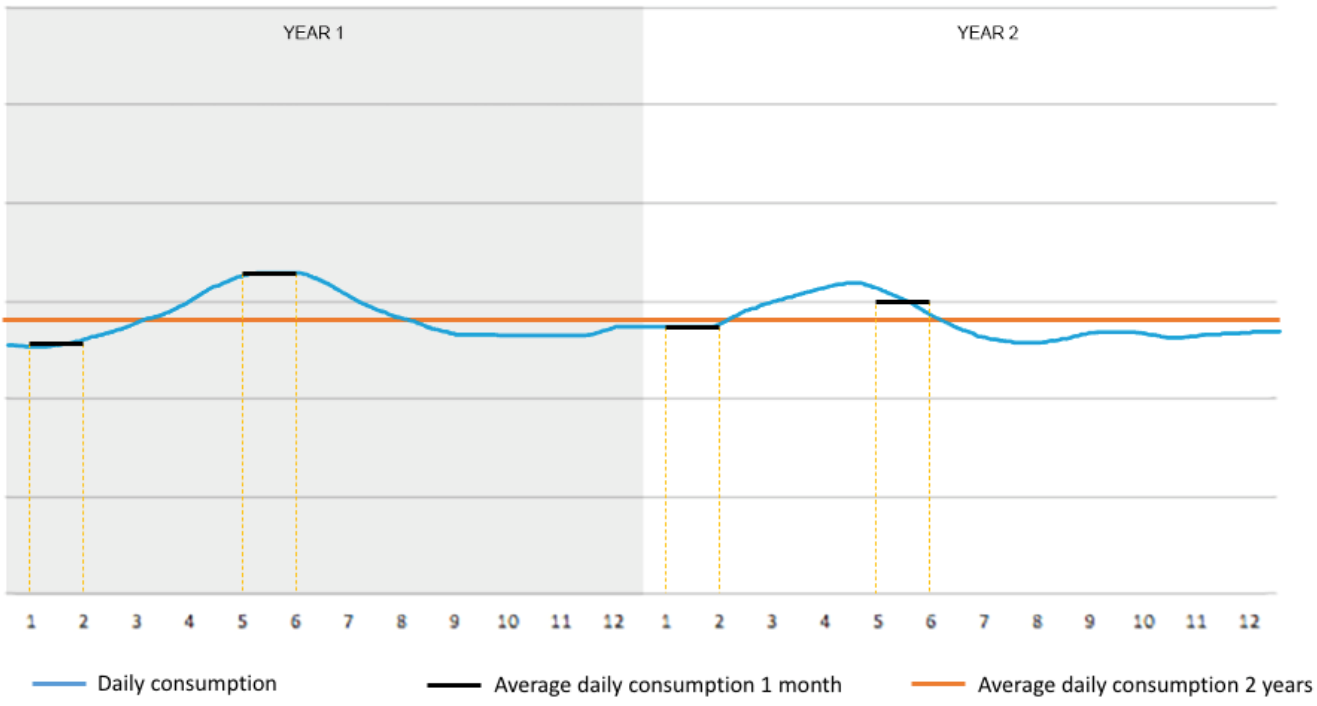
To define demand in worst and best-case scenarios, planners should identify the maximum positive (and negative) variation (V_{max}) over the last recorded time period, and add (or deduct) the V_{max} to of the average monthly consumption.

Month	Consumption (Kg)	Variation
January	300	0%
February	320	6% Vmax
March	285	-5%
April	302	0%
May	297	-1%
Average =	301	
Demand =	301 + (301 x 6%)	= 330 Kg



Depending on the context and the type of inventory, seasonal fluctuations may appear. Data based on previous years or consumption figures, or of previous interventions can help to prevent stock-outs or over-stocks due to seasonally increased or decreased demand. It is recommended to check previous annual demand signals to identify and understand seasonal patterns.

Using annual data to calculate average monthly consumption can help balance sporadic high demands: surplus stock built up during low consumption periods should compensate higher demand during high consumption periods. If agencies plan to hold unused stock for anticipated higher demand, they must ensure that stock will not expire or become unusable by the higher period of anticipated demand. Pre-positioned or new stock items may not be a major issue, but inventory delivered to a country may already be approaching the end of its life and must be used accordingly.



If seasonal fluctuations are substantial and average consumption between different months differ significantly, seasonal stocks with specific thresholds could be considered. In such cases demand forecasts must accommodate the time-frame and the period in the year to be covered.

Limitations of Forecasting

While forecasts can be useful for smoothing out demand curves and predicting seasonal needs, they also come with their own limitations, especially in the humanitarian context. An inappropriate demand forecast can lead to stock wastage in the form of unused items piling up, or major stock outs.

A demand forecast should never be confused with the goals of a project. Humanitarian projects often run on expected population numbers or goals reported to donors. A demand forecast should be built upon real consumption data and informed by demand signals, not the desired distribution numbers. Early in a humanitarian intervention, it can be hard or impossible to know what real consumption numbers will be, and project plans or available funds is the only data to work from. After a project has been running for a few months, any given forecast must be revisited.

Another risk of demand forecasts in humanitarian response is the unpredictable nature of the response environment. Unforeseen natural disasters, civil unrest or governmental regulations can dramatically alter demand signals, driving up or slowing down consumption. While these events may be hard to predict, they should be adapted into future demand forecasts.

When to Order

Based on demand data, a replenishment plan for inventory must be designed. A replenishment plan consists of deciding when to order and the quantities to order in the period to be covered.

The decision of when stock should be replenished and when an order should be placed is crucial for successful inventory management. Two different methods can be applied:

1. Based on the pre-established frequency of systematic orders.
2. Based on a pre-established threshold of stock levels, the re-order level.

A third method includes reacting to dynamics external to the storage facility, such as budgetary cycles or combining orders with other agencies as part of a network or consortia. If inventory management is runs the risk of being exposed to external dynamics, coordination with relevant stakeholders is key.

Agencies should decide if a single method should be applied, or if switching from one method to the other is more useful. This decision depends on criteria such as:

- The phase in the relief intervention: Is the supply chain responding to a stable long-term program? Or is it responding to the early phases of a response with high levels of uncertainty?
- The standard delivery time of the orders: Are the supplies sourced from the local market taking short lead times to get the ordered items? Or the supplies are sourced in international market with long lead times?
- The supply chain strategy: is the supply chain operating under a push or pull strategy?
- The number of different products ordered simultaneously: Although forecasting may be done on the level of SKU, it is a common practice to order on the level of a product group or supplier. Product grouping can be designed according to the market and supplier (i.e., construction materials, drugs, hygiene) or demand dependency (i.e., kits).

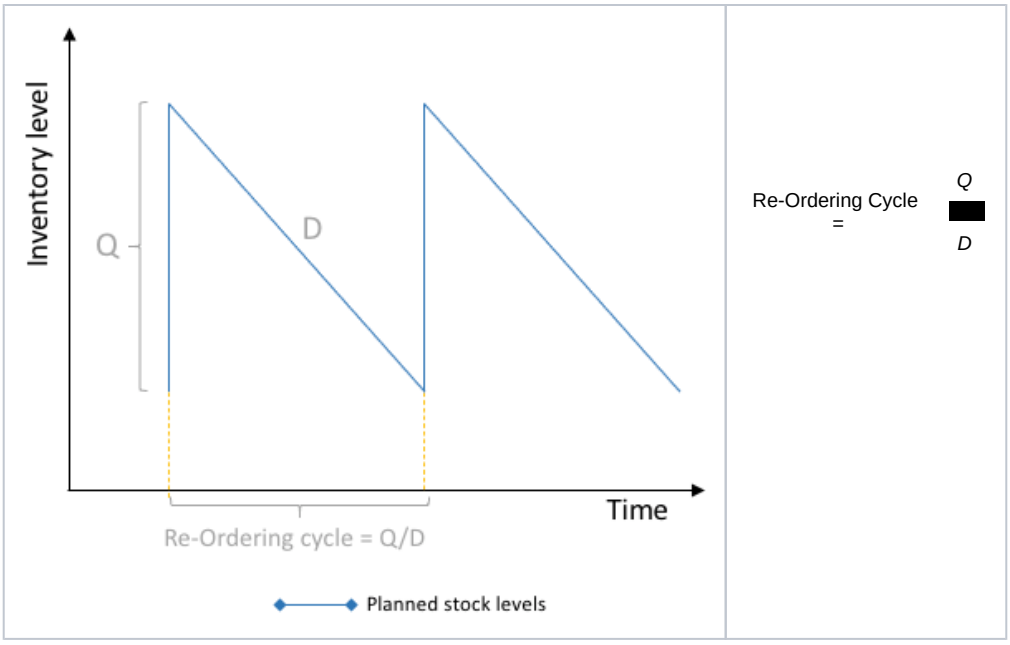
Systematic Orders

Systematic orders based on a pre-established frequency is a common practice in:

- Long term programs with steady consumption rates.
- When operating under a push strategy.
- When supplies are sourced in the international market and undertake long transportation periods.
- When different products are grouped and ordered simultaneously.

Systematic ordering is the most efficient method to refill inventory as it establishes working patterns and distributes the workload regularly throughout time. Systematic ordering also requires good planning, team discipline and reasonable forecasts.

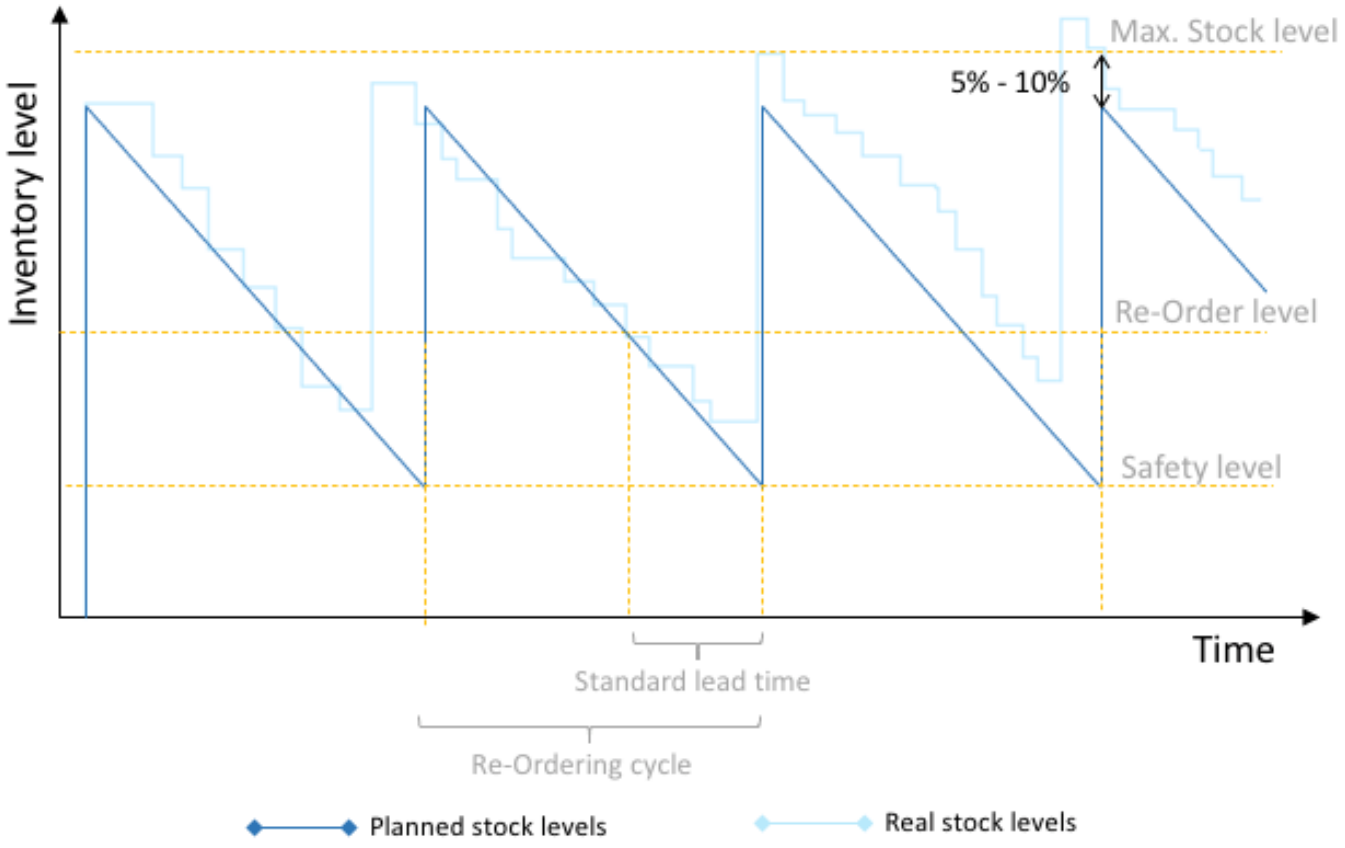
The re-ordering cycle is directly related to the demand (D) and the quantity to be ordered (Q): the larger is the quantity ordered, the longer will be the period between orders. The higher the demand (D), the shorter will be re-ordering cycle.



The frequency of orders may also be affected by other factors such as:

- Lead time.
- Costs of reordering (C_R), including costs of labour in the procurement department and the cost of transporting.
- Costs of holding inventory (C_H).
- Available storage capacity.
- Security risks of the given context (related to transport or to storage).

All the above-mentioned factors must be considered to find the best compromise between inventory levels and the frequency of orders. For international orders having a lead time between 3 to 4 months, bi-annual or annual orders are considered a correct compromise. For domestically procured or locally available items, shorter lead times may be acceptable.



In general, a 5% to 10% buffer can be kept as a margin from the maximum stock level to avoid over-stocks after periods of lower consumption. In cases where the re-ordering cycle is constrained because of limited storage capacity, consider alternative storage facilities to decrease the stress in the supply chain.

There are several mathematical models in commercial logistics to calculate the optimal re-ordering cycle. One of these models is based on the demand and the economic variables only (costs of reordering an item and the cost of holding it in the inventory). It is referred as the Economic Order Quantity (EOQ) model:

$$\text{Optimal Re-Ordering Cycle} = \left(\left(\frac{2}{D}\right) \times \left(\frac{C_R}{C_H}\right)\right)$$

Nevertheless, estimating the costs of reordering and holding an item in inventory can lead to complex calculation processes and is only recommended for well-established and mature supply chains.

Misalignment between expected inventory levels and real inventory levels for certain items may happen due to fluctuations in demand or variations in lead time. Corrections to the pre-established frequency of orders can be done after certain re-ordering cycles have been completed. It is recommended to stick to clear and easy-to-remember frequencies: monthly orders, quarterly orders, bi-annual orders or annual orders. This will ease the coordination between the different stakeholders all along the supply chain.

Pre-established Thresholds/Minimum Re-order Levels

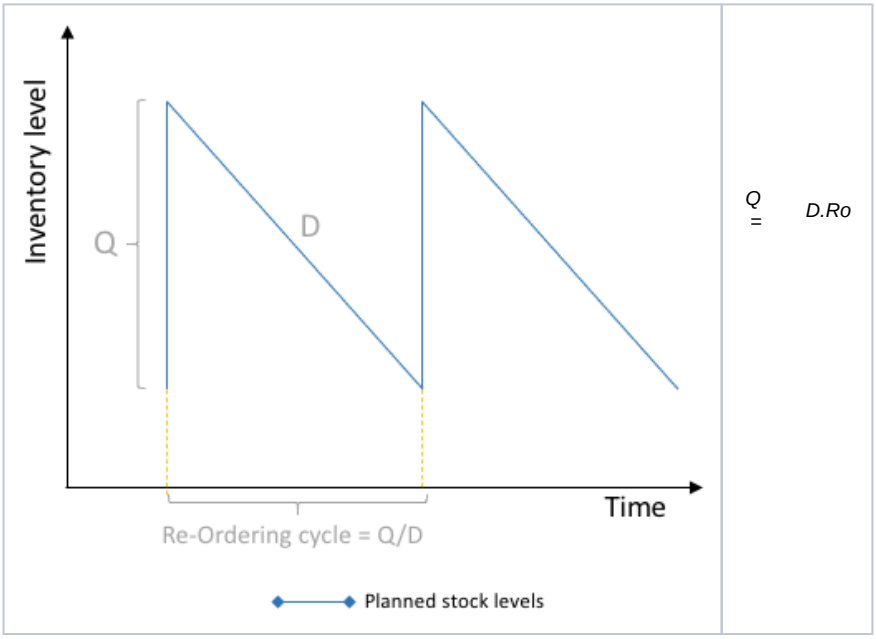
A second method used to decide when to place an order for stock replenishment, consists of monitoring stock levels and placing orders whenever they reach the pre-established re-order level. This method is normally applied under pull supply chain strategies, at the beginning of new programs when consumption records are unavailable, or when the concerned articles are easily accessible with short lead times.

Special attention must be taken when storing articles with dependent demand or when requiring kitting for order processing. Stock items with dependencies on items with lower stock levels will determine the need to launch an order for a whole group of items.

Refer to the section Systematic Orders under pre-established frequency in this chapter to understand how to calculate the re-order stock level.

Calculating Order Quantities

Demand (D), the re-ordering cycle (Ro) and the quantity to be ordered (Q) are closely related. The longer the period between orders, the larger the quantity to be ordered. If demand increases, the larger the order that will need to be placed.



Independently of the re-order level, the quantity to be ordered (Q) can be calculated at any given time based to the following variables:

- Demand (D),
- Lead time (L_T)
- Time period to be covered by the order (T)
- Stock level (S): the running stock at the given time
- Items in the pipeline (P): ordered inventory, transit inventory, back orders, loan reimbursements, etc.

The basic calculation for the quantity to be ordered (Q) considers the demand during the period to be covered (T x D), plus the demand during the lead time (L_T x D), subtracting the quantities in stock (S) and the quantities in the pipeline (P):

$$\underset{=}{Q} = T.D + LT.D - S - P$$

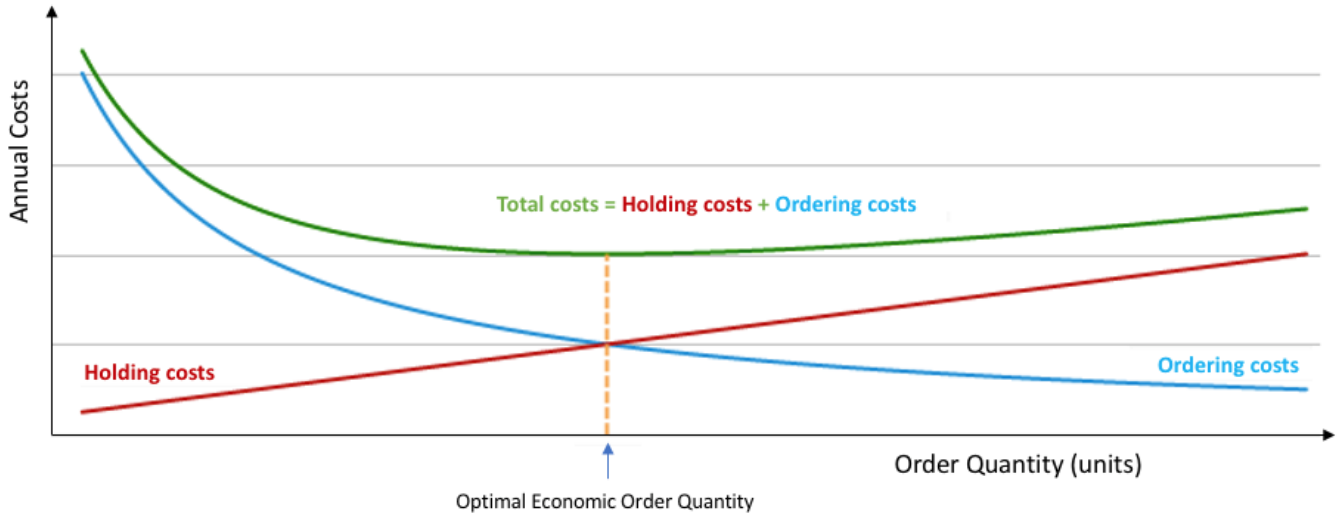
If preparing an order when inventory reaches the pre-established re-order level, the quantity to be ordered (Q) will be calculated in the same way but using the re-order level instead of the running stock level.

$$\underset{=}{Q} = T.D + LT.D - Ro - P$$

In cases where the safety stock (S_S) must be replenished (totally or partially) the required amount should be added to the previous formula.

$$\underset{=}{Q} = SS + T.D + LT.D - S - P$$

More sophisticated models can be applied to calculate the optimal quantity of goods to order. The Economic Order Quantity (EOQ) model can be used for computing the economic optimal quantity of goods while ordering. This model is based in economic variables such as the ordering costs and the holding costs. It defines the optimal quantity as a balance between increased costs due to holding a lot of stock, and the economy of scale obtained when making big orders.



According to the EOQ model, the optimal quantity to be ordered is defined by the annual demand quantity (D), the costs per order (C_R) and the holding costs (C_H), as follows:

$$\text{Optimal Economic Ordering Quantity} = \left(\frac{2.D.C_R}{C_H}\right)$$

Inventory Control

The basic purpose of inventory control is to know at any given moment what supplies are in a given storage location or warehouse. Inventory control is a cornerstone of good inventory management.

Inventory control ensures traceability and transparency of any storage activity, providing accurate information on any movement of supplies including:

- Where the products come from.
- When the products were received and in which quantities.
- Where the products have gone.
- When the products were dispatched and in which quantities.

Inventory control improves stock management practices and supports decision making through:

- Optimising working processes and costs.
- Providing some degree of protection against potential over-stocks or stock-outs.
- Anticipating products getting expired or close to expire.
- Detecting loses or any deterioration of the stored products.

Inventory control is essential for accountability, providing values of stored items and consumption status from projects close to conclusion. Proper inventory control will provide value to the storage facilities through optimised management, higher levels of satisfaction among customers and stakeholders.

For a successful inventory control three critical activities must be accomplished:

1. Systematic recording and keeping support documentation accessible.
2. Monitoring consumption, stock levels and inventory performance.
3. Reporting.

Systematic Recording and Support Documentation

There are two main types of records that enable proper inventory control: those tracking stock movements and those tracking stock levels. Both types are connected as each stock movement affects the level of stock in any given location. Records should be formally cross-referenced allowing traceability of each item from reception to dispatch.

The documenting system in place should be as standard as possible while still avoiding unnecessary complications. The system needs to be established at the onset of operations and fully understood by the staff whose job it is to put it into practice. Training of the warehouse personnel is crucial in this sense.

Recording Stock Levels

The basic purpose of inventory control is to know at any given moment what supplies are in a storage facility. There are different levels of granularity in terms of recording stock levels.

A basic tool for inventory control is the *stock card and bin card, both of* which record any movement of physical quantities for each SKU and are stored next to the item in the warehouse, while the *inventory ledger* tracks inventory transactions in a central location.

Where stocks are held for different donors, it may be convenient to keep separated records for each donor. This will ease accountability and reporting processes, especially at the closure of the project.

Recording Stock Movement

All movements of stock should be recorded and supported by the corresponding documents certifying receipt or dispatch of supplies. Supplies should change hands only when the corresponding documents have been signed by the next recipient link in the supply chain. All documents involved in the exchange of goods must be duly archived.

All goods received in the storage facility should be accompanied with a *waybill or a delivery note* note describing the supplies details and the item origin. If a supplier or transporter does not provide a waybill or a delivery note, the storekeeper should fill in a goods received note. A copy of the signed document should be retained by both the recipient and person delivering the goods.

To dispatch a product from storage, a fully authorised stock release order should be provided. Without the stock release order, the storekeeper should not release any product.

All transaction documents should clearly specify the name and exact quantity of the supplies received/released, as well as names of the individuals or agencies issuing and receiving them. The reference number of the transaction should be included on the related stock cards, allowing full traceability of any goods in the stock.

It is key that all stock receipts, issues, transfers, disposals and adjustments are documented and authorised. Do not postpone any of the essential recording tasks; all stock movement records must be updated immediately. Hard copies of stock cards and waybill/delivery notes should be properly archived within the warehouse premises, and be accessible to authorised persons.

Monitoring

Consistent records will enable proper monitoring. Basic things to be regularly monitored are:

- Levels of stock with special requirements:
  - Items reaching critical thresholds (like re-order or safety stock levels).
  - Items belonging to specific projects.
  - Items with expiry dates.
- Consumption patterns, and the length of time that inventory will last under current usage with special attention to:
  - Items with high rotation.
  - Items that are core to running relief operations.
  - Items with short order cycles.
  - Items with a significantly increased demand that could lead to stock-out situations.
  - Items with a significantly reduced demand that could lead to over-stock situations.

In addition, the performance of inventory management can also be monitored. To adjust the management processes, consider monitoring the following information:

- Inventory rotations - Transactional frequency, volume and value, identifying those items with higher turn-over. The value of individual transactions can be compared to the average inventory value and to the required workload to manage them.
- Actual time to completion - The amount of time from issuing instruction to completion of a task. This might include the time for dispatch preparation, including the time lapse between the moment when the stock release order is received and when goods formally dispatched.
- Number of stock-outs in a given period.
- Stock valuation.
- Quantities and values lost.

When coming to control and monitor particular items, consider that stocks follow the *Pareto principle*, also known as the “80/20 rule”, the “law of the vital few”, or the “principle of factor sparsity”. This principle states that roughly 80% of consequences come from 20% of the causes. When applied to inventory management, 80% of the movements tend to come from 20% of the line of items. Identifying this 20% of “high-rotation” items is vital for an optimal inventory management.

Physical Inventory

To ensure that records are consistent and aligned with the stock physically on hand, it is recommended to regularly reconcile stock records with actual physical counts. This process is referred as "physical inventory". The frequency of physical inventories may be determined by the number of stock movements, by the value or nature of the stored goods, the frequency of visits to third-party managed locations, or by donor requirements for a specific project.

To optimise the efforts of controlling mechanisms of a physical inventory, an A-B-C system can be put in place dividing the inventory into three categories:

- "A items" with very tight control and accurate records.
- "B items" with less tightly controlled and good records.
- "C items" with the simplest controls possible and minimal records.

Regular control can be achieved dividing the inventory in A, B and C groups and counting a rational combination of each category per period of review. This type of counting occurs when some parts of the stock on hand are counted more often than others, usually following a schedule, is referred as “Cycle Counting”.

Other forms of counting are:

- **General physical inventory:** Typically happens in predefined periods such as on a yearly, semester or quarterly basis and covers the whole inventory in a given storage facility.
- **On demand inventory of specific items:** For specific reports or requests, particularly for items that may require more regular counting.
- **Inventory by sample:** Random spot checks usually performed by request of auditors or program management. Random spot checks are good to carry out during random or infrequent visits.

When conducting physical inventories, stock should remain stationary - no stock movement should be performed for those items under scrutiny. On demand or random spot checks are easier to conduct and may occur as needed; during random spot checks or on demand inspections only movement of the selected stock item should be halted. A full physical stock count will require the entire facility to be closed to stock movement for a pre-defined period of time.

Random Spot Checks

Random spot checks are encouraged throughout any operation, and at any time. They are useful for when counters only have access to storage facilities for limited periods of time, due to security or operational constraints. Spot checks are also a relatively low effort way to continually monitor activities.

To conduct a spot check, counters should pick out 3-7 line items from any random cargo item in the warehouse ledger and conduct a blind count. To facilitate a blind count, locate the items in the warehouse.

- If the items cannot be located, ask the storekeeper or warehouse manager to help locate them.
- The inspector should conduct their own count, and ask the third-party or other team member to do a separate count conducted at the same time.
- At the end of both counts, compare the two numbers and reconcile any discrepancies between the two counts.
- Cross-check between the physical count and the stock count in the warehouse ledger afterwards. If the physical count does not match the numbers on the ledger, counters should make a note of the discrepancy.

Weights and Dimensions (if required)

- Weigh and measure the 3-7 selected items.
- Cross check against the weights and volumes in the warehouse ledger. Discrepancies in weights and dimensions should be recorded and fixed.

Full General Physical Inventory

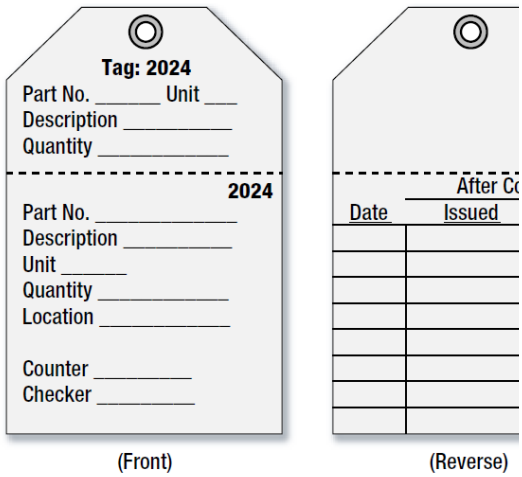
When general physical inventory happens, the warehouse should be locked down during the entire inventory period. The overall size of the warehouse and quantity of items stored within it will determine the length of time required to complete a full count. A small facility could be completed in a just a few hours, while a large facility might take several days.

If the physical inventory is expected to take more than a few hours, all users of the warehouse should be informed of the delay and closure. If incoming deliveries are expected, they should be rescheduled in advance.

In order to mitigate the chance of human error and bias, it is recommended that two separate teams count the same set of items without any information exchange between them. A third person should be appointed to oversee or manage the counting teams. If available, employ the “stock tag” system to facilitate counting.

Inventory Sheet	Stock Tags

PO	Description	Position	Quantity



(Bragg, 2005)

While on-demand or random spot checking may occur as needed, it is strongly advised that a full stock count should be conducted at least once a year, if not more frequently depending on the size of the facility and the overall volume of throughput. The standard accepted best practice for a full stuck count is called “double-blind”, and follows the below steps:

Double Blind Counting Procedures

1. Two teams of two persons each (four persons total) are identified in advance. These two teams will conduct the count sequentially. All four persons should ideally come from different parts of the organisation, and not have direct control over the stock or direct financial incentive to tamper with stock counts.
2. Warehouse activities are completely halted during the time of the stock count. This means that no cargo goes in or out, and stored items are not moved around the facility. Ideally, only counters should be let inside the facility during counting.
3. The two teams should meet in advance to ensure all parties understand the process.
4. The first two-person team starts at one far end of the warehouse/storage facility and begins counting, using a pre-defined common understanding (example: Piece count per shelf, piece count per line item, etc). The first team member counts, while the second team member records on a pre-defined recording system.
5. The second two-person team begins after the first two-person team. The second count can begin after the first count has ended, or even by waiting for only a few minutes.
6. The second team will count using the same agreed upon common understanding. The second two-person team can start from the same location as the first team, or start from the opposite side of the warehouse.
7. Once the full warehouse/stockroom has been counted fully by both parties, both parties compare counts. Any time there are discrepancies between the two counts, both parties must go to that stock location and reconcile the differing counts.
8. Only after both teams have come to a mutual agreement on the stock numbers can the count be considered closed.

Discrepancies

Once a physical inventory is complete, the counter should record discrepancies for further analysis and follow up.

Types of Discrepancies:

- **Loss** – There are fewer of one or more line item than is recorded in the warehouse ledger, and there are no waybills/release files to explain the difference.
- **Expired/Spoiled/Infested** – Items are considered unusable because they are past their expiration date or infested.
- **Surplus** – There are more line items than are recorded in the warehouse ledger, and there are no waybills/received notes to explain the difference.
- **Damage** – Stored items too damaged to be usable by the requester.
- **Mislabelled** – Stored items have been erroneously listed as a different item or belonging to a different project in the warehouse ledger.
- **Unidentified** – Stored items do not appear to be associated with any known other item or project in the warehouse ledger.
- **Incorrect Dimensions** – Stored items have incorrect volumetric or weight measurements than what is recorded in the warehouse ledger, or no measurements are recorded at all where required.

Many discrepancies result from simple administrative error. Common problems include:

- A warehouse worker or a loader may confuse two similar line items from two projects and store them together as one.
- Cargo is released, but the warehouse manager forgets to update the warehouse ledger.
- Cargo was recently received but not yet recorded on the warehouse ledger.

Only a full physical inventory will tally the total numbers of all items on hand. If counters find loss or mislabelled cargo during random spot checks, additional investigation may be required to understand the full problem.

Corrective Actions

In cases of loss, spoilage or damage:	Counters should reinspect items and conduct additional counts if required. If loss or damage persists after additional counts, then a loss report must be filled out, and the warehouse ledger must be updated. The owner of the cargo must be informed of the loss.
In cases of mislabelled or unidentified cargo:	Counters and warehouse staff should correctly link cargo to anticipated deliveries. Mislabelled cargo should be properly labelled, an updated stock card placed with the items and the warehouse ledger updated. Unidentified cargo should be linked to a project, donor, budget code or category as required, and be properly labelled in the warehouse and updated in the warehouse ledger. If no information on the cargo exists, warehouse staff must investigate where the stored items may have come from.
In cases of surplus cargo:	Counters and warehouse staff should reconcile cargo movements with stock on hand. If there is no explanation for additional items discovered, warehouse staff must investigate where the stored items may have come from.
In cases of mis-measurement:	Newly corrected measurements – weights and volumes – should be updated in the warehouse ledger.

Follow Up

The frequency and number of inaccuracies should be regularly monitored for each warehouse location. Any stock discrepancy should be reported and analysed and corrective actions should be taken to reduce the risk of further inaccuracies. The logistics team should record the results of general inventories in a file specific to that warehouse location. If a warehouse continues to perform below the acceptable standards, corrective action or training may be required.

Reporting

Reporting mechanisms aim to consolidate and communicate all monitored data, especially those signs requiring further action.

There are two types of report:

1. Regular reports.
2. Ad-hoc reports.

Regular reports should be produced in useful time intervals, normally: weekly, monthly, quarterly or yearly. Reports contribute to general program management, help with following up a specific inventory items, assist supply chain strategic decisions, and help update forecasting figures and critical stock thresholds.

The intervals for reports can be set based on the turn-over of the articles and/or the location of the storage facility. As an example, reports from health facility storage running a nutritional program with daily patients and deliveries of medication might want to establish reports in weekly intervals.

Regular reports can include information such as:

- Stock Summary: A record of the relevant transactions and stock levels. For all or a particular list of relevant items during a pre-set time period, this might include opening and closing stock levels, average consumption, and total receipts and dispatches. The value of the transactions and the value of the balance quantity may be relevant for some inventories. Perishable products must be included in this summary.
- An outline of those items reaching a pre-established stock threshold requiring re-ordering or other action.
- An outline of those items approaching their date of expiry.
- Key performance indicators, based on the information mentioned in the Monitoring section on the performance of the inventory management.

WEEKLY MONITORING

WEEK :	

STOCK LOCATION	
DATES	

PRODCT	INITIAL STOCK	RECEIVED	DELIVERED	DAMAGED	EXTRA	BALANCE	PHYSICAL COUNT
CSB (kg)							
Oil (L)							
Mosquito net (u)							
PPN (sachet)							
Soap (u)							
Salt (kg)							
Sugar							
Plastic bag (u)							

	Name	Date	Signature
Stock keeper			
Supervisor			
Control			

	Moderate	Sev.<6kg	Sev.>6kg
PATIENTS IN PROGRAM			
DISCHARGED CURED			
PATIENT OUT NOT CURED			
TOTAL PATIENTS			
+ NEW CASES			

Fig.: Weekly inventory monitoring report from an outreach stock, part of a Nutritional program with daily distribution of food items and non-food items

Regular reports should be shared with relevant stakeholders, especially those making use of regularly stored items. It is a common practice to cross-check information in the inventory reports with the expected and current number of beneficiaries.

In addition to regular reports, storekeepers should inform the pertinent individuals when relevant inventory events occur:

- The stock level of an article reaches the re-order level.
- One or several stock items are lost, damaged or spoiled. In such cases, a loss report should be completed.
- A stock discrepancy is identified.
- A project is reaching to its end.

Data management

Reliable, up to date and accessible information is key for inventory management. Data management will enable making the correct information available to the correct people in the required moment. Furthermore, data management is a cornerstone for accountability.

Procedures and means should be in place to ensure that records are properly kept for internal and external use. Basic information to be recorded and kept updated is mentioned in the systematic recording and keeping support documentation section.

Formats: Physical or Electronic

The means to store and manage stock data can be physical (hard) or electronic (digital). According to the needs, both methods can be combined and used to complement each other. In case of using both systems simultaneously it is highly recommended to keep one as a "master file", and the other as back-up.

Considerations to choose the most appropriate data format may include:

- **Urgency to setup inventory operations**: Physical data record formats can be set immediately, always accompanied by a basic training. Digital formats can take longer time-frames depending on the operational environment and the organisational culture.
- **Existing funds**: The level of investment is considerably higher for the setup of electronic data management means.
- **Digital literacy of staff**: In some particular contexts, staff will be better able to adopt and use digital systems, while in other some resistance may occur.
- **Environmental conditions**: Access to reliable power supply and reliability of the internet connection.

In general, working with digital records can improve data reliability and access to information, make working processes more efficient, reduce space to store physical files, and increase data recovery. Also, digitising records will reduce the use of paper and other stationary.

Similar to physical filing, digital records should be kept under certain order and logic. Folders and files related to inventory management should follow an agreed standard in terms of name and location, enabling searching for a specific file or group of files. Persons accessing digital files data should be trained in the process, and access granted to only relevant people.

Physical file data management is recommended in temporary setups, such as opening new emergency operation or in locations with unreliable power supply or with limited access to information systems.

Physical records require proper format and labelling, ideally in a standardised manner. A secure but still accessible location should be designated within the storage facility to keep hard files, while files from past periods should be kept aside in a secure place. The time period to be covered for the active physical files should be defined in a coordinated manner with other relevant departments. It is a common practice to make use of natural years, though this may differ depending on the organisation and the type of data. For example, waybills or delivery notes may be archived as per natural years while stock cards may follow a different logic.

When using physical records, consider that carton or heavy paper is more expensive and less environmentally friendly, but more durable during intensive use. It is recommended to use carton or heavy paper for files requiring frequent access and updating, such as stock cards.

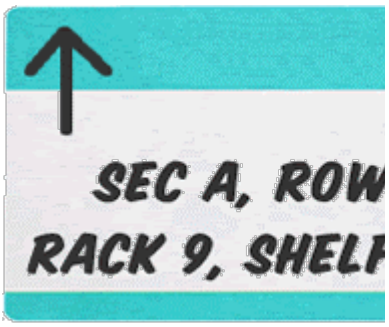
Using physical data management formats still require frequent consolidation of stock record information into a system / excel spreadsheet. A daily or weekly consolidation is advised. More frequent consolidation will improve data backup, will provide faster access to information in case of need, and will avoid additional burden in particular periods of the month.

Coding

Whatever physical or digital file formats are used, a coding system should be in place to ease information flow. Standardised codes and labels serve as a shorthand, or abbreviated item description. The use of codes should speed references to files and entities of interest such as locations, providers, clients, donors, etc. In addition, a proper coding system will enable data segregation, cross-referencing and ultimately, analysis.

Typical inventory information to be coded is:

- Geographic information: Region, country, district, office, etc.
- Supply chain entities: Suppliers and sources, clients and destinations, departments, warehouses, etc.
- Locations within the storage facility where items may be stored: Rooms, corridors, shelves, stacks, etc.
- Operational information: Program, project, donor, etc.
- Units of measure: “pcs”, “Kg”, “bags”, etc.
- Time scales: Date, year, week, etc.

Carton Labelling/Coding				Shelf Labelling/Coding
COUNTRY:	UGANDA	DEPT.	FSL	
YEAR :	2011	PROJECT	J3B	
MONTH FROM:	Jan TO: Dec	BASE :	LIRA	
Code for the box:	UG/LI/FSL/00001			

As preliminary step, a consistent, unique and well-organised set of descriptions per inventory function should be designed and agreed upon in advance, including: covered geography, relevant stakeholders, locations, type of stored items, etc. Critical elements to be identified through codes should be outlined. Avoid over-coding: not all the fields above mentioned are always relevant to be coded.

Labels and codes should be easy to read, unambiguous, and harmonisation with other departments and other supply chain units within the organisation. An agency's finance department may be a key collaborator in this task.

The use of codes should be central to inventory management, therefore it should be included in inventory management procedures. Staff should be trained on how to follow codes, making the way inventory is handled and records are kept consistent across the operation.

Coordination

Inventory management is central for timely implementation of humanitarian relief operations. For a successful and valuable stock keeping, inventory activities must be synchronised with other activities from stakeholders external to the storage facility: suppliers, transporters, clients, other departments, and others. Key information must be regularly gathered and delivered *from* and *to* relevant stakeholders.

Inventory management should support the ordering process, providing information on stocks levels, expiry dates, consumption rates, etc. Monitoring past consumption can help to estimate future needs.

Transit inventories should also be closely followed. This can be done by gathering information from suppliers or supply chain managers on the current status of local, national and international orders. Tracking in transit inventory will allow planners to properly prepare a given storage facility for shipment reception or to alert clients on the imminent delivery of a pending request or a back-order.

Whenever possible, coordination should also help to anticipate intensive use of the inventory, such as during emergency responses or distribution periods. In such situations, extra resources such as increased labour or extended working hours can be made available.

Potential spikes or steady increases or reductions of demand should also be prevented through coordination. Operational information such as new activities, an increase in the number of people in need or access restrictions to deliver in a certain area, are critical in this sense and can help to prevent situations stock-outs or over ordering.

Data from inventory management can also serve to quantitatively monitor the delivery of relief supplies. Increased or decreased demand patterns contrasted with expected consumption can provide information on the humanitarian situation or outline changes in the management of a particular activity.

Coordination should especially be used during the beginning or ending of projects. Particular donor requirements related to stock keeping must be communicated, with special attention to specific reporting mechanisms and disposition regulations.