Inventory Planning and Management

Common Terms

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 are committed to a particular order or transfer.
Demand Signal	Any form of request to remove stock from a warehouse or storage facility coming in any format.
Inventory	Refers to 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	Accountancy 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. It is established for products which are critical or difficult to supply and their shortage can jeopardize the 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 the goods in stock in order to reconcile data in records and 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 the inventory can’t cope with the demand for a certain item.
Time bucket	The time frame used to measure consumption and demand: days, weeks, months, quarters or years are the most commonly used.
Vendor Managed Inventory (VMI)	Inventory management strategy in which suppliers take care of the inventory as part of their retailer’s inventory.

Introduction

Inventory (or stock) management refers to the knowledge and the practices to keep the optimal amount of material in the storage facility. When holding a storage facility, inventory management becomes an integral part of the supply chain management. It is complementary to warehouse facility management and to the physical management of stored material.

Correct inventory management contributes to ensure the timely delivery of supplies. It requires deep knowledge on both, the acquisition process and the consumption patterns and it 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 burden and risk increased.

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 the international procurement. In addition, a conveniently managed inventory can contribute to **economies of scale**: buying large quantities can reduce the cost per item, though the storage costs must also be considered.

When keeping an inventory of relief operations, it is highly recommended developing a “stock policy” aligned with the supply chain strategy. The stock policy should guide the organization on the decision process of keeping any type of stock in any location. Applying certain logic to the stock management is a first concern for critical items in the relief operations and applicable to all type of storage facility without regards to location or scale.

Stock policy is broadly defined by the following questions:

- Where should the inventory be located?
- What specific products should be available at each location? 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 holding.

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 logics or strategies:

Push Strategy

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

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 driven by this demand. 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 as a project whose outputs are predefined. Quantities are clearly defined and the regular supply chain activities trigger demand signals based on quantities informed in the end of it. 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 the 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	Stock acts as a buffer between supply and demand. An inventory is kept because the impossibility to align them perfectly. Most of the decisions are taken based on how much of these items should be kept in the organization's warehouse.
Kitting	Stock is kept to consolidate supplies different in nature for further kitting or assembling. The supplies are dependent on each other for delivery. Unbalances of stock levels may lead to inefficiency, though parallel inbound streams must be coordinated within the inventory. In addition, two different stocks should be managed: one for the original supplies and one for the assembled kits.
Splitting	Stock is kept to split large consignments in smaller lots to be delivered to different locations or consumers, sometimes at different moments. Mostly used to gain procurement efficiency and economies of scale. Attention must be placed only to a single inbound stream, but attending to multiple consumers often with uneven demands. Consolidating these demands to calculate the amount to be ordered can result challenging. Larger buffer stocks may be required.
Contingency	Stock is kept as part of a contingency plan. There is little inventory management as the stock suffers minimal rotation. Nevertheless, if perishables are part of the contingency stock, they may be included in a rotative stock system.
Vendor Managed	Sock is kept in the vendor facilities until a release order is activated. The vendor keeps under reserve a specific number of supplies as part of its own inventory or grants certain manufacturing capacity with a convenient delivery time. This is known as *Vendor Managed Inventory (VMI)* or virtual stock. 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 own funds.
- In Kind Donation from an International Organization, 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

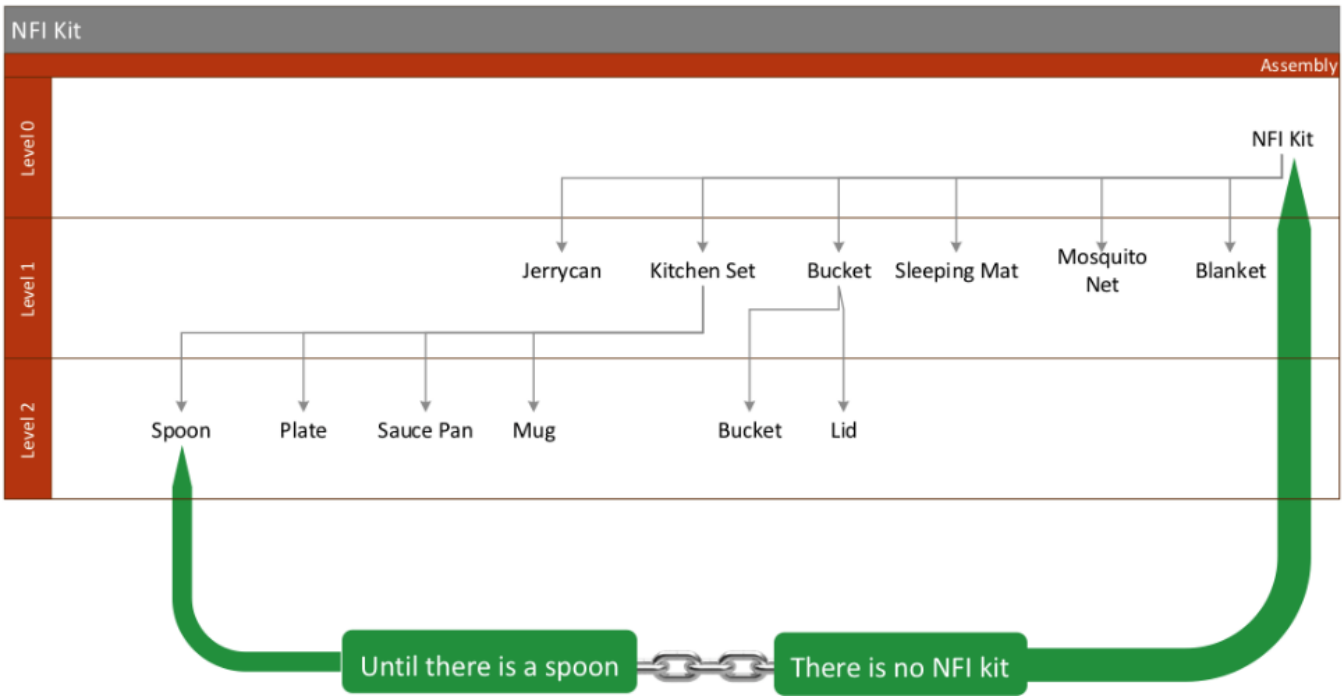
The type in nature of stock can also influence how inventory is managed. Particular considerations should be taken with perishables, consumables (i.e., stationary) or products which are essential to the program implementation, such as drugs in a health program, food in a nutritional program or fuel.

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 means the consumption of both.
- Support equipment - spare parts for a generator; the use of the generator implies 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 also categorized according to its financial value and the stock management can be influenced by the level of cost. This can help to manage risks, to plan expenditure on new and replacement stock or to prioritize 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. SKU refers also to the code made of letters and numbers, which identifies a product in the store. An 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 as the most disaggregated level when dealing with inventory, consequently, an inventory with multiple SKUs will require very different handling procedures than an inventory with few SKUs.

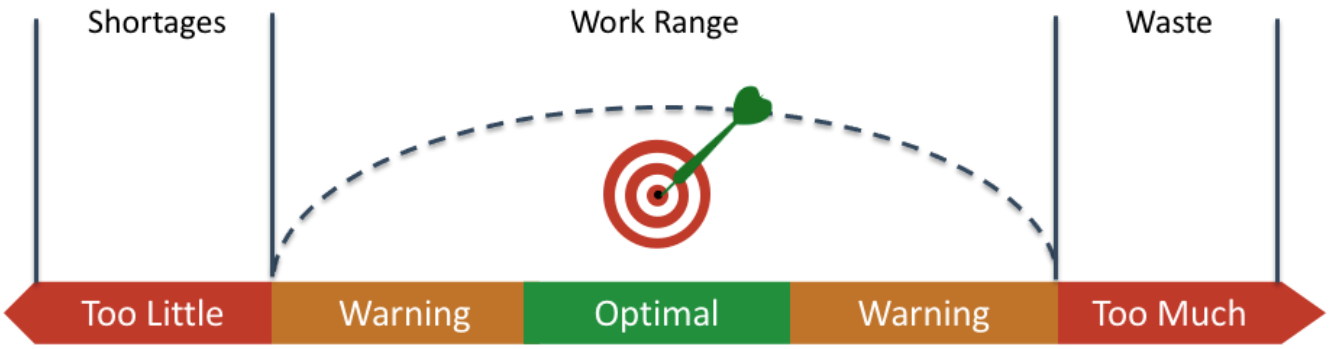
For example, when storing buckets, a decision must be taken regarding the pertinent characteristics that will define it as SKU. Is it appropriate to consider all buckets as a similar article and considering them under the same SKU? Or is it pertinent to differentiate buckets by specific characteristics like: color, size and material, thus creating three different SKUs? The correct SKU design will depend on the type of program and intended use: if buckets are only used as part of an NFI kit to be distributed to the population, the color may not be important; But if buckets are used to segregate waste in health care facilities using color coding, the color of the bucket may be determinant to design SKUs. Possible attributes for designation of a SKU:

- Type
- Color
- Weight
- Volume
- Dimensions (size)
- Packaging
- Technical information
- Anything else

It must be considered that SKUs are designed to keep track of inventory and to know how many of a specific product is available. They can also help to reconcile stock levels, to analyze which products are more demanded or to identify reorder point for products.

Managing Inventory Levels

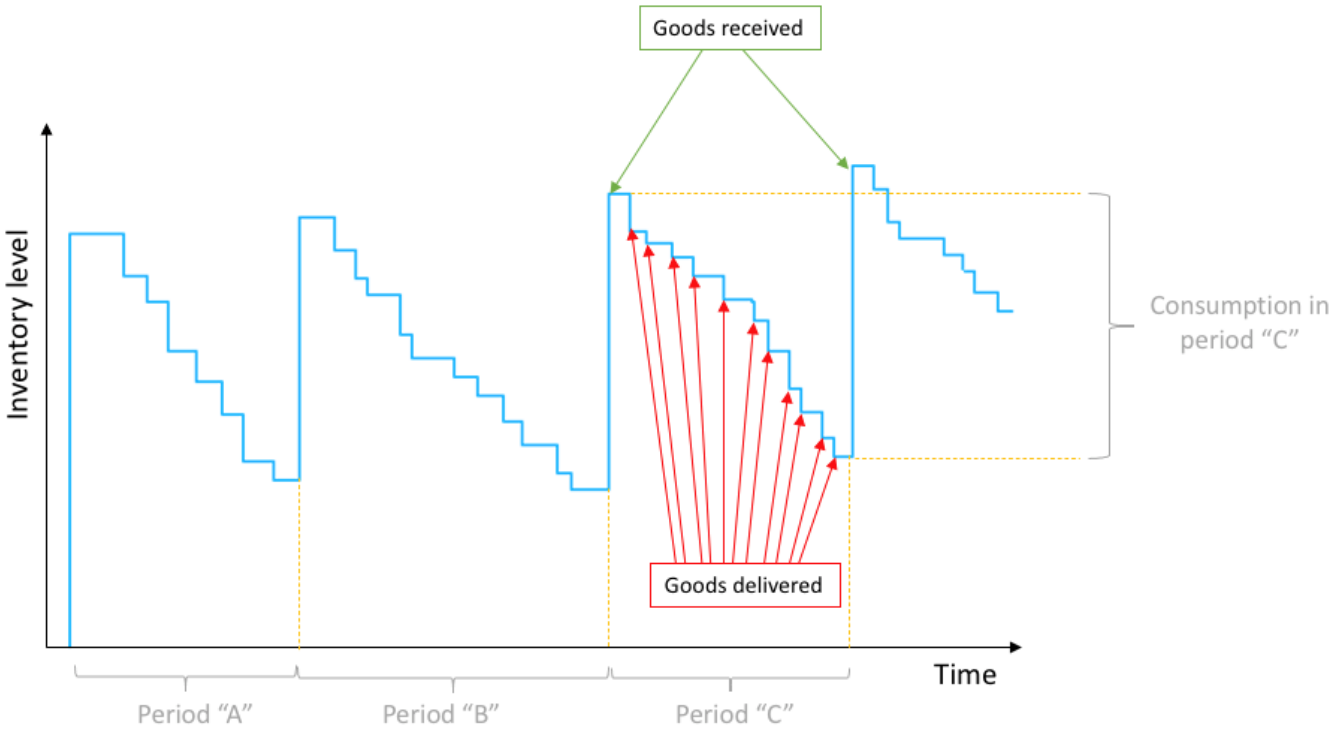
Inventory management consists in keeping the optimal inventory levels at all times. This is achieved when demand is furnished on time while resources such as time, space, effort and expenditures are efficiently managed. Deciding what is the appropriate inventory level, requires a good knowledge of demand 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 summarized 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. It is 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*."

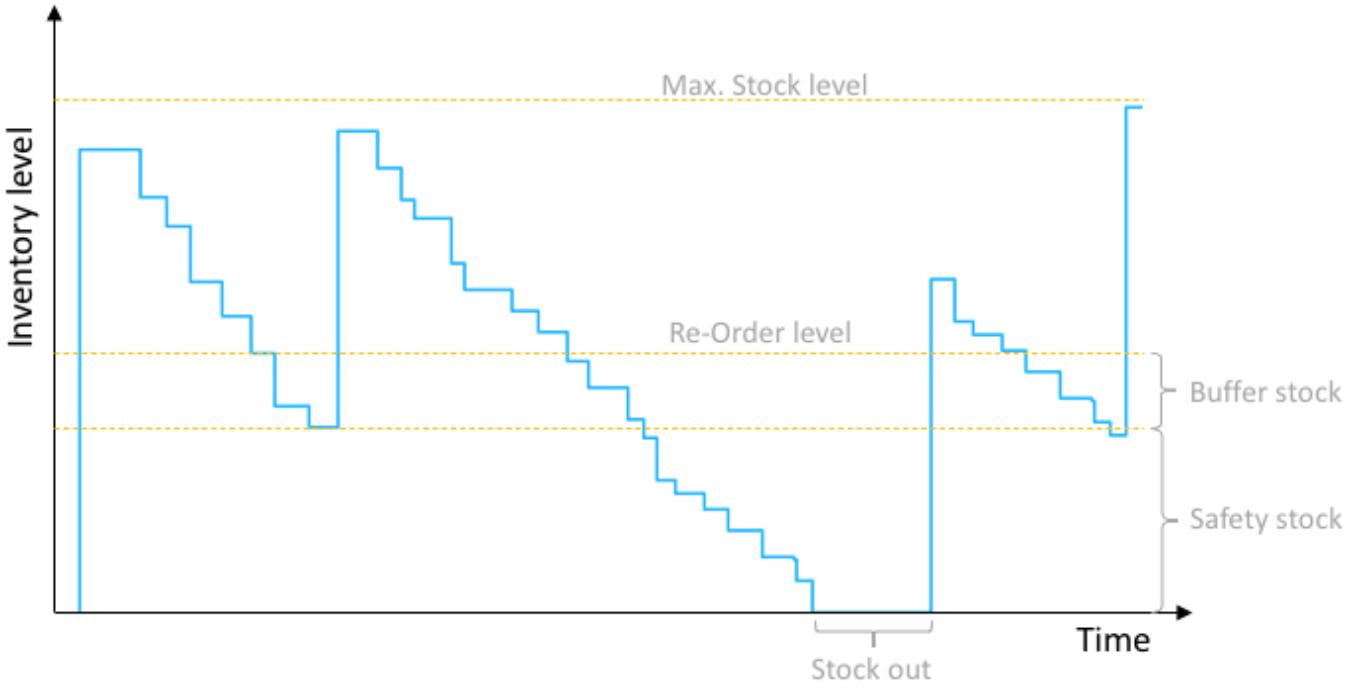


But goods are not automatically restored in the warehouse - an ordering process must take place. This means agencies must place an order of a certain quantity and waiting for its reception. The time lapse between the moment when the order is placed and the moment of its reception is known as “lead time”. 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 being fully depleted, and happen when the order is placed long-overdue, the expected lead time is significantly exceeded or when consumption is significantly increased. To prevent this happening, a safety stock should be maintained. “Safety Stock” is the quantity of extra stock that is kept to mitigate risk of stock-outs caused by uncertainties in supply and demand. Access constraints due to insecurity or harsh climate events or increased needs due to amplified vulnerability or to increased population in need, are common examples of context uncertainties in relief operations. Awareness on the humanitarian situation and the potential supply chain bottlenecks can help designing 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 before another order is placed. It must be sufficiently larger to allow regular replenishment of the stock before reaching a critical situation and a potential stock out. The reorder level is calculated 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 subsequently establishing a maximum stock level for each of it. 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 immediate. To allow certain degree of maneuverability, the “maximum stock” level should not be reached.

Inventory Components

A correct inventory management requires a broader vision than just inbound and outbound movements. Understanding different ways to visual inventory is especially important in certain supply chains with long transport stretches, limited storage capacity, 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 then dispatched, the item can pass through different states:

- **On hand/Running inventory** is the current stock in the storage facility. It is the number of available units of a certain SKU for running operations.
- **In transit inventory** is the stock being transported between two locations. Although not in a warehouse, these supplies remain as a property of the organization and should be recorded/accounted. It is common that the sender deducts an item from its controls before the receiver accepts it. This is particularly important when transit between facilities or to a delivery location may take long periods.
- **Committed inventory** is the stock which 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** is the stock that has been ordered to replenish the inventory but that was not yet received. If an order is partially received, the remaining quantity (pending to be received) is called back-order.
- In case that there is not enough inventory to cope with a request (because of receiving orders that are larger than on-hand inventory stock or because it is the first time an item is requested and the acquisition has not been yet completed), it is referred as **inventory backorder**. If inventory backorders are a frequent occurrence, it may be necessary to evaluate the inventory control procedures.

Demand Forecasting

"Demand forecasting" aims at predicting the future demand as accurately as possible. Demand forecasting can be a simple task, but it can become far more complex when managing inventories of many different products or when multiple customers with differing demand cycles that place orders concurrently.

A good forecast can be achieved reviewing historic 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, the “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 the consumption figures is the key activity to forecast. The simplest way to calculate the monthly consumption is counting the deliveries recorded in the stock card. The more records are available on historic consumption, more accurate and reliable the forecast will be. Between three and ten “time slot” previous records 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	Kounra		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	Kounra		8.000	112.000	

Monthly consumptions

January: 60.000

February: 55.000

March: 53.000

Average monthly consumption: 56.000

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

$$D = \frac{C_1 + C_2 + C_3 + \ldots + C_N}{N}$$

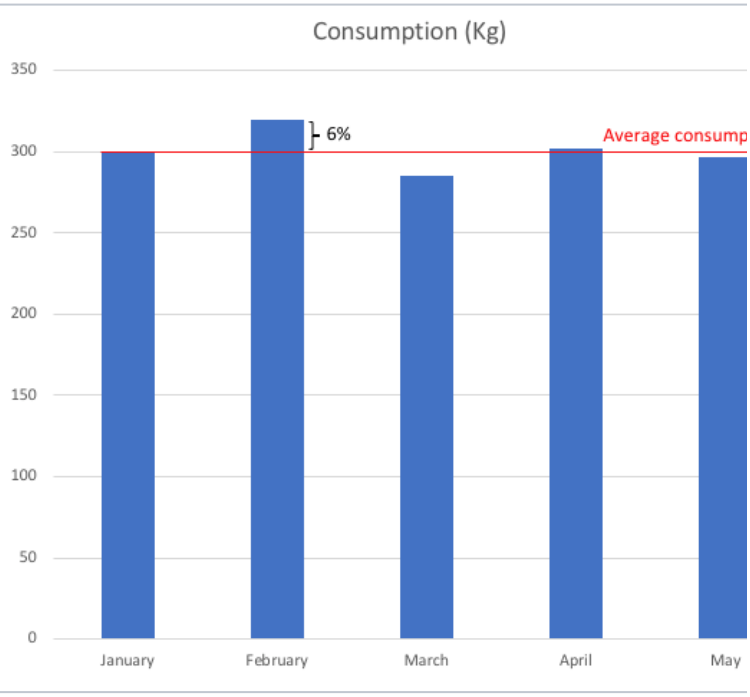
Consumption can be calculated by reviewing historical periods of time in relation to key destinations or areas of intervention. In relief operations consumption during the kick-off of an activity may be higher than in subsequent orders. This is commonly due to:

- 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 in designing a best and a worst-case scenario in addition to an average case forecast.

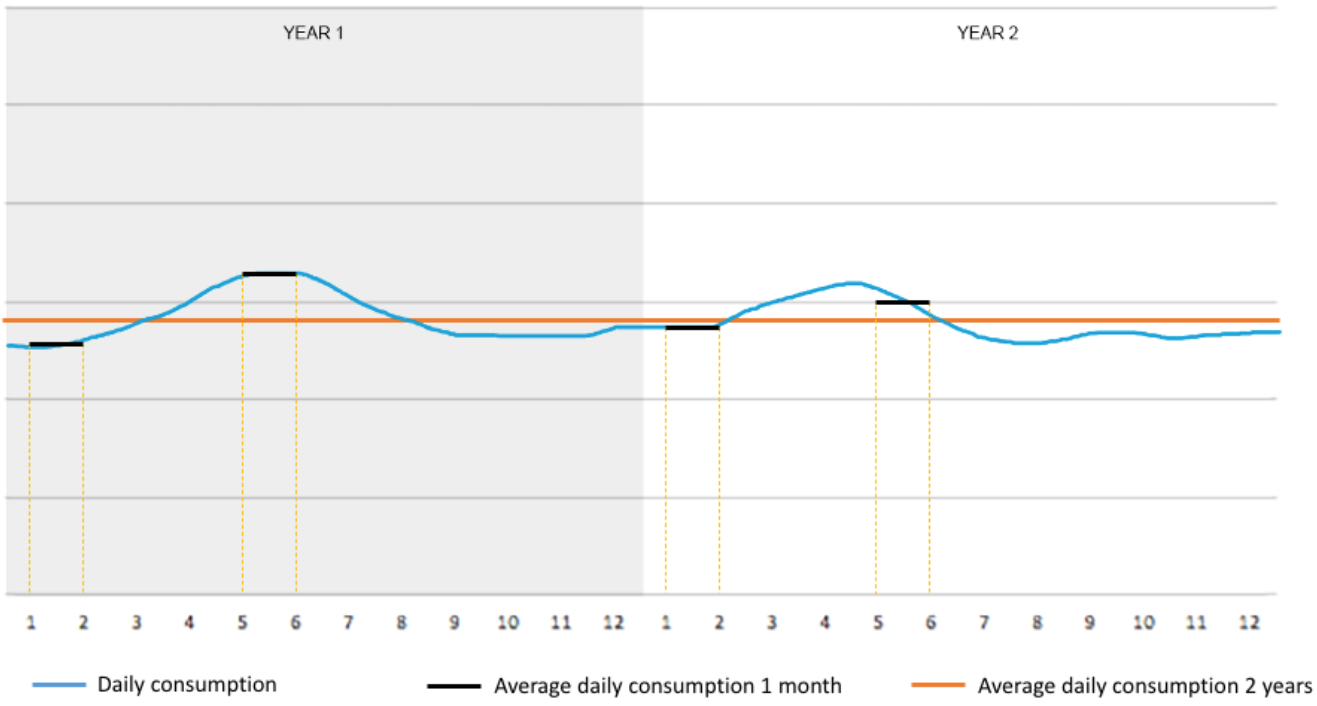
To define demand in worst and best-case scenarios, planners should identify the maximum positive (and negative) variation (V_{max}) over the last recorded time periods, and add (or deduct) the V_{max} to of the average monthly consumption.

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 seasonal 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 to balance sporadic high demands: surplus stock cumulated 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. Prepositioned or new stock items may not be a major issue, but inventory delivered to a country may already be approaching the end of it's life and must be used accordingly.



If seasonal fluctuations are substantial and average consumptions between different months differ significantly, seasonal stocks with specific thresholds could be considered. In such cases demand forecasts must accommodate the timeframe 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 are the only thing to work from. After a project has been running for a few months however, 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 the inventory must be designed. This consists in deciding when to order and the quantities to order in the period to be covered.

The decision on when stock should be replenished and an order 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 together with other agencies part of a network or consortia. If the inventory management is exposed to such external dynamics, coordination with relevant stakeholders is key for anticipation.

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 it a stable long-term program? Or the opening of a response to a sudden onset emergency with high levels of uncertainty?
- The standard delivery time of the orders: Are the supplies sourced from the local market taking short time to get the ordered items? Or the supplies are sourced in international market
- 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. The products grouping can be designed according to the market and supplier (i.e., construction materials, drugs, hygiene) or according to demand dependency (i.e., kits).

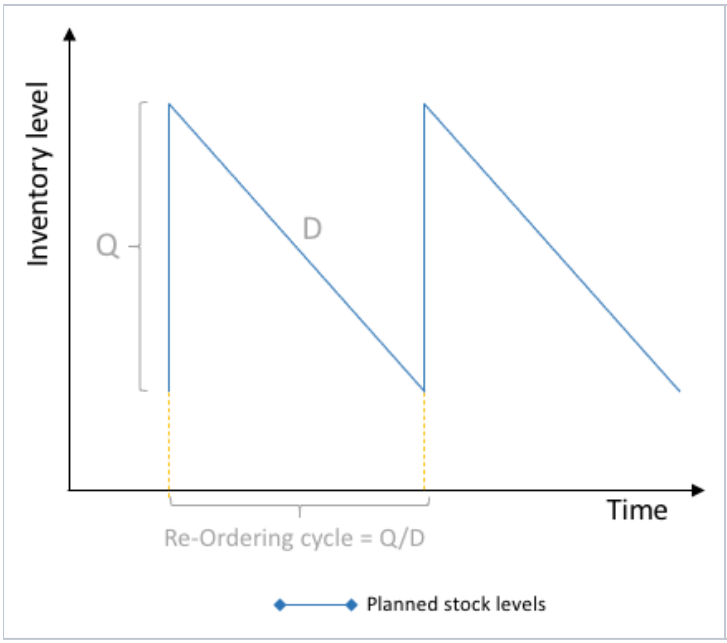
Systematic Orders

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 is to refill inventory as it stablishes working patterns and distributes the workload regularly throughout time. However, it 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 is the demand (D), the shorter will be re-ordering cycle.

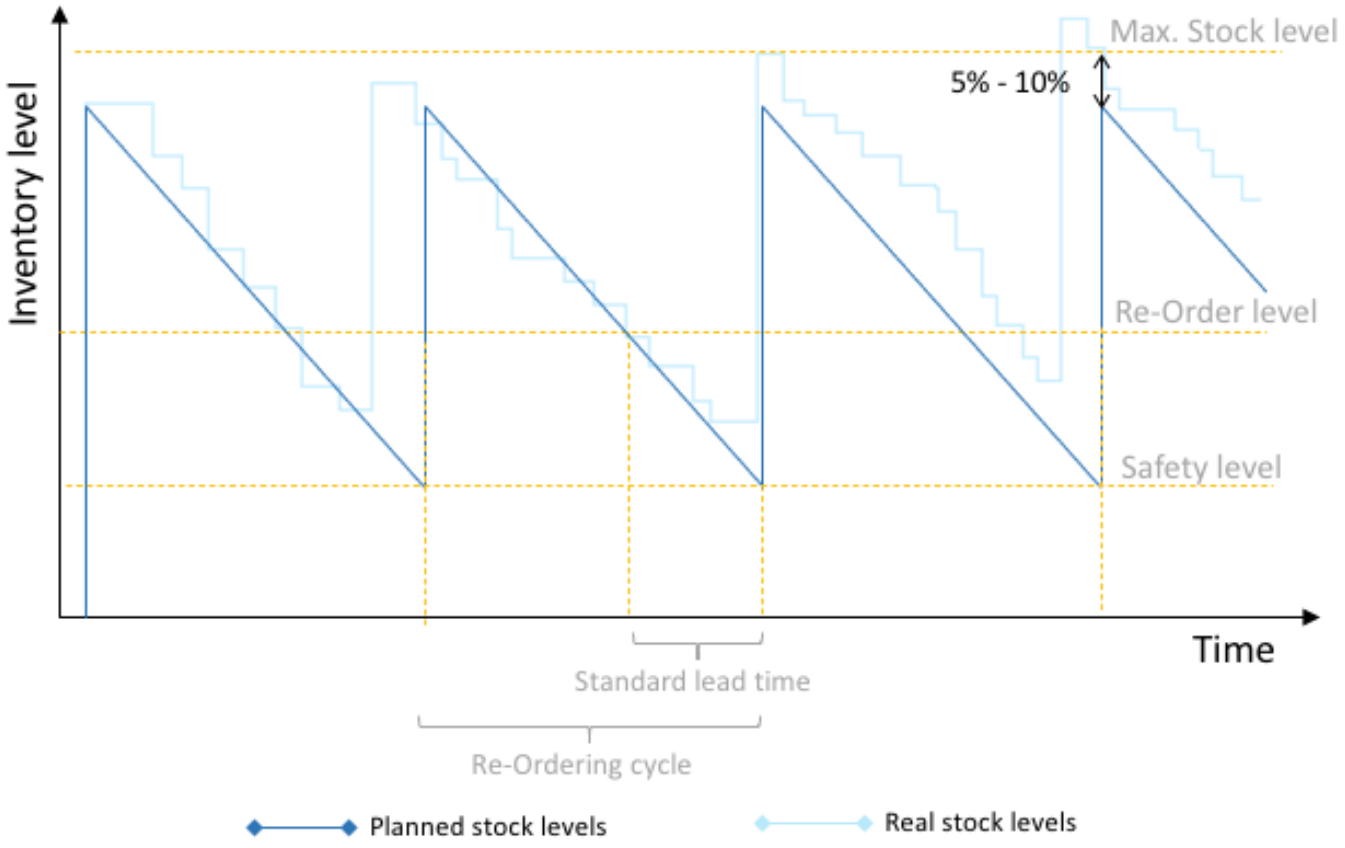


Re-Ordering Cycle =

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

- Lead time.
- Costs of reordering (C_R), including costs of labor 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 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 it is based in 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:

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

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

Consider that misalignments between expected inventory levels and real inventory levels for certain items may happen due to fluctuations on 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. Nevertheless, 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

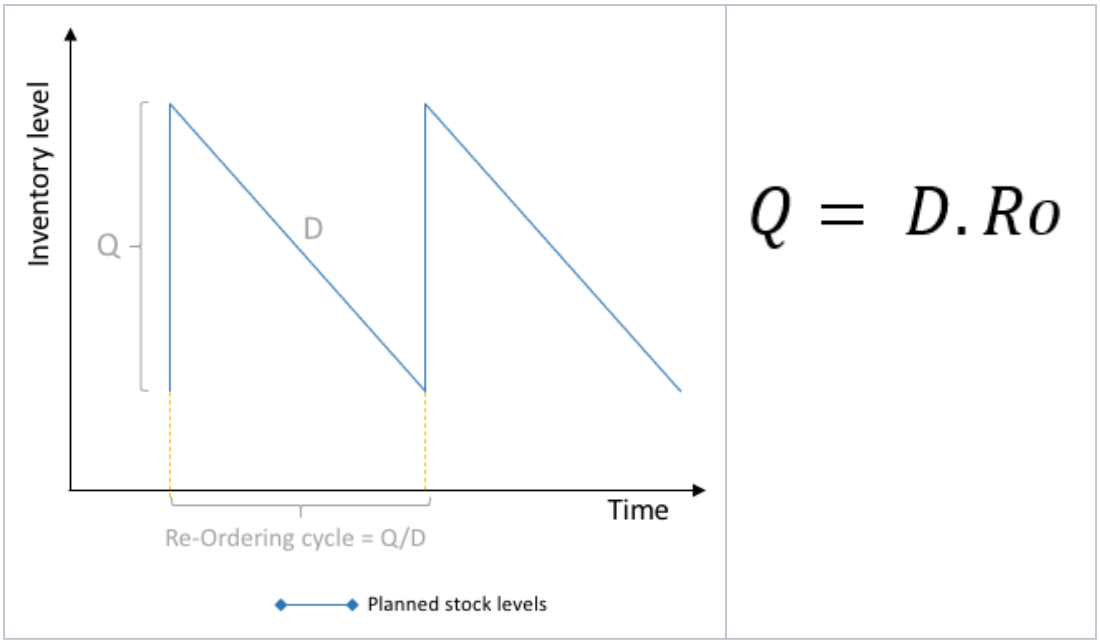
A second method to decide when to place an order for stock replenishment, consists of monitoring stock levels and placing orders whenever they reach the pre-established re-order level. This method is normally applied under pull supply chain strategies, or at the beginning of new programs when consumption 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 lower stock levels will determine the need to launch an order for a whole group of items, if required.

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

Calculating Order Quantities

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

$$Q = T.D + L_T.D - S - P$$

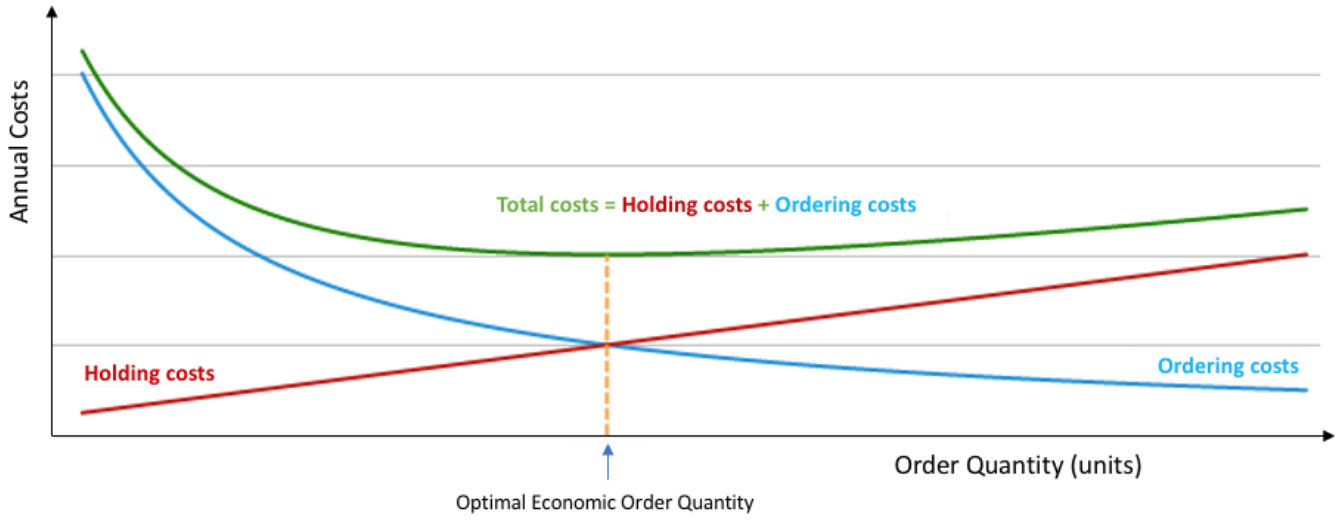
If preparing an order to be launched when inventory reaches the pre-established re-order level, the quantity to be ordered (Q) will be calculated in the same way but using the re-order level instead of the running stock level.

$$Q = T.D + L_T.D - Ro - P$$

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

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

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 to order. This model is based in economic variables such as the ordering costs and the holding costs, and it conceives the optimal quantity as a balance between increased costs due to holding a lot of stock, versus 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:

$$\text{Optimal Economic Ordering Quantity} = \sqrt{\frac{2.D.C_R}{C_H}}$$

Several calculators are available online to make use of EOQ model.

Inventory Control

The basic purpose of the 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.

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

- 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 to support decision taking:

- Optimizing 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.

In addition, inventory control is essential for accountability, providing for instance, the value of the items kept in the store and reporting about the items unconsumed from a project close to concludion.

In summary, inventory control will provide value to the storage facility through optimized management and higher levels of satisfaction among customers and stakeholders as products and information can be available on demand.

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 to feed decision making.

Systematic Recording and Support Documentation

There are two main types of records that enable inventory control: those controlling stock movements and those controlling stock levels. Both types are related to each other as each stock movement affects the level of stock. Therefore, they 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 but 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. The training of the warehouse personnel is crucial in this sense.

Controlling stock levels

The basic purpose of the inventory control is to know, at any given moment, what supplies are in the warehouse. 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 is convenient to keep separated records for each donor. This will ease accountability and reporting processes, especially at the closure of the project.

Records of stock movement

All movements (in and out) should be duly recorded and backed by the corresponding documents certifying receipt or dispatch of supplies. In addition, all supplies should change hands only when the corresponding document has been signed by the next recipient link in the supply chain. All these documents 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 its origin. If the supplier or transporter does not provide the 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 Stock Release Order duly authorized should be provided. Without the stock release order, the storekeeper should not release any product. A delivery note should be prepared, duly signed by both parties (deliverer, receiver/transporter) and archived.

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 authorized. 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 kept properly archived within the warehouse premises.

Monitoring

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

- Stock levels, with an especial regard to:
    - Items reaching critical thresholds (like re-order or safety stock levels).
    - Items belonging to specific projects reaching to its end.
    - Items close to expire.
- Consumption patterns, and the length of time that inventory will last if current usage continues. With special attention to:
    - Items with high rotation.
    - Items which 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 management processes, consider monitoring the following information:

- Inventory turns - transactions (in and out) frequency, volume and value, identifying those items with higher turn-over. The value of the transactions can be compared to the average inventory value and to the required workload for its completion.
- Time to completion - Time from issue of instruction to completion of task (i.e., Time for dispatch preparation, considering the time lapse between the moment when the stock release is received and 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 (the “vital few”), which applied to inventory management is translated to: 80% of the movements are from 20% of the list of items. Identifying this 20% of “high-turn” items is vital for an optimal inventory management.

Physical Inventory

To ensure that records are consistent and aligned with the real stock situation, it is recommended to regularly reconcile stock records with actual physical counts. This process is also referred as "Physical inventory". The frequency may be determined by the number of stock movements, by the value or nature of the stored goods or by donor requirements for a specific project.

To optimize the efforts of controlling mechanisms, 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 day. This type of counting where parts of the stock 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.
- **On demand inventory of specific items:** For some specific reports or requests, particular items may have more regular counting.
- **Inventory by sample:** Random spot checks usually performed by request of audit or management.

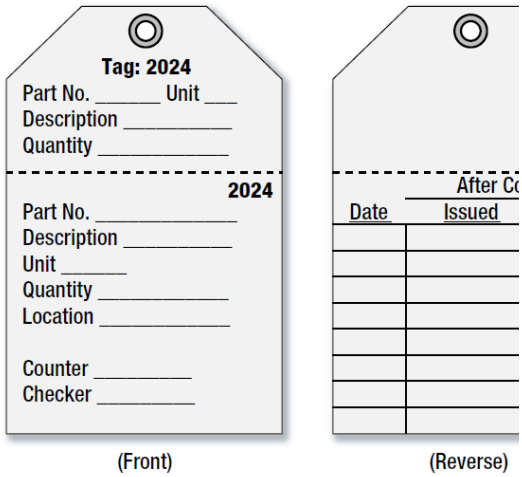
Physical inventory requires a stationary stock, meaning that no movement should be performed for those items under scrutiny.

When general physical inventory happens, the warehouse should be locked down during the whole 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. Humanitarian agencies should consider their storage setups when planning a stock count system. In such events, it is recommended to inform in advance to all potential requesters, so they can place forward their requests. In order to mitigate the chance of human mistakes and bias, it is recommended that two separate teams count the same set of items without any information exchange. Some agencies prefer to have an appointed person to oversee or manage the counting teams. Agencies may also choose to employ the “stock tag” system to facilitate counting.

Inventory Sheet

PO	Description	Position	Quantity

Stock Tags



(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 organization, 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 team 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 place where 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.

The frequency and number of inaccuracies should be regularly monitored. Any stock discrepancy should be reported and analyzed and corrective actions should be taken to reduce the risk of further inaccuracies. In case that the real amount is less than the amount in the records, a loss report should be completed.

Reporting

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

There are two types of report:

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

Regular reports are produced in meaningful time intervals, normally: weekly, monthly, quarterly or yearly. They contribute to general program management, to follow up a specific inventory and to feed supply chain strategic decisions, improving inventory related working processes and updating forecasting figures and critical stock thresholds.

The intervals for the reports can be set based on the turn-over of the articles and/or the location of the storage facility. As an example, the reports from the storage of a health facility running a nutritional program with weekly receptions and daily deliveries of ready-to-use therapeutic food, can be established 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: period opening and closing stock level, average consumption during the period, total receptions 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 and thus, 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

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

In addition to regular reports, the storekeeper 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 loss, damaged or spoiled. In such cases, a loss report should be completed.
- A stock discrepancy (positive or negative) is identified.
- A project is reaching to its end. This should be done according to donor regulations.

There should be considered the ability to produce management reports on stocks per project.

Data management

Reliable, up to date and accessible information is of key importance 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.

The basic information to be recorded and kept updated is mentioned in the previous section systematic recording and keeping support documentation.

Formats: Physical or Electronic

The means to store and manage stock data can be physical (hard) or electronic (digital). According to the needs, both means can be combined and used to compliment 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 formats can be set immediately, always accompanied by a basic training. Digital formats can take longer timeframes depending on the operational environment and the organizational culture and preparation on the matter.
- **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, the staff will be interested 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 should improve data reliability and access to information, enhance working processes making them more efficient, optimize the use of space avoiding the storage of big volume of archives, and increase the safety of the data and easing its recovery if needed. Also, digitizing the records will reduce the use of paper and other stationary.

Digital records, similarly to physical archiving, must 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 the search for a specific file or group of files. Furthermore, the people accessing the data and how they use it must also be convened and controlled.

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

Physical records require proper format and labelling, ideally in a standardized manner. A suitable location, secure and accessible, should be designated within the storage facility to keep hard files under use. Files from past periods should be kept aside in a secure place. The period to be covered by the running folders 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 organization 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. Files requiring frequent access and update such as stock cards are recommended in carton or heavy paper.

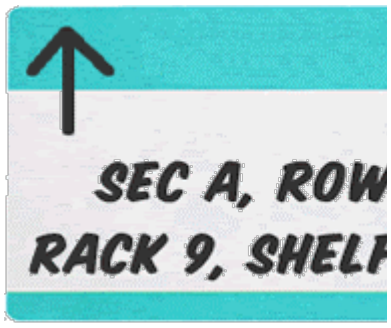
Using physical data management formats will require frequent consolidation of stock records information into a system / excel spreadsheet. A daily or weekly consolidation is advised rather than making it monthly. More frequent consolidation will improve data backup, will provide faster access to information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

Coding

Whatever is the format for inventory data management, physical or digital, a coding system should be in place to ease information flow. Standardized codes and labels serve as a shorthand, or abbreviated item description. The use of codes should speed references to stored articles, files and entities of interest such as locations, providers, clients, donors, etc. In addition, a proper coding system should 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 Labeling/Coding				Shelf Labeling/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-organized set of descriptions per inventory function should be designed and agreed, 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 and unambiguous, and harmonization with other departments and other supply chain units within the organization or key partners should be contemplated. 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. In addition, the staff should be trained to know how to follow them, making the way inventory is handled and records are kept consistent.

Coordination

Inventory management can be central for timely implementation of humanitarian relief operations. For a successful and valuable stock keeping, inventory activities must be synchronized with other activities from stakeholders external to the storage facility: suppliers, transporters, clients, other departments, etc. 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, consumptions 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. This 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-orde*r*.

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

Potential spikes or steady increases or reductions of demand should also be prevented. 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 granted during beginning or ending of projects. Particular donor requirements related to stock keeping must be communicated, with especial attention to specific reporting mechanisms and dealing with remaining stock.