

# Commodity Management Enhancement Project

*Food Aid Logistics Operational Handbook*

---

Written by [Harlan Hale](#). Edited by Walter Franciscovich. July, 1999

---

© CARE USA.1999  
Information Systems Development  
All rights reserved.

# Introduction

Food aid programs can be developed for a variety of reasons and with a variety of goals and objectives. Food aid can be given freely to people selected based upon need and food insecurity. Food aid can be used as an incentive to promote maternal and child health. Food aid can be used as salary payments to communities working on infrastructure or some other common project. Food aid can be injected into markets to address supply and price imbalances. Regardless of the type of food aid program and the goals to be achieved, the logistics required to manage and deliver food aid to project sites is largely the same and shares the *common goal of delivering the right goods to the right place at the right time in the right condition and for the right cost.*

The information contained in this handbook is designed to provide logistics managers and NGO program staff with basic information and guidance in planning and establishing a supply chain to deliver food aid. There is no "one right answer" to any logistics operation; there are options and combinations of options that must be examined and evaluated. This handbook should assist logistics managers in this task.

This handbook is intended to complement manuals, guidelines, and handbooks already developed and available to most PVO/NGO managers of food aid. There are detailed manuals on proper storage practices for food aid and guidelines for documenting, accounting for, and reporting on food aid utilization. Many of these can be obtained through the offices of food aid donors (USAID, the European Union, etc.), through the World Food Program, through Food Aid Management's (FAM) resource center, and through individual PVO/NGO offices. The focus of this handbook is logistics. Its purpose is to provide food aid managers with an understanding of logistical issues, challenges and options involved in *supply chain management* decision making.

**There are eight major steps that logistics managers and staff must go through when designing and establishing an in-country supply chain. These steps are as follows:**

- [STEP 1: Determine Delivery Requirements to the Distribution Site](#)
- [STEP 2: Select the Distribution Site](#)
- [STEP 3: Understanding the Supply Chain](#)
- [STEP 4: Determine the Practicality and Extent of using a Freight Forwarder](#)
- [STEP 5: Determine the Type and Amount of Transport required throughout the Supply Chain](#)
- [STEP 6: Determine the Location and Type of Storage Required along the Supply Chain](#)
- [STEP 7: Determine the requirements for Loading, Unloading, and Handling of the Food Aid](#)
- [STEP 8: Determine the Costs for Transport, Storage, and Handling along the Supply Chain](#)



## STEP 1: Determine Delivery Requirements to the Distribution Site

The first step in designing and managing the logistics network is to determine the quantity and type of food aid that must be available for distribution at a given time. There are three key elements to determining this: the ration scale for each commodity (expressed in grams per person per day); the number of planned recipients (expressed in individuals or in households, depending on the unit of distribution); and the length of time the ration must cover (expressed in days).

For example, a per person ration scale designed to provide a full ration of essential commodities might look like this:

Cereal	400 grams per person per day
Pulses	60 grams per person per day
Oil	25 grams per person per day
CSB	50 grams per person per day
Salt	5 grams per person per day

As such distribution point serving 1000 people with a cereal ration of 400 grams/person/day for one month (30 days) would require 12 metric tons of cereals to be available on distribution day:

$$1000 \text{ people} \times 400 \text{ grams} \times 30 \text{ days} = 12,000,000 \text{ grams or } 12,000 \text{ kgs. or } 12 \text{ metric tons}$$

Similarly, quantities for other commodities in the food basket (pulses, oil, etc.) are calculated resulting in the total quantity and type (the right goods) required for the distribution.

Pulses	1000 people X 60 grams X 30 days = 1,800,000 grams or 1,800 kgs. or 1.8 metric tons
Oil	1000 people X 25 grams X 30 days = 750,000 grams or 750 kgs. or 0.75 metric tons
CSB	1000 people X 50 grams X 30 days = 1,500,000 grams or 1,500 kgs. or 1.5 metric tons
Salt	1000 people X 5 grams X 30 days = 150,000 grams or 150 kgs. or 0.15 metric tons

This results in a total monthly tonnage requirements of 16.2 metric tons, including the cereal requirement. As such, this amount of the above commodities in the right proportions must be available at the distribution site to effect a monthly distribution. NB: It is generally recommended that a monthly ration be the largest ration size distributed at any given time due to the volume/weight of commodities provided and the time between distributions. In many cases, distributions are done on a fortnightly (every two weeks or 15 days) or weekly basis.

## STEP 2: Select the Distribution Site

The Distribution Site is the physical location where people will gather to receive their food rations and the location must be selected with several factors in mind, including:

- **Accessibility to Deliveries** – the Distribution Site should be accessible to road trucks to enable the food aid to be delivered to the site without any additional handling and transport. The ideal distribution site will be close to, but not directly on a main road, and will have sufficient space for trucks to arrive, unload, and depart, without serious congestion and the possibility of accidents between vehicles and between vehicles and staff or recipients.
- **Accessibility to the Recipients** – the ideal site will be accessible to the intended recipients. There is a balance between setting up a few central distribution points where people will come from surrounding areas and setting up numerous distribution points close to communities and neighborhoods. It must be remembered that if the quantity of the ration and/or the distance the recipient must travel to receive it and return home is too great, then recipients may be forced to sell or barter some of their ration in exchange for transportation services. This unnecessarily reduces the amount of food aid for consumption or exchange.
- **Ability to Hold Recipients** – the distribution site must be large enough to contain the commodities and an area for distribution (distribution lines, bins, etc.), as well as the people waiting to receive their rations. It must be remembered that the number of people being served is not the same as the number of people actually present at the distribution site to receive the ration. Usually only one or two members of a household will be present to receive the ration on behalf of their households. One method of estimation is to use 1.5 people per the number of households as a base for planning (e.g. 300 households would be represented by 450 people on distribution day).
- **Crowd Control** – related to the ability to hold the receiving population, the ideal distribution site will facilitate crowd control. There should be adequate space to set up barrier fencing or rope markers to help direct people in an orderly manner. If possible access to shade, drinking water, and toilet facilities should be provided. If recipients are uncomfortable, hot, or otherwise become irritable, arguments among the waiting population could develop into full fledged riots, resulting in injuries to recipients and distribution staff alike, and certainly interrupting the flow of the distribution. Local authorities and community leaders must be charged with maintaining and enforcing crowd control. Choosing a site that facilitates crowd control will greatly reduce potential problems.
- **Infrastructure** – along with infrastructure like road access, shade, access to drinking water and sanitation facilities, the distribution site should be covered to prevent rain damage to commodities and provide shade for the people working in the distribution areas. The presence of fencing or other area/boundary markers, gates and entry/departure points to the distribution areas, and covered and secure space to store or accumulate the food aid at the distribution point prior to distribution should be available. If not available, the ability to install these should be a factor in selecting the site.

In many cases, schools, churches, hospitals or health posts can be used as distribution sites as they generally possess the accessibility and space required. They are also usually well known locations. It must be noted, however, that distribution activities should be planned and scheduled so as not to conflict with ongoing activities at these sites (weekend distributions at schools would be reasonable, but not Sunday distributions at churches). Field Warehouses may also serve as distribution points as well, provided they are close enough to the recipient population.

The distribution site has been identified (the right place) and a date for the distribution to occur has been appointed and communicated to the intended recipients (the right time). With these parameters set, the logistics manager can begin planning and organizing the necessary transportation, storage, and handling to ensure that distribution staff can serve their clients.

As the number of people increase and/or the number of distribution points increase, logistics capacity requirements will also increase. Time, perhaps the most precious commodity, however cannot be increased. As such, planning and scheduling are essential to effectively make use of the time provided to deliver food aid for distribution. The logistics manager will be faced with a variety of decisions, options, and trade-offs when planning and undertaking food aid deliveries.

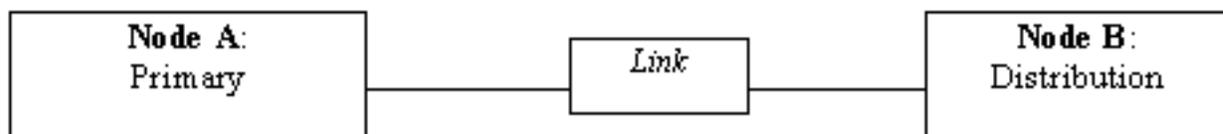


# STEP 3: Understanding the Supply Chain

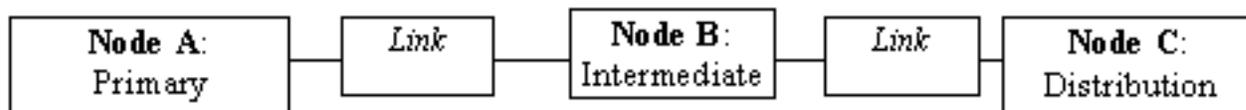
The overall goal of managing the in-country supply chain is to efficiently and effectively deliver goods to designated end-points for final distribution to the intended recipients. To do this, logistics managers must establish a supply chain, or logistics network, through which commodities will physically move from the primary storage point(s) to those end points. The complexity of the in-country supply chain will be determined by the logistics infrastructure available (roads, railroads, bridges, waterways, air fields, warehouses, etc.), the transport capacity available (trucks, trains, barges, air craft), budget, and the number of delivery destinations that must be served.

The supply chain is composed of two basic components: nodes and links. Nodes are points in the network where commodities are received, stored, and dispatched. Links are the transportation corridors connecting nodes on which the commodities will move (roads, rail tracks, waterways, and air corridors). At nodes, commodities may be received on one mode of transport (e.g. trucks) and transferred to another mode of transport (e.g. rail). They may be received and issued using the same mode of transport, but with different characteristics (e.g. received on large capacity trucks and dispatched on smaller trucks due to poorer road conditions or the need to deliver to multiple destinations). At each node in the supply chain, commodity receipt and dispatches must be documented and accounted for using an inventory accounting system.

In the simplest supply chain, commodities are dispatched from the primary warehouse at the point of reception and customs clearance directly to a distribution point(s), where they are distributed to the recipients.



A more complex supply chain may have an intermediary node where commodities are received, stored, and dispatched to a distribution point(s).



An even more complex supply chain may have more than one primary point of reception, several intermediary nodes and a multiplicity of distribution points. This is usually the case in large emergency relief programs covering a large geographic area.

To begin to understand the operating environment in which the supply chain will function, the following steps should be taken:

- **Get a Map and become familiar with the geography** – Maps are essential in planning for the distribution of food aid. Maps will:
  - indicate the location of roads, rail, air fields and river networks linking population centers
  - display the relative size of population centers, pointing to larger ones where logistics services may be more readily available
  - show the physical characteristics (rivers, mountains, elevation) that may impact on access
  - give an indication of distances between points (or nodes) within the country.
- **Talk to Knowledgeable People about Your Operations** – In any country, there will be people who have an extensive knowledge of the logistics and freight movement business and the operating and regulatory environment that exists. These may include:
  - government officials from the ministries of Commerce and Transport

- staff from major UN agencies such as WFP and UNHCR that have experience with in-country logistics
- other NGOs involved in food aid programs currently or in the recent past
- commercial sector enterprises such as large agro-businesses, mining companies, breweries and soft drink bottlers and distributors, consumer goods trading houses and distribution companies.
- **Visit Key Transportation Providers and Facilities** – From information gained by talking to knowledgeable people, make an initial familiarization visit to key transportation and storage providers and their facilities. This will provide a good impression of "the state of the art" in the country. These may include:
  - Ports and freight forwarders
  - companies involved in import/export and transit operations
  - storage companies
  - manufacturing firms
  - airports involved in cargo and air freight forwarding
  - the rail station and freight yards
  - road transport companies and places where for-hire trucks are stationed.

### ***The Role of a Logistics Manager***

Once this basic "homework" has been done, logistics managers and their staff can begin to piece together a supply chain by beginning to examine specific options with regard to transportation, storage, and handling. The following sections serve as a primer and introduction to some of the issues that logistics managers and staff will encounter when designing and operating the supply chain.

The role of the logistics manager is to establish and operate the supply chain such that distribution schedules are maintained and distribution personnel have a sufficient mix and quantity of commodities to distribute according to the program plan. To do this, the logistics manager must have a good understanding of the logistics infrastructure, capacities, and services available in the country that can be accessed and used to move commodities to distribution points.

Depending on the country and resources available, the logistics manager will be faced with a number of choices. Many of these choices involve the level of operational involvement that the PVO/NGO takes on directly relative to the level of operational involvement taken on by/through contracted service providers. Increasingly, PVOs/NGOs involved in food aid programs are opting to contract out a greater portion of the logistics function to contracted service providers, rather than undertake direct logistics operations themselves.

#### **Reasons for private contracting of logistics operations include:**

- Local service providers may have superior knowledge of logistics and transportation operations
- Using contracted service providers reduces the direct management load on the PVO/NGO; freeing staff to spend more time with the recipient community and other program responsibilities
- Contracting local resources helps to inject funds into the commercial local economy
- Using contractors can serve to reduce the NGO's direct liability for any commodity losses

In most, if not all instances, contracted service providers will be used at some point in the supply chain. Determining the degree and extent of this involvement is one of the tasks facing the logistics manager. The drawback is that the NGO does not have direct involvement in managing the commodities.



# STEP 4: Determine the Practicality and Extent of using a Freight Forwarder

A Freight Forwarder is a person/company that specializes in receiving goods and delivering them to a designated location/recipient. To do this, freight forwarders use their knowledge of and relationships with transport and storage resources and providers, local rules, regulations, business norms, communications, logistical, and management infrastructure in the operational areas.

Often, freight forwarders manage the international importation, receipt and clearance of shipments as well. Freight forwarders many also serve as steamship agents in the local ports of entry and/or as clearing agents, working with shippers and receivers to clear goods through customs. As such, freight forwarders may:

- own and/or operate bonded warehouses in international entry points
- serve as agents for international cargo survey companies
- own and operate trucking capacity
- book and load rail and coastal shipping
- undertake fumigation and inspection services for food commodities
- and a wide variety of other services related to the receipt, storage, and delivery of shipments in the country.

If the Freight Forwarder does not provide these services directly, s/he probably knows who can and has sub-contracted them to do so on behalf of his/her clients in the past. Finding a good freight forwarder can simplify the life of the PVO/NGO logistics manager greatly. In some cases, the PVO/NGO logistics manager may be able to contract a Freight Forwarder to undertake all aspects of in-country logistics from receipt from the port to delivery to designated distribution points. Discussions with other NGOs and UN agencies, as well as with large commercial businesses and local government counterparts can serve to indicate whether any freight forwarders exist and whether they are reliable enough to be entrusted with the job of managing the supply chain; as well as credible enough to assume the liability for the food aid resources placed under their care.

Freight Forwarders are usually located in the capital city with offices in the major ports and economic centers of the country. In general, a NGO will have worked with one or more freight forwarders in the past, if only for receipt of staff personal effects shipments. These forwarders may be able to indicate other forwarders located throughout the country.

## **The following questions should be asked when evaluating potential forwarders:**

- Where are your offices/agencies located throughout the country? (This will give you an idea of the forwarder's range of operations and knowledge of the "interior" of the country.)
- What services do you offer clients as a matter of course: 1) cargo reception and clearance through the port and customs?; 2) container handling, transport, and stripping; 3) temporary/transit storage; 4) freight consolidation and dispatch; 5) organizing onward transport from the point of reception; and/or 6) delivery to receiver's warehouse. Can any additional services be provided (e.g. independent survey, fitness inspections, and cargo salvage/reconstitution)?
- What receipt/delivery capacity do you have: 1) own warehouses or have to hire/sub-contract? What capacity in tons?; 2) own transport capacity or have to hire/sub-contract? How much trucking capacity can be provided? Container transport? 4-wheel Drive Trucks?

#### Step 4

- What kinds of routine reporting can be provided (reception reports, stock balances, delivery reports) and how often can these be produced. How are commodity status and final reports produced and verified?
- What is the method used for invoicing clients for services provided?
- Is the forwarder prepared to accept full liability for all commodities while under their care? How will losses of cargo during transport and storage be verified? How will the NGO be compensated for any cargo lost?

Obtaining a list of forwarding agents in the country and an idea of the services offered by each one can not only provide the logistics manager with valuable information but can aid in determining whether the use of a commercial freight forwarder is feasible/advisable.

If preliminary research shows that one or more reliable freight forwarders exist, the logistics manager then must decide:

- the point at which the commodities are entrusted to the forwarder (e.g. upon customs clearance and delivery to the forwarders warehouse, upon customs clearance and delivery into the forwarders trucks at the port warehouse, etc.)
- the point at which the forwarder delivers the commodities back to the NGO, or to a designated recipient (at inland storage hubs, at local warehouses, at distribution points)
- the types of services that need to be provided (e.g. primary/secondary storage, transportation, tallying and inspection, fumigation, salvage and reconstitution).

## ***Determining the Take-over and Delivery Points***

The responsibility for food aid commodities remains with the NGO from the point at which the goods are provided to the NGO (e.g. loaded on board vessel at country of origin) to the point at which the commodities are distributed to program recipients. At points along the supply chain, the NGO may delegate authority and transfer liability to third party contractors (e.g. freight forwarders, transporters, and warehousemen). It is essential to be clear as to the points where this authority/liability is transferred from one party to another and to the means by which this authority will be transferred.

**For example, imagine the in-country portion of the supply chain as comprising five segments:**

- **Segment 1: Port operations** – this link begins when the vessel docks and the cargo is transferred from the vessel up to the point where it is placed in a warehouse and cleared through customs formalities.
- **Segment 2: Primary Storage** – this link begins when the cargo has been cleared and is placed in the primary storage facility and ends when the cargo is delivered to an inland, regional hub and placed into secondary, intermediate storage.
- **Segment 3: Secondary Storage** – this link begins at the point of reception into intermediate storage and ends when the cargo is delivered to a local storage facility and ends when the cargo is delivered to local warehouses in the program area.
- **Segment 4: Local Storage** – this link begins when cargo is received in local storage sites and ends when cargo is delivered to distribution points.
- **Segment 5: Distribution Points** – this link begins when cargo is received at distribution points and ends when commodities are distributed to end-users.

The NGO has contracted a port clearing agency to manage Segment 1, coordinating and supervising the receipt of cargo from vessels, clearance through the customs procedures, and delivery to the primary storage facility. At that point, the liability for the cargo is transferred from the port clearing agent to the party authorized to manage Segment 2.

The NGO has contracted a Freight Forwarder to take delivery of commodities cleared through customs and the port and to deliver these to towns in the program area. As such, the forwarder is responsible for managing Segments 2 and 3. The NGO is responsible for providing the forwarder with delivery details (type and quantity of goods to be delivered to

each location, name of receiver at each location, time by when deliveries should be completed) and the freight Forwarder is responsible for carrying this out according to instructions. When goods are delivered to project offices in the town, liability is transferred from the freight forwarder to the receivers in those towns (e.g. NGO personnel, local counterparts, another local contractor, etc.)

The NGO works with local counterparts who are charged with receiving cargo in project areas, delivering it to distributions sites, and distributing it to project recipients (end-users). The local counterpart is charged with and assumes liability for Segments 4 and 5 in the chain.

In the above example there are three take-over points, where liability for the food aid passes from one entity to another. The first point is at the port where liability passes from the vessel to the Port Clearing agent (Segment 1). The second point is at the Primary warehouse where liability passes from the Clearing agent to the Freight Forwarder (Segment 2). The third point is in the local project offices (Segment 4) where liability passes from the Freight forwarder to the Local Counterpart.

It is quite possible that the Port and Clearing Agent that the NGO has chosen to handle reception of commodity shipments in the port and clearance through the Customs process may, in fact, be able to serve as the primary Freight Forwarder as well. If this is the case, then the contract for services with the freight agent would entail all those functions necessary for port reception and clearance, intermediate storage, and dispatch to inland locations as indicated by the NGO. In this case, a relatively seamless interface occurs between port operations and the first portion on inland forwarding, not unlike that of a through-bill of lading. The only difference is that the local NGO serves as the contract principle and is responsible for payment for services, rather than the steamship line as in the case of a through bill of lading. If this is the case in the example above, the forwarder would be in charge of segments 1 – 3 of the supply chain

The number of links in the supply chain may be as few or as many as required to deliver food aid to distribution points. The number of entities (contractors, counterparts, etc.) may also vary, depending on the size and complexity of the program, and on the ability of any one contractor to manage multiple segments. It is critical that the logistics manager clearly defines, documents and receives written agreement concerning responsibility and liability from all parties acting as agents on behalf of the NGO involved in the supply chain. Transfer of liability between parties must be well documented.

### *Services to be Provided*

#### **The following services may be requested from the Freight Forwarder:**

- **Provision of independent tally survey upon receipt of all goods** – the forwarder is required to hire an independent surveyor to verify all deliveries (quantity and condition) made to the forwarder
- **Salvage/Reconstitution of damaged goods** – the forwarder is required salvage any damaged cargo and to reconstitute/re-bag these into standard weight packages. A fitness inspection and certificate from qualified health inspectors may also be requested/required for any reconstituted commodities
- **Disposal of Unfit Commodities** – the forwarder may be requested to have any unfit commodities inspected and certified as such and then to dispose of them in accordance with established food aid norms and the outcome of the inspection report. Any funds derived from sale of unfit commodities for animal feed must be accounted for and the funds returned to the NGO.
- **Storage of Commodities** – the forwarder may be requested to store all food aid commodities in safe, clean, and secure warehouses and in separate stacks able to be physically counted by NGO personnel
- **Loading out of commodities** – the forwarder may be requested to load out commodities into carriers (trucks, rail cars, etc.) and to issue waybills for each carrier receiving commodities.
- **Provision of Transport** – the forwarder may be required to provide transport to deliver commodities to onward locations as indicated by instructions from the NGO.
- **Transshipment through intermediate points** – the forwarder may be required to transship commodities from one carrier to another at intermediate points in the supply chain. When doing this, the forwarder may be required to maintain accounts of receipts, issues, and balances at each of these points.

The key point to remember when entering discussions with freight forwarders is that they can provide, either directly or through sub-contracts, a wide variety of services associated with logistics and commodity deliveries, and the NGO must specify clearly which services the forwarder is to provide.

### **Case Example**

In one large multi-country drought relief program, freight forwarders were contracted to receive food aid at ports of entry and transport it to over 30 delivery points in 4 countries for 16 different NGOs. They did this using a combination of rail and road transport and by managing intermediate transit warehouses along the supply chain. The contracting organization was quoted a flat rate per ton and the forwarders were given strict time limits in which to deliver the food aid. All the decision-making and management was left to the forwarders, enabling each of the 16 NGOs to focus on distribution and community rehabilitation, rather than logistics.

In one country, a transport company was given a contract to receive transport commodities to inland destinations. As part of the contract, the transporter agreed to store the commodities at their facility in the main port of entry, thus eliminating the need for a separate storage contract and making coordination between warehouse and transporter easy, as they were one in the same. When transporters needed to load in a hurry, they were able to keep their facility working at night.

### ***Preparing a Tender for Freight Forwarding Services***

Most NGOs have established procedures for awarding contracts, whether for procurement of goods or of services. Unless there is only one qualified freight forwarder from which to choose (or due to local regulations government counterparts require a specific forwarder to be used for humanitarian shipments), a forwarder will probably be chosen through a competitive tendering process due to the large sums of money involved. As such, the logistics manager will be required to produce a tender offer and publish or make this available to all potential service providers for their consideration and response. The logistics manager should be familiar with internal tendering, bidding, and contract awarding procedures and norms to avoid any problems in the future, or impressions of less than open and transparent contract awards.

**In producing a tender for forwarding services the following information is essential, so that forwarders can accurately bid for the contract:**

- Type of goods and total tonnage to be handled
- Break-down of tonnage by delivery location
- Time-frame required to complete each delivery
- Expected duration of the program
- Services to be provided (e.g. transportation, storage, handling)
- Reporting requirements (interim, final, status)
- Loss liability (very important)
- Currency to be used
- Terms of Payment
- Method of Presentation of Bid

It is useful to provide potential bidders uniform guidance on presentation of their bids. This will not only assist bidders in preparing quotations, but will enable the logistics manager to compare bids more easily and select the most appropriate offer. Ask the bidders to provide quotations as a "cost per ton delivered, inclusive of all services required" per destination; or ask bidders to provide costs for each type of service to be provided (transportation – by mode and origin/destination, storage – by location and/or duration, handling – by location and/or type of

The logistics manager must follow roughly the same procedure for all segments in the in-country supply chain – from initial reception down to final distribution – such that a party or parties is charged with management and custody of the food aid commodities at all times. Liability for the food aid must be clearly defined and transferred from one party to another as food aid moves through the supply chain.

### ***Forwarding and Contracting Tips***

- Look for local contractors to provide transportation, storage, and handling services before trying to do it yourself. It lightens your management load, supports local industry, and transfers liability.
- Check references and ask for names of previous clients before awarding contracts. Ask them about their experiences with the specific contractor.
- In all contracts, make sure that all service providers accept liability for 100 percent of the commodities entrusted to them. Contracts can call for service providers to reimburse the cost of lost commodities or replace losses with commodities purchased on the local market.
- Require contractors to provide regular status reports and final reconciliation for all commodity movements. Require that they use your reference number on their reports to facilitate your own reporting and verification.
- Keep your own inventory records based on forwarders reports and use these in cross-checking reports and making sure that deliveries are completed in full.
- Make sure contractors' payments are only made to the account specified in the contract. Any changes to any terms in the contract should be in writing and signed by the contractor and you. Accept no verbal changes or subordinate's directives, unless accompanied by a written request/instruction.
- Hold regular meetings with all contractors to discuss operations and resolve any problems. Good communications between contracting parties can serve to resolve or eliminate problems amicably.

### ***Transportation Options***

Transportation corridors (roads, rail lines, navigable waterways, and air corridors) represent the links in the supply chain, linking nodes where food aid commodities are stored. In constructing a supply chain, it is necessary to review all transportation options and select those that are the most cost effective, reliable, and that will serve to move food commodities through the supply chain to distribution points to meet program goals and objectives. In most cases, transportation costs represent the single largest cost category in operating the supply chain, and as such options should be considered and decisions made on the basis of good information.

### ***Transport Brokers***

Transport Brokers are people or companies that can provide transport services to NGOs. A Transport Broker contracts to provide transport capacity to meet clients' delivery requirements. Transport brokerage may be part of the services provided by a Freight Forwarder, or it may be a service provided by a Common Carrier trucking company. The Transport Broker may own and operate a fleet of cargo trucks, but more importantly may be able to sub-contract additional trucking capacity from the transport market of smaller firms, owner-operators, and other trucking services available.

**The advantages to the NGO logistics manager of using a Transport Broker are as follows:**

- a single point of contact for all trucking/transport needs
- a single contractor for transport services
- knowledge of the local trucking market and service providers
- knowledge of pricing norms
- ability to assume liability for any losses

The brokerage function may be essential to assemble adequate transport capacity within the market to be able to meet the needs of the food aid program. In many cases, one single trucking company of sufficient size to meet food transport requirements may not be present, but through a system of sub-contracts and service agreements, a fleet with enough transport capacity can be assembled from smaller transport companies and owner-operators. If transport brokers, per se, do not exist, this function can be undertaken by one of the larger trucking companies that is willing/able to assume liability for providing safe and secure transport services. Merchants and large commercial trading houses may also be able to provide this service to NGO logistics managers under contract.

# STEP 5: Determine the Type and Amount of Transport required throughout the Supply Chain

There are four principle modes of transportation that can be used in delivering food commodities: road transport, rail transport, air transport, and maritime transport (coastal, inter-island, river). The amount of tonnage that can be transported, the speed at which that happens, and the cost per ton for transportation are all interrelated and should be kept in mind when making decisions on which mode(s) to select. The relationships are as follows:

<u>Mode</u>	<u>Tons per Trip</u>	<u>Cost per ton</u>	<u>Speed</u>
Maritime	Most	Least	Slowest
Rail	Decreasing	Increasing	Increasing
Road	Decreasing	Increasing	Increasing
Air	Least	Most	Fastest

Selecting the most appropriate type of transport for any one link in the supply chain will depend on 1) the location of the nodes in the supply chain (distance between nodes and geography/topography of the terrain) and 2) the types of transport services and capacities present. A review of current transport services will indicate which modes of transport are possible. Those modes determined as most feasible will then need to be reviewed to determine the availability of capacity for hire and the presence of service providers that can be contracted to transport food commodities.

## *Road Capacity and Services*

Within each country, there is a network of primary and secondary roads. By consulting a good map and the national Ministry of Transport and/or Department of Road Transport, some indication of the extent of the country's road network can be determined.

Information should be collected and maintained on the following:

- **Distances.** From main and secondary ports of entry to hinterland regions, primary inland population centers, and distribution sites in the program area.
- **Road Composition.** Are the primary roads in good condition and considered "all-weather"? Are the secondary roads considered all-weather? Are there any times of the year when road access along a specific corridor is reduced or eliminated due to bad weather? Are specialized road trucks required for any specific road corridors, i.e. four-wheel drive, small capacity. What is the maximum size cargo truck that can safely operate on each road corridor?
- **Turn-around Times.** How long does it take to go by road truck from the main and secondary ports to hinterland regions and inland population centers? (Turn-around times are generally a reflection of Distance and Road Composition)
- **Bottle-necks.** Are there points along the road system where bridges and/or ferries are present/required. If so, what size/weight of truck and cargo can they accommodate? Are these crossing points ever closed by flooding? If so, what are the alternate access routes to the other side?

Once it has been determined that road access exists and road transport can be used to deliver food commodities along any one link or segment of the supply chain a review of existing road transport companies and/or capacities should be made.

These should include common carriers, contract carriers, and private carriers.

- **Common Carriers** are those transporters who are engaged in the business of cargo transport. In many countries, there is a mix of large to medium sized trucking companies, either privately owned or state-owned; and single truck owner-operators. A list should be maintained of the trucking companies along with information on where to locate and how to contract the owner-operators. Usually there are several places where these truckers congregate to wait for clients.
- **Contract carriers** are those fleets owned by a particular company which serve the transport requirements of that company, such as trucks owned by logging companies, mining companies, or agro-business concerns. These trucks are often only occupied in one direction, i.e. from the mine to the port, and can be contracted to transport relief items on the back-haul portion of their trips. Contract carriers often have lower rates, as the trucks would have to return any way, although they may not be willing to go where needed in an emergency, unless it is close to their base of operations. A list of major industry and economic enterprises operating their own fleets should be part of the review.
- **Private carriers** are those road transporters which only haul for a specific purpose and company. NGO-owned fleets and the local military would be classed in this category, as would truck fleets of utility companies or construction firms. These fleets are normally not in the business of carrying others' cargo, but could be utilized during an emergency or disaster situation.

### *Local, Short-Haul, and Long-Haul Road Transport*

Road transport will always be required in any food aid supply chain, to one degree or another. There are three basic categories of road transport, defined largely by the distance to be covered and the number of trips possible in a given time period.

- **Local Transportation** can be defined as road transport required to move food aid within a localized area. At nodes within the system, it may be necessary to move food aid from ports, airports, and/or rail stations to storage facilities and from storage facilities back out to ports, airports, and/or rail stations for onward transport. The distances between these points is generally short, and trucks may be able to load, travel, arrive, and unload in a few hours; and be able to return to make several trips in a working day. This type of transport is especially required when food aid is transferred from one mode of transport to another. Given the frequency of deliveries to any one node in the supply chain, there may be a steady requirement for local road transport to receive and position food aid. In these cases, the logistics manager may consider leasing some trucking capacity on a time-charter basis (i.e. leasing a truck and driver for a flat monthly rate, as opposed to paying on a per trip or per ton basis) such that there is a constant supply of transport capacity available when needed.
- **Short-haul transportation** can be defined as transportation required to deliver commodities from a node to other destinations in a relatively close proximity, such that a truck can load, travel, unload, and return on the same day. This is largely the type of transportation requirement at nodes furthest down the supply chain, such as at field warehouses serving refugee camps, or those nodes food aid is dispatched directly to distribution points. Depending on the number of distribution points to be served and/or the amount of food required to be delivered, short haul transport may be required on a continuous basis, or it may be required only at certain times during the working month (e.g. to pre-position food prior to distribution). If short-haul requirements are fairly constant and uniform, then logistics managers may want to consider leasing transport capacity on a time-charter basis. If there are times when short-haul transport is not required, then trip-charter should be considered to avoid paying for trucks that might remain idle for extended periods of time.
- **Long-haul transportation** can be defined as transportation required to deliver cargoes between greater distances and where the turn-around time (the time required to load, deliver, and return) is greater than one day, requiring trucks to over-night during the trip. This is largely the type of transport required to move food aid commodities between nodes in the supply chain (e.g. from the primary warehouse to regional or intermediary warehouses). In most cases, it is advisable to contract this type of road transport on a trip-charter, where payment is usually based on tons transported over a given distance (e.g. \$0.10/ton/km) and the time required is not an explicit factor in the price calculation. Road conditions permitting, it is generally advisable to seek the largest capacity trucks available for long haul deliveries, such that more tonnage can be delivered over a given time period.

## Case Examples

In one food aid program, the decision was made to supplement the government-owned fleet of trucks with commercial-sector common carriers. This allowed for increased delivery capacity. Older trucks were targeted to handle local transportation requirements and other commercial trucks were tasked on routes that did not require convoys and security escorts. This allowed the government-owned trucks to operate on the high-risk routes where the potential for loss due to rebel attacks was greater.

In another food aid program, trucks owned and operated by a coal mining company were brought coal down to the main port city for use in the power plants and railroads. These trucks were often contracted to back-haul food aid at a very reduced rate, given that they normally returned empty. Logistics staff checked the trucks to make sure they were clean prior to loading food aid.

In one emergency program, an NGO assembled a fleet of trucks to support repatriation and food aid activities by leasing several trucks for periods ranging from two weeks to one month. These trucks, along with their drivers, were under the direct tasking control of the NGO, who made them available to transport food aid, assist in moving people, and transporting materials and equipment to areas of return. Some trucks were even fitted with water bladders and used to transport water to transit camps and other areas along the repatriation route. These trucks provided a service to many NGOs, some of whom had food and relief supplies but lack the means to deliver them.

## Fuel Supplies and Services

The supply of fuel to support any logistics operation is critical and should be considered by the logistics manager. Besides the requirements for road transport, generators and cold-chains also require fuel. A review of fuel distribution and supply points should be undertaken when developing the supply chain. In cases where road transportation is contracted on a trip-charter basis or through a transport broker, providing fuel to trucks will be the responsibility of the transport provider and included as part of the cost of transport. When leasing trucks on a time-charter basis, however, it is generally the responsibility of the leasee (the NGO) to provide fuel for trucks in accordance with the amount of work and/or distances required to travel. In many cases, import and a government department manages supply of fuel, and as such, information should be available from this department as to the location of retail outlets and the cost of fuel in general. Where fuel provision is in private hands, there are usually a limited number of companies involved (e.g. BP, Shell, Caltex, Agip).

The following information should be collected and maintained:

- **Location of Fuel importation points.** A list of all ports where bulk fuel enters the country, giving information on how fuel is stored and how it is transported from the entry port.
- **Location of any refineries in the country.** A list of fuel refineries, their locations, and the areas which they serve.
- **Location of bulk storage facilities.** A list of any tank farms located in the country and their storage capacities. Are fuel stock-piles maintained, and where? Can bulk fuel purchases be undertaken and drawn from these facilities over time?
- **In-country distribution of fuel.** An understanding of how fuel is distributed around the country (road tanker, rail tankers, pipe-lines) and delivered to filling stations or other retail outlets.
- **Fuel Storage.** A list of other large fuel users (e.g. large plantations, mines, factories) that may have large tanks and pumps for receiving, storing, and disbursing fuel. Are 200-litre drums readily available? Jerry-cans?

In most cases, the need for fuel for road transport can be met through the commercial market. The logistics manager should examine to potential for contracting for fuel supplies through a reputable commercial dealer/filing station. Authorized fuel vouchers can be used and a system developed whereby the fuel supplier submits an invoice for fuel taken, along with a detailed accounting by date and vehicle. When negotiating this type of service arrangement, it is advisable to

estimate the amount of fuel that will be needed over a given period, so that the supplier can order stocks in sufficient quantity. A fixed price per liter should be included in the service contract, and given the quantity estimated, it may be possible to negotiate a volume discount below the normal retail price.

In only the most isolated cases/locations should logistics managers seek to develop their own private fuel depots and filling stations. This may, however, be required and technical assistance from local fuel suppliers should be sought to ensure compliance with local safety and environmental regulations. NGOs may, however, need to store small stocks of fuel for emergencies/contingencies in certain circumstances. Fuel is often considered a precious commodity and proper accounting and control systems should be put in place for its management.

### *Air Capacities and Service*

Air-lift operations are often the fastest means to deliver food commodities and emergency relief supplies to an area affected by disaster, especially if ground transport links (roads, bridges) have been affected by the disaster. Air-lift, however, is the most expensive means of transport on a cost-per-ton basis, and as such should only be considered under extreme conditions or as a last resort. Air-lift has been used a lot recently in emergencies resulting from civil wars, where ground access is impossible due to security constraints. The feasibility/viability of air transport to deliver food aid is constrained by two other factors, besides the cost – the infrastructure of airports and landing fields and the availability of air transport services and aircraft

A review of airports and airstrips should be undertaken by the logistics manager for 1) feasibility of use in normal operations and 2) possible use in the event of urgent deliveries or emergency evacuation. The local Ministry of Transport or the Office of Civil Aviation can often provide the information. Local air charter companies may also have this information.

The following information should be collected and maintained:

- **Location of airports/strips.** A list of all airports and airstrips in the program area and/or along the supply chain should be collected and maintained.
- **Condition of the landing areas.** The length and composition of each airstrip should be included. This will determine the type of aircraft that may be able to land.
- **Distance from the main airport** (cargo staging area) to each of the airstrips in terms of air miles and/or flight time. (flight time will vary per aircraft, but most air charter companies bill by flight hour).
- **Storage facilities, handling equipment,** fuel storage, and ground support at each airport. How effectively can an airlift be managed from/to each airport? Are transit sheds for cargo positioning available, or do containers and/or tarps have to be placed at the airport for this purpose. Are fork-lift and conveyors available to facilitate loading and/or discharge of aircraft? Is fuel provision to aircraft possible? What types of fuel supply systems are in use? Below-ground tanks? Tanker trucks? Hand pumps?

Along with a review of air transport infrastructure, the logistics manager will make a survey of available air charter companies that can be contracted to provide services. This can generally be accomplished by a visit to the main airport where most of these companies will have their offices. Along with phone and fax contact information and a contact person, the following information should be collected:

- Type and number of aircraft the company has at present.
- Cargo carrying capacity of each aircraft.
- Type of fuel required for each aircraft.
- Minimum landing strip requirements for each aircraft in terms of length and composition.
- Ability of the charter company to contract additional aircraft, if required.

It is generally best to work with local air charter companies in an emergency situation, as no registration problems will

occur, and the cost of positioning the aircraft is either avoided or greatly reduced.

Given the cost of operating an airlift, it is often the case that one agency will manage an airlift operation and make capacity available to other organizations as well. Operating efficiency must be sought to enable the maximum use of transport resources. Aircraft can usually load quickly, deliver, and return for another trip, or several trips, on the same day. As such, it is advisable to establish a transit storage capacity at the loading airport, with operating stock sufficient for 1-2 days available for dispatch. This will avoid any delays on the ground due to lack of cargo, should there be problems with local transport or access to warehouses. Likewise, at the destination air fields labor and space must be organized and available to quickly unload each aircraft and move the cargo from the parking apron to off-airport storage, so that aircraft can land, park, and unload with sufficient working space.

### ***Rail Capacities and Services***

Rail networks also represent a valuable logistics resource, especially for moving large quantities of relief supplies at low cost. If a rail system is present and operational, the logistics manager should review of system and services to determine whether rail can play a role in transportation of food aid.

Rail, is by nature, less flexible than road transport, given that trains can only operate where the tracks are. In general, rail cannot be the only delivery mode used and requires some transshipment on to road vehicles to complete final delivery. However, rail can play a role in delivering relief supplies on part of the route from origin to final destination.

Rail networks operating locally from the port to in-town warehouses can be used to receive cargo from vessels and deliver it to warehouses for onward forwarding by other transport modes. By using rail to receive cargo, trucking capacity is made available to handle distribution requirements. Rail networks operating in the hinterland can be used to position large quantities of supplies at inland hubs closer to the program area.

There are generally only a few railroad companies in any one country (in many cases it is a state-run monopoly). A visit to the railroad headquarters can serve to collect all necessary information. This, along with a map showing the extent of the rail network and indicating rail sidings and rail terminals will serve to have a reasonable picture of the rail system.

In reviewing the rail capacity, the following information should be collected:

- Does **local port-to-warehouse rail** capacity exist? If so, can vessels discharge directly into rail wagons?
- How many **locomotives are operating** on each line? What is the maximum number of cars/tonnage able to be transported per train? What is the frequency of train departures?
- What are **the primary and secondary rail destinations**? What is the transit time from origin to each of these destinations? Where are there bridges and/or tunnels that may be affected by a disaster?
- How are **wagons loaded/discharged**? What equipment is available to handle cargo? Can containers be loaded on, transported, and/or discharged on rail cars? Are transit sheds available at rail terminals for short-term storage of relief supplies?
- How are **wagons registered and tracked** to record delivery? Is security of cargo a factor? If so, what responsibility does the railroad take to safeguard client's cargo?

As with air transport, local road transport will often be required to deliver food commodities to the rail terminal for loading and to move commodities from the destination rail terminals back into storage. There is also additional handling required, which will have an impact on costs and potential for damage. These factors should be taken into account and will offset some of the cost savings from lower cost rail transport. Rail transport should be considered, especially in the beginning and middle of the supply chain where large quantities of food commodities can be moved between nodes.

### Case Example

In the southern African drought of the early 90s, rail transportation played a key role in moving food aid from the major ports in southern Africa to the landlocked countries in the interior. From rail yards all over the region, food commodities were then moved by trucks to final distribution points in a hub-and-spoke system. This proved to be lower cost and prevented congestion of food aid in the receiving ports.

### *Domestic Maritime Transport*

Depending on the geography of the country, domestic maritime transport (coastal, inter-island, river, and lake) may be a transportation option that can prove useful in the supply chain. Coastal shipping may provide an efficient option to transport large quantities of food aid from primary ports to secondary ports for further inland transport. In archipelago countries international ports of entry may not exist on all islands and food commodities may have to be

A review of domestic maritime transportation should be undertaken by the logistics manager to determine whether this provides an option in food aid transportation. A list of presently active commercial ports can be obtained from the local Ministry of Transport. Along with this information, some physical data on the port(s) capacity should be readily available. The following information should be collected and maintained as part of the review:

- **Location of each port** and the inland regions best served from it.
- The **number of berths** available at each port, and the maximum size of vessel that can be docked. Length of berth(s) and draft restrictions should be included.
- If direct vessel berthing is not possible, are **lighter services** available to transport food aid from vessels at anchor to the wharf/beach?
- Type of **cargo handling equipment** present at each port. How are vessels loaded and unloaded? Are there shore-based cranes? If so, what is the tonnage lift capacity? Is the port able to receive goods in shipping containers? If so, 20-foot and/or 40-foot containers?
- **Transit shed capacity** present at each port. Are there transit sheds for short-term storage? If so, what is the capacity?
- **Transport from the port.** Is there rail access to/from the port(s)? If so, does rail go along side vessels such that vessels can discharge directly into rail wagons for inland transport? If not, is direct ship-to-truck discharge possible?
- **Working hours** of the port(s). What are the working hours of the port? 24-hours? Daylight hours only? 7-days per week?
- **Lighting and security of the port?** Does the port have floodlights for night operations? Is the electricity supply to the port dependable? Is fencing and proper security present to control movement and access to the port area?

In countries where domestic maritime transport is an option, there may be a number of service providers from which to choose. There may be regular cargo and passenger service between islands or to islands from the mainland. There may be regular coastal vessel traffic bringing raw materials from the hinterland to major ports for export or to industrial areas for processing. A visit to the port and discussions with freight forwarders, merchants, and port officials will serve to indicate the types of maritime transport services existing. The following information should be collected from service providers:

- **Types of services available.** Are there cargo vessels that operate between ports? Passenger ferries? Do these operate on a regular schedule? Are these vessels available for trip charters? Can passenger ferries also carry cargo? Vehicles?
- What are the sizes/**carrying capacities of the vessels** operating between ports?
- Are there events that can **interrupt shipping services** between ports? Rain and storms? Tide fluctuations? How is the cargo stowed on board the vessel? What measures are taken to avoid damage during handling and transport?

- How is cargo **loaded and unloaded** from vessels? Ships tackle? Shore based cranes? Porters? What are the loading rates? How much cargo can be loaded in an 8-hour shift? How much cargo can be discharged at destination ports in an 8-hour day?

NGOs in the past have made creative use of domestic maritime transport. Besides larger, regular coastal ships, ferries, and barges, small fishing boats have also been used to carry food aid to remote locations located on the coast/shore/river bank. Should the characteristics of the country and program area allow for domestic maritime transport, it can provide an alternative to other transportation modes at an affordable cost.

### Case Example

In one food aid program, extensive use of coastal shipping served to transport food aid from primary ports where large international shipping could dock to secondary and tertiary ports along the extensive coastline using smaller vessels. In some cases, the vessels could not berth due to lack of docking facilities, and locally hired small boats were organized to provide lighter service from the vessel at anchor to the shore, where the food aid was received and transferred into warehouses.

In another food aid program, extensive use was made of riverboats to transport food aid to isolated villages accessible only by boat. Small fishing boats hired to transport food aid from the mainland warehouse also served populations living on offshore islands.

### *Alternative Transportation Options – Isolated locations*

In some cases, the final destination or distribution point may not be accessible via the four types of transport detailed above. Isolated mountain villages and communities off of primary or secondary roads may only be accessible to pedestrian traffic, horses or donkeys, or carts pulled by draft animals. When this is the case, it is often possible for a designated drop-off point to be indicated where food aid is delivered using "regular" transport. The recipient community then organizes and mobilizes local resources (people, pack animals, and carts) to come to the drop-off point, collect the food commodities, and deliver the food aid to the final distribution point. In the case of "pedestrian convoys" it may be necessary to break down heavy units into smaller units for ease of carriage. In these cases, extra empty bags should be made available and a count of the new "units" made.

### Documenting Transportation Movements

There is an expression "Freight moves on paper". Regardless of the mode of transportation used, each time food aid is loaded from a warehouse or staging area (port, airport, rail terminal) into a carrier (truck, plane, rail wagon, or vessel) it must be counted and a document issued transferring liability to the carrier. This is done through the issuance of transportation documents. In maritime transport, the primary document is called a Bill of Lading. In road transport it is called a Waybill. In air transport, it is called an Air Waybill. Rail transport may refer to a Consignment Note. These documents essentially serve the same purpose and will contain the same basic information. This includes the following:

- A document reference/tracking number
- A date of issuance
- The Transport Company
- The shipper (or owner of the cargo)
- The point of loading (origin)
- The consignee (or receiver of the cargo)
- The point of delivery (destination)
- The type of cargo being transported

## Step 5

- The type of packing used
- The unit weight of each package
- The number of packages
- The reference number for the carrier (plate number, aircraft registration, wagon number)

After loading, the responsible person (driver, pilot, etc.) will sign the document attesting to receipt of the cargo. Upon arrival at destination, the cargo will be counted again and the amount delivered will be listed on the document, along with the signature and name of the party receiving the cargo. Should there be any difference in the quantity or condition of the cargo upon receipt, the receiver must note this on the transport document. This will serve as the basis for any loss claims filed against the transporter. Without this notation, transporters are not liable for the loss that occurred.

### *Transportation Tips*

- Discourage the transport of people and their personal goods on the same trucks as are carrying your commodities. They may pilfer or inadvertently damage you commodities, and overloading can lead to breakdowns on route.
- Specify in Transport contracts that all food must be transported in a watertight manner, either inside covered trucks or covered with tarps. Make sure that all trucks leaving the storage area have tarps securely tied down.
- Specify in transport contracts that fuel and other hazardous material not be transported in the same area at the commodities, as this can lead to spills and contamination of the food.
- Inspect cargo beds of trucks before loading to insure that they are clean and in a condition that will not damage commodities in transit (i.e. no sharp edges or points that can rip or puncture packaging).
- Use older trucks or trucks in poorer condition for local and short-haul transportation and reserve more reliable trucks for long-haul trips. It is easier to rescue a broken down truck closer to the dispatching base than if it is far away.
- Even if security doesn't require it, encourage trucks to travel together in pairs, so that in the event of a problem, one truck can help the other.
- When more than one mode of transport is possible, look at using a mix of faster transport to get the program started and/or respond to increases in demand and slower, cheaper transport to maintain and replenish stock along the supply chain.
- When using air transportation, make every effort to work on opening up ground access to the area, as air transportation may be difficult and expensive to maintain.
- Consider rail transport to move commodities between intermediate hubs along the supply chain in a low cost way. While rail is slower than road transport, a train may be able to deliver more food aid over time due to its large capacity per trip.
- Review all return copies of waybills immediately upon receipt and take action on any discrepancy noted by the receiver. Don't wait too long to investigate and take corrective measure.

### *Storage*

Storage is a primary function at each node in the supply chain. Storage may be short-term transit storage (where commodities are received and expected to be dispatched to other nodes or distribution points within a relatively short period of time). It may be long-term to accumulate a working stock and a buffer stock (or safety stock) of food aid that can be used for long range planning and distribution, or as contingencies if additional food aid beyond earlier projections is required (e.g. should additional recipients be identified). Depending on the type of storage at any one node, the amount of storage capacity required will differ, with transit storage being generally smaller lots than long-term storage as commodities may move more quickly through a transit storage facility.



# STEP 6: Determine the Location and Type of Storage Required along the Supply Chain

One of the key factors to consider when developing storage capacity is the rate of flow of food aid through the node. If commodities are received and dispatched through a node at a fairly constant rate, then large quantities of stock will not accumulate and storage requirements will be minimal. If commodities are received at a faster rate, or in larger quantities, than can be dispatched from the node (such as at ports, where shiploads are received at one time, or at rail terminals where trains arrive with hundreds or thousands of tons per train), then storage requirements will increase. As such, storage requirements are linked to transportation and must be considered together when developing the supply chain. The logistics manager should review storage requirements at each node along the supply chain.

## Storage Capacities and Services

Food aid will require storage at some point(s) during their journey from origin to delivery to end user. It is important to have a good picture of storage facilities available in country when developing a supply chain. Storage facilities will, in all likelihood, be located at or near transport hubs and economic centers. In general, storage is required when relief supplies are transshipped from one transport mode (e.g. sea, rail) to another mode (e.g. road, air). Storage is also required at origin, when large quantities of relief supplies are delivered, and at final destination, while supplies are arriving and accumulating in quantities sufficient to undertake distribution. Ideally, storage should be located on or close to transport corridors and near the program area, to reduce transport distance and facilitate distribution.

A large variety of storage facilities may exist. Some freight forwarders operate large transit warehouses where cargoes are received, consolidated, and dispatched. These are generally located in the port cities and are often "bonded", meaning that goods not yet cleared through customs can be stored. Railroads often operate transit sheds to facilitate the loading and discharge of goods from rail wagons. Be cautioned, however, that a transit shed is not a warehouse. It is usually available for short-term storage only, and the charges are generally on a daily or weekly basis. Transit sheds can become very expensive if relief supplies remain in them for extended periods of time. As such, sufficient transportation, either local (to move cargo from transit sheds to longer term warehousing) or long- and short-haul (to move cargo to onward nodes or to distribution points) must be available when cargo arrives in a transit shed.

Agro-businesses and commercial distributors may also have warehousing capacity that can be made available to the food aid program. Agricultural warehouses may be located in a wider network, closer to the rural production areas, while commercial distributors generally locate their warehouses in urban and town centers. Besides these, public buildings, such as schools and churches, may be made available as storage sites for food aid during an emergency. The role of storage is to secure cargo in a safe location. As such, "temporary" storage can be created using tarpaulins, pallets, and fencing material, if no local alternative exists.

## Case Examples

In one food aid program in Southern Africa, extensive use of Freight Forwarders transit warehouses was made in one major port. This enabled commodities received by ship to be loaded directly into rail wagons and delivered to bonded transit warehouses outside the port area prior to clearance. It also enabled onward dispatch by rail to inland destinations.

In another food aid program, warehouses operated by a coffee company were used to store food aid during the growing season when these warehouses would have been empty or underutilized, providing revenue and employment for the coffee company in between peak periods.

In one large refugee camp, since no warehousing facilities previously existed, the UNHCR and WFP established sizable warehousing capacity using prefabricated and tent-type warehouses in sufficient number and size to store many months worth of food aid requirements. This allowed food distributions to occur during rainy seasons when road access was limited.

When reviewing storage options and requirements, the logistics manager should collect the following information:

- What companies/agencies operate storage facilities along the logistics network? Port(s)? Railroads? Agro-businesses? and/or Commercial Distributors? Are these facilities available for hire?
- Where are these storage facilities located? Are they accessible by rail, road, sea/river, or a combination?
- What is the storage capacity in terms of tonnage or square meters? How much of this is covered? Walled? Fenced?
- Is the storage facility electrified? Are lights present that would facilitate working at night? Is security present to safe-guard the warehouse and its contents?
- Is any specialized handling equipment available? Fork-lifts? Stacking Conveyors? Is equipment available to lift containers from/on to trucks?
- How many loading doors are available in each warehouse? How many trucks can be received/dispatched simultaneously?
- What labor is available at the storage facility? Is permanent warehouse management staff on-site? Can existing labor be increased through hiring of casual labor?

It is important to keep in mind that storage facilities, whether short-term transit sheds or long-term warehousing, must exist at each modal change point (i.e. where goods transfer from one mode of transport to another) and at the end points of the delivery network. Where local warehousing capacity is insufficient, a variety of prefabricated warehouses exist on the market and may represent storage options, when emergency response is expected to be long-term.

## *Warehousing Service Providers*

In some cases, warehousing service providers exist. These companies own and operate warehouses and storage facilities for the general public and can be contracted to receive, store, and load out food aid commodities. In general, these companies will have:

- A number of sheds in one location with sufficient capacity
- A fenced, lighted, and secured compound
- Trained, experienced management and supervisory staff
- Sufficient handling capability to receive and dispatch food aid (people and equipment)
- Multiple warehouse doors so that simultaneous loading in/out can occur

- Good drainage to prevent flooding
- Loading docks to facilitate loading/unloading of trucks/rail wagons
- Knowledge of safe storage procedures (stacking, rodent control, fumigation)
- Inventory accounting and control systems
- Knowledge of salvage and repackaging/reconstitution procedures
- Good access to transportation corridors
- Accept liability for any losses in storage

When possible, NGOs should seek to contract for warehouse services, as this will reduce the management load on the NGO logistics staff. When contracting for warehousing services, it is important for the NGO to work closely with the service provider to make sure that proper storage, and accounting procedures are implemented particular to the nature of food aid. For example, keeping shipments in separate stacks, providing detailed loss/reconstitution reports, and stacking in a manner to permit periodic physical inventories to be taken. The NGO may want to provide the warehouse service provider with the stock control and reporting formats to use to facilitate cross checks and donor reporting. Warehouse service providers may charge based on an average quantity stored over a stated time period (X-amount per ton per week/month); on throughput (i.e. the quantity received and issued through the facility) or a combination of the two.

It is also possible that the NGO may decide to lease a warehouse facility and contract a service provider to operate it on a day-to-day basis. Likewise, the NGO may decide to erect pre-fabricated warehouses, but be able to contract a professional company to operate the warehouses, rather than staff and operate them using NGO personnel. This has an advantage in that in any of these contracts, the service provider will be liable for any commodities lost in storage.

### ***NGO-operated Warehouses***

If warehouse service providers do not exist, the logistics manager may find it necessary to secure and operate warehouses using NGO personnel. This may especially be the case further down the supply chain in rural area or locations where economic activity is limited. There are several good manuals and guidebooks available from the World food Program and from NGOs that provide guidance on warehouse management and commodity storage. Likewise, there are guidebooks on establishing inventory accounting systems that are available within the NGO community. These manuals should be consulted as they provide guidance and tips on stacking, warehouse maintenance, and warehouse operations. The capacities, services, and characteristics for warehouse service providers, detailed above will have to be established by the NGO. It must be noted that the NGO carries full liability for losses that occur while commodities are in NGO-operated warehouses.

### ***Storage Tips***

- Always count the number of units being loaded into and unloaded out of storage. Make sure that the number of units is accurately reflected on the waybill. Never sign for receipts unless you are sure of the amount. You will be held liable for any discrepancies. When taking receipt, note all shortages and damages on the waybill before signing.
- Segregate all suspect units (wet, slack, torn, short-weight) from sound units immediately upon receipt. Do not place them in the stack. Deal with them immediately and try to safely salvage what can be saved. Have salvaged/reconstituted commodities inspected by health authorities, especially if they were received wet or infested or otherwise appear questionable in terms of quality. Remove any units infested with insects from the sound storage area, as these may cause infestation of good stock.
- Keep your commodities dry. Inspect roofs and windows to make sure that rain cannot enter the warehouse. Inspect drainage and guttering to make sure that water cannot enter the warehouse. Always place commodities on pallets or some other type of raised surface to prevent moisture from seeping into the commodity stack.
- Always used First-In/First-Out procedures when loading out commodities from storage. Limit the amount of time

any one unit remains in storage.

- Do not mix different commodities in the same stack, even though they may have similar packaging (e.g. 50-kg bags of maize and beans). Do not mix different shipments of the same commodities in the same stack, unless you can clearly differentiate them, either by package marking or by some sort of separator in the stack. Make sure that commodities are stacked in an orderly manner with a uniform patter that makes it possible to take a physical count.
- Always keep two sets of inventory accounts, one in the warehouse and one in the management office. Reconcile these accounts on a periodic and frequent basis. Take physical inventory on a routine and on a spot-check basis as often as is possible. This will detect any imbalance between inventory records and physical stock.
- Do not tolerate pilferage and/or commodity theft, no matter how small. Investigate all suspected cases of theft and enlist the support of local judicial and legal authorities in the event of actual theft. Do not simply dismiss suspected workers, as this may land you in labor court for wrongful dismissal.

## ***Handling***

Handling of food aid is a necessary activity at each node in the supply chain. Handling serves to transfer the cargo from a transportation carrier to 1) a storage area, 2) a staging area, or 3) another carrier. The movement of the cargo without damage to the packaging or loss of any cargo during the process characterizes successful handling operations.

# STEP 7: Determine the requirements for Loading, Unloading, and Handling of the Food Aid

In general, handling is not a complicated activity and may not be that costly. Handling can, however, be a time consuming process and excessive handling increases the chance of damage and loss of some commodity during the operation. In general, food aid packaging sizes have been designed to facilitate handling along the supply chain. However, some packaging, such as vegetable oil in 200 liter drums or vegetable oil packed in cartons and palletized may require some additional thought and effort to facilitate handling. Through planning and scheduling, handling of commodities should be kept to the minimum necessary. Every time food aid is handled, it must be tallied and any losses identified and investigated.

## Handling Capacities and Services

Handling of food aid commodities at the warehouse (receiving from, stacking, and loading out on to transport) is generally part of the service provided by contracted warehouse service providers. Where contracted warehouse services are used, or where these are provided through a general freight forwarder, the NGO may not have much to worry about. Handling services may be billed on a per unit or per ton basis, or be included in the over-all "per ton" price for managing the flow of commodities on a particular segment of the supply chain. As such, the logistics manager should collect information on handling when interviewing potential freight forwarders and warehouse service providers.

If the NGO is managing its own warehouse(s) then provision of handling services will be the responsibility of warehouse managers and logistics staff. Handling services include the following:

- Removal of cargo from carriers arriving at the warehouse
- Tallying of goods received
- Segregation of any damaged or suspect units for further treatment
- Stacking of all sound units
- Inspection of all suspect units
- Salvage and reconstitution of any damaged units
- Disposal of any commodities certified as unfit for human consumption
- Loading of cargo from storage to carriers for onward delivery

Commodity handling is a labor-intensive process with many people involved. As such, management and supervision of handling personnel is essential to prevent petty theft and pilferage or unintentional loss/damage to commodities while being handled. To organize the labor force into manageable units, many warehouses use a systems of labor gangs. A standard number of laborers (8-10) may be organized into a work gang under the gang supervisor. As such, warehouse managers issue instructions and tasks to gang supervisors who then organize their work gang to get the particular task done.

In some cases, warehouse laborers are salaried employees. In other cases, laborers are hired on a daily basis, given the amount of work to be performed. In other cases, a combination of these two may be used, with a small core of regular,

salaries labor hired to handle routine and small handling operations, which can be supplemented by casual day-laborers as the need arises. Using this model, the regular laborers can be trained in proper stacking and handling techniques for food aid and can function as gang supervisors when the labor force is augmented with casual laborers. In some cases, the regular porters may be assigned the responsibility to recruit their own gangs of day laborers as needed. Maintaining lists of individuals contracted as day laborers is essential to facilitate payment at the end of shifts.

Depending on the country, there may be "porters cooperatives" in existence. These are associations of laborers that work in a cooperative manner. Porters cooperatives may charge by the unit handled or by the ton handled. They should provide a stated gang of workers along with their own supervisory personnel.

## Case Example

ELU/CARE, the project charged with delivering and distribution of food aid to Ethiopian Refugees in Somalia from 1981 to the fall of Siad Barre in the early 90s, managed a central warehousing and truck park facility in the Old Port complex in Mogadishu. All unloading, stacking, and loading, as well as reconstitution, was performed by a Porter's Cooperative. Cooperative management planned with the ELU/CARE logistics staff to make sufficient porters, checkers, and supervisors available during working days. The Porter's Cooperative was paid on a "per-unit" basis, regardless of how many people they had on the job. This method provided incentive for the porters to work quickly, as the more they loaded the more they earned.

NGOs may want to explore the potential to organize their casual day labor into a cooperative that can provide services to the NGO food aid project as well as begin to market their services to other employers of casual day labor. New small enterprises that empower people can be a spin-off to the food aid project.

Ports, airports, and rail terminals will generally have their own handling personnel and the NGO will be obliged to use them for handling of food aid. These facilities should also have any necessary equipment to load and discharge cargo that may be required (conveyors, fork-lifts, cranes, etc.) and staff trained to operate them.

At the distribution site, the local community and/or the food aid recipients themselves can often do handling themselves. Handling at the distribution site involves unloading the carrier (usually a truck) and stacking the commodities at the distribution site or into a small holding area prior to distribution. There are a number of guidebooks available from NGOs, the World Food Program, and other UN agencies that describe a variety of distribution systems and the processes and procedures for undertaking distribution. These should be consulted and the most appropriate method determined for the situation. Equity and transparency are key to handling commodities at the time of distribution, and measures should be taken such that the recipients consider the process fair.

## Surveyors

While discharge surveys in the port are a fairly common practice, logistics managers may want to engage surveyors to oversee and report on receipts and transfers at selected points in the supply chain. Survey companies are independent firms that serve to provide an accounting of the quantity and condition of goods changing hands from one part to another. As such, the NGO, a contracted freight forwarder and/or transporter may wish to engage an independent surveyor to verify compliance with the terms of a delivery contract and produce a supporting document for the purposes of billing and claims adjudication. Independent surveyors can also be engaged to undertake a physical inventory of goods in a particular warehouse, should the logistics manager want independent confirmation of sound warehousing practices.

## Bulk Shipments

Cereals shipped in bulk (i.e. loose in the hold of a vessel or in a rail wagon) may be discharged using clam-shell buckets and cranes, scooping the grain from one carrier to another or into a hopper and bagging machine, where the bulk grain is bagged into standard units. Similarly, suction hoses (called vacuators) can be used to suck loose grain into hoppers or conveyors and into/out of silos. Where bulk grain is being used, this specialized equipment must be made available, usually by the loading/discharge port, the carrier, or the receiving silo. At some point in the supply chain, bulk shipments will have to be bagged and counted, at which time the shipment can be handled using manual labor or light machinery.

(fork-lifts, conveyors).

# Containerization

Food aid, especially vegetable oil, may be shipped in standard shipping containers (either in 20-foot or 40-foot sizes). These shipping containers are loaded at the source, or in the export port, and are then stacked on board vessels and transported to the discharge port. The use of shipping containers is increasing internationally due to the efficiencies in handling and the safeguarding of the cargo inside. Containerization of cargo has made it possible to reduce the physical handling of the contents significantly, thereby reducing the need to tally units during each transfer and reducing the potential for damage during the handling process. Cargo can be loaded into a container placed on a truck chassis at the source warehouse and then transported by road to either a port or a rail yard. The container can then be transferred from the truck to either a rail car or vessel for the next leg of the journey. Upon arrival, the container can be quickly discharged and then put onto another transport carrier for the next leg, on down the supply chain until it reaches a point where it must be opened and the contents discharged.

All shipping containers have a reference number painted on the side and this number is referenced on all shipping documents for identification. Similarly, loaded containers travelling internationally will have a numbered seal on the door, also referenced on shipping documents. This seal cannot be broken unless under the presence of a customs officer. Domestic use of containers for freight transportation will not be under customs supervision, however, and may be opened without customs presence.

Specialized handling equipment is necessary to use shipping containers, especially if the container is to be removed from the carrier or transferred from one carrier to another. A loaded 20-foot container can weigh as much as 22 metric tons, while a 40-foot container can weigh as much as 42 metric tons. As such, large fork-lifts and specialized cranes are necessary and usually present at container handling facilities.

## Handling Tips

- Good planning and scheduling can avoid excess handling. If you know goods are coming by train or boat, have trucks ready to receive the cargo directly from the rail wagon or boat.
- Make sure when stacking bags that top seams are facing inward in the stack. That way, if any bags break open, the contents will spill within the stack and not on the floor.
- Teach porters to load and stack cargo in uniform dimensions so that physical counts are easier.
- When handling vegetable oil, or other liquid cargo, procure and place clean empty containers at warehouse location so that damaged oil can be repackaged quickly, reducing the amount lost.
- Ask Surveyors to show you a copy of a survey report they provided for another client. Check the information provided and negotiate any special or non-standard reporting information you require.
- When handling large drums of vegetable oil, planks can be used to roll the drums off of and on to trucks. Similarly, stacks of old tires can be used to cushion drums dropped off of the backs of trucks
- When receiving goods in large crates or palletized, check to see if fork-lift trucks can be rented for the day to facilitate unloading and stacking.
- Keep a daily list of casual porters hired for each day. Make sure that names are correct and that each person hired signs the list at the end of the day. This will provide the basis for payment of workers. It will also provide a record of people in the warehouse on a particular day, should any type of loss investigation be required.
- Do not allow porters to carry backpacks or shoulder bags into the warehouse. Provide them with a secure place to keep their personal effects while working. This will reduce the chance of petty pilferage.

- Remember that physical handling by porters is hard work. Provide them with regular

## Cost Categories and Behaviors

This section describes the major types of costs that will be incurred when undertaking food aid logistics. Cost behaviors will also be described (fixed, variable, and mixed). Some guidance will be provided for Logistics Managers in developing cost budgets.

## The Least Total Cost Concept

Due to the high costs associated with the transportation, storage, and handling of food aid, the logistics manager must have a clear understanding of the types of costs that will be incurred and the way in which these costs affect one another. The primary goal in managing food aid logistics is to achieve the Least Total Cost that meets program goals and targets.

The three main cost areas involved in logistics revolve around activities related to transportation, storage, and handling. These activities, however, are not independent of each other and decisions made in one area will effect costs incurred in the others. It is necessary to take into account the impact on other costs when making decisions regarding any single cost area. For example, reducing the number of warehouse porters may result in cost savings on handling but result in cost increases in transportation, as productivity decreases as trucks spend longer time waiting to be loaded. Likewise, reductions in transportation costs through use of rail transport for long-haul segments and trucking for short-haul segments will result in increases in storage and handling costs at the rail head, as commodities are transferred from rail to storage and then on to trucks. The question to ask is "are cost savings associate with the action greater than cost increases that might result in other areas of the logistics network?" As such, it is not the goal to try to achieve the lowest cost in each area individually, but to achieve the Least Total Cost for the logistics network as a whole *expressed as the Least Total Cost for a ton of commodity delivered to a point for distribution*. To be able to achieve the Least Total Cost, it is necessary to have an understanding of how different costs will behave as changes in activity occur.

# STEP 8: Determine the Costs for Transport, Storage, and Handling along the Supply Chain

## Cost Behaviors

There are three basic types of costs – fixed costs, variable costs, and mixed costs. Within each of the cost areas (transport, storage, and handling), some of the costs will be fixed, some variable, and some mixed.

A *fixed cost* is a cost that remains the same over a specified time regardless of the level of activity within a relevant range. A relevant range of activity is the level of activity at which can be supported by current fixed costs. Examples of a fixed cost would be 1) the monthly rental on a warehouse; 2) the cost of key management staff salaries; 3) the insurance and licensing cost on a truck; and 4) the monthly lease fee on a truck. These costs will remain the same each month regardless of whether a warehouse is full or empty or the truck transports any food that month. As activities increase, the fixed cost allocated to each unit of activity will decrease on a per unit basis. For example, a \$1,000 per month warehouse rental with 100 tons in storage would mean that the storage cost is \$10 per ton per month; with 200 tons in storage, the cost would be \$5 per ton per month.

A *variable cost* is a cost that changes proportionally with the level of activity. Examples of variable costs would be 1) loading/unloading costs billed on a per ton or per unit basis; 2) transport charges using hired trucks; 3) salaries for casual laborers; and 4) fuel costs for trucks. These costs will vary depending on the level of activity. If there is no activity, loading costs will not be incurred or transport charges will not be raised. As activity increases, these costs will also increase proportionally. Variable costs are usually expressed in terms of a cost per unit of activity (e.g. tons transported, distance driven, labor-days). For example, handling costs charged at \$2 per ton for 100 tons will result in a total cost of \$200 and for \$200 tons would be \$400.

A *mixed cost* is a cost that exhibits characteristics of both a fixed and a variable cost. The cost will increase with an increased level of activity, but it will not increase proportionally. Examples of mixed costs would be 1) utility costs (electricity, water, and telephone) that contain a basic rate for service plus a rate based upon usage and 2) truck leases that contain a daily fee plus a fee covering kilometers driven. Some costs, such as warehouse labor may consist of both fixed costs (a core of salaried staff) and variable costs (casual, day laborers hired as needed) and combined could be treated as mixed costs.

The importance of knowing whether logistics costs are fixed, variable, or mixed occurs when levels of activity change. For example, a program designed to deliver and distribute 5,000 tons of food commodities has a total budget of \$250,000 covering internal transport, storage, handling, management and monitoring. This translated into a "per-ton" cost of \$50. This cost includes fixed, variable, and mixed costs. For example, of the total \$250,000, \$50,000 represents fixed costs and the remaining \$200,000 are variable costs. As such, the per-ton cost of \$50 is composed of \$10 in fixed costs (the \$50,000 allocated across the 5,000 tons) plus \$40 in variable costs.

If another donor provides an additional 1,000 metric tons to the program it would be erroneous to use \$50 per ton as the basis for determining the additional funds required to deliver and distribute this quantity. A more accurate method would be to isolate costs into fixed, variable and mixed, and then to see what the impact of the additional 1,000 tons would be on them. The variable costs should increase proportionally with the additional level of activity ( $\$40 \times 1,000 \text{ tons} = \$40,000$ ). The fixed costs, however, will not increase (unless the additional tonnage needs to be programmed in a different geographic area or current capacity is insufficient to handle it; i.e. the relevant range has been exceeded). At a minimum, the donor of the additional 1,000 tons should cover the variable costs associated with the shipment (\$40,000). The fixed costs expressed on a per ton basis should be recalculated based on the total 6,000 tons ( $\$50,000 / 6,000 \text{ tons} = \$8.33$  per

ton), resulting in a new per-ton cost of \$48.33, as the fixed costs are spread over a larger level of activities.

Many of the decisions that logistics managers will face involve weighing alternatives. Alternatives have different costs associated with them, and it necessary for the logistics manager to be aware of the cost implications of each alternative when making decisions. Advice and assistance for project financial officers and controllers should be sought when needed.

## Cost Categories in Budgeting

When food aid programs are designed, a program budget is prepared that includes all the costs associated with carrying out the project. The logistics costs will be a major portion of this budget and should include all costs associated with transportation, storage, and handling. The following provides a basic listing of the costs associated with in-country logistics and can be used as a checklist when developing logistics budgets.

## Internal Transportation

Transportation costs should be calculated for each segment in the supply chain. The method of calculating transportation costs may vary depending on the type of transport used and/or the type of service contract developed. Some examples are:

### Flat rate per ton between points

Flat Rates may be used is freight forwarder contracts where payment is based on a flat rate per ton to deliver between points in the system. Likewise, maritime, rail, and air transport tariffs may be based on a table of per ton rates to points with a different rates depending on the characteristics of the destination (distance being the primary determinant)

### Method of Calculation

Total tonnage to be moved between Points X the Cost per Ton =Total cost of transportation between Points
--

**Example:**

2,000 tons from Primary Warehouse to Regional Hub X US\$ 20 per ton =US\$ 40,000
--

### Rate based on distance and tonnage

This may be used by common carriers and based on a standard distance between points. In general, a full truckload will be billed as the maximum tonnage the truck can carry, irrespective of the actual weight of the cargo. NB: Some bulkier items may fill the carrying capacity of the truck before reaching the maximum weight limit. Charges would be billed using the maximum weight limit.

### Method of Calculation

Tonnage to be moved between 2 specific points X the distance between these points X the cost per ton/kilometer = the cost to deliver to a selected point

Total cost of transportation = the sum of costs to deliver to all points

**Example:**

1000 tons from Regional Hub X 250 kilometers to District A X US\$ 0.10 per ton/kilometer +  
 500 tons from Regional Hub X 175 kilometers to District B X US\$ 0.10 per ton/kilometer +  
 500 tons from Regional Hub X 300 kilometers to District C X US\$ 0.10 per ton/kilometer =  
 1000. X 250 X US\$0.10 = US\$ 25,000 + 500 X 175 X US\$0.10 = US\$ 8,750 + X 300 X US \$0.10 = US\$ 15,000 =  
 Total cost of Transport = US\$ 48,750

## Rates Based on Differences in Road Surface/Conditions

In some cases, road transport rates may differ based on the road surface, with a premium charged for deliveries on secondary roads, unpaved roads, or roads known to be in poor repair and thus increasing the transit time and the wear-and-tear on vehicles. In some cases, transporters will charge a higher rate on road segments where insecurity and risk of loss are also high.

Tonnage to be transported on Good Road X Rate (using one of the two above) +

Tonnage to be transported on Poor Road X Rate (using one of the two above) =

Total cost of transportation

### *Examples*

200 tons from District B to Distribution Point 1 X 50 kilometers X US\$0.10 ton/km (paved rate)

150 tons from District B to Distribution Point 2 X 30 kilometers X US\$0.15 ton/km (dirt rate)

150 tons from District B to Distribution Point 3 X 50 kms. (paved) + 25 kms. (dirt)

200 tons X 50 kms X US\$0.10 = US\$ 1,000

150 tons X 30 kms X US\$0.15 = US\$ 675

(150 tons X 50 X US\$0.10) + (150 tons X 25 X US\$0.15) = US\$ 1,312.50

Total Cost of transportation = US\$ 2,987.50

## Leasing and Operating Trucks

If the NGO decides to lease and operate trucks, then a calculation based on the number of trucks and the lease rate will determine the transportation costs for the NGO. If the NGO must provide fuel to the leased trucks then an additional calculation for the fuel costs must be made and included in the budget.

### *Method of Calculation*

Number of Trucks to be Leased X Lease Rate per Month X Number of Months =

Total Cost of Truck Lease

plus

Average (or Estimated) kilometers driven per truck per month / Average (or Estimated) consumption, stated in kilometers per liter = amount of fuel need per truck per month

Number of trucks being leased X amount of fuel needed per truck per month = Total fuel Needed/month

Total Fuel Needed/month X Number of Months Lease = Total Fuel Needed

Total Fuel Needed X Cost per Liter = Total Fuel Cost

Total Truck Lease + Total Fuel Cost = Total Transportation Cost

### ***Example***

District A will lease 4 trucks X a lease rate of US\$ 750 per truck per month X 2 months

4 trucks X US\$750 X 2 months = US\$ 6,000

Each truck will average 1200 kms per month / average fuel consumption of 4 kms/liter

1200 kms / 4 kms/liter = 300 liters of fuel per truck per month

4 trucks being leased X 300 liters of fuel per truck per month = 1200 liters of fuel per month

1200 liters of fuel per month X 2 months = 2400 liters of fuel per month.

2400 liters of fuel X US\$0.20 per liter = US\$ 480

US\$ 6,000 for truck lease + US\$ 480 for fuel = US\$ 6,480 total transportation cost

## **Local Transportation on a Daily Basis**

At points where food aid needs to be transferred from a warehouse to a port, rail terminal, or airport for onward delivery by another mode of transportation, local transportation will be needed and may be hired on a daily basis. Trucks or tractor-trailers may be hired for the day to load at the warehouse and transfer commodities to the loading area. Given that trucks engaged in local transportation can make several trips each day, some estimation on the number of trips that can be made by one truck is necessary to calculate the cost of local transportation

### ***Method of Calculation***

Estimate of the number of trips that can be made by one truck each working day X the amount of tonnage carried on each trip by that truck = the amount of tonnage transferred by one truck in a day

The total tonnage to be loaded in a day / the amount that one truck can transfer =

Total number of local trucks to be hired in a day

Number of working days estimated X number of trucks to be hired X cost per truck per day =

Total cost of local transportation

### ***Example***

District C will load 65 tons on a river barge once per week for delivery to distribution sites along the waterway.

3 trips per truck per day (from warehouse to port) X 5 tons per truck trip = 15 tons per truck/day

65 tons / 15 tons per truck/day = 4.3 trucks (or 5 trucks)

8 loading days (once a week for 2 months) X 5 trucks X US\$50 per truck/day =

US\$ 2,000

## The Internal Transportation Budget

The Internal Transportation Budget is the detailed estimate of all transportation costs necessary to move the planned quantity of food aid commodities from the primary reception point, or primary warehouse through the supply chain to delivery to distribution sites. The budget can best be presented broken into segments in the supply chain. From the examples detailed above, the Internal Transportation Budget can be presented as follows:

### Internal Transportation

Primary Warehouse to Regional Hub (2,000 Metric tons @ US\$20/Mt.)	\$ 40,000
--	-----------

#### Regional Hub to Districts:

District A (1000 Mt. x 250 kms x US\$0.10)	\$ 25,000
---	-----------

District B (500 Mt. x 175 kms x US\$0.10)	8,750
--	-------

District C (500 Mt. x 300 kms x US\$0.10)	<u>15,000</u>	\$ 48,750
--	---------------	-----------

#### District to Distribution Points:

District A (4 trucks leased for 2 months)	\$ 6,000
---	----------

District A (Fuel for 2 months operations)	500
--	-----

District B (common carrier hire)	3,000
----------------------------------	-------

District C (river boat hire @ US\$ 5/ton)	2,500
---	-------

District C (local transportation)	<u>2,000</u>	<u>\$ 14,000</u>
-----------------------------------	--------------	------------------

#### Total Internal Transportation

\$102,750

By basing the internal transportation budget on detailed calculations of tonnage expected to be moved along particular segments of the supply chain, a fairly accurate depiction of the costs for internal transportation can be derived. Should there be any changes in tonnage to be handled (increases or decreases) a recalculation of the budget should be fairly straightforward. It should also be a fairly easy budget to defend if based on accurate, documented unit costs and distances.

It should be noted that with the exception of District A's leased trucks, all other transportation costs are variable costs. District A has committed to a two-month lease of four trucks and this expense will be realized whether or not they move any tonnage. The fuel cost in District A is variable and will fluctuate as activity increases or decreases.

## Storage

Storage costs should be calculated for each node in the supply chain where commodities are received and stored. Storage costs can be calculated as variable costs when warehousing services are being provided by a contractor or can be calculated as fixed costs, when a warehouse is being leased and operated by the NGO. Examples of each are as follows:

# Warehousing Rates based on Tonnage and Time

Warehousing services may be calculated based on per ton per time (day, week, or month). This may be the case with large transit warehouses in the primary reception points and in the regional hubs. All necessary services such as stacking in the warehouse, inventory control, reporting, and security are usually contained in the warehousing rate charged by the service provider. When estimating costs for storage under these circumstances, a quantity of one-half the total tonnage can be used as the base for calculations (Assuming full tonnage at the beginning of the time period and an empty warehouse at the end of the time period)

## *Method of Calculation*

Total Tonnage to be stored / 2 = Average tonnage in storage

Average tonnage in storage X length of storage X cost per ton per time =

Total Cost for Storage

## *Example*

2,000 tons received at the primary warehouse with the expectation that the entire quantity will be transferred to the Regional Hub within a month's time

2,000 metric tons / 2 = 1,000 metric tons average stock during the month

Storage rates in the Primary Transit Warehouse are US\$ 3.00 per ton per week

1,000 metric tons average X 4 weeks X US\$ 3.00 = US\$ 12,000

# Rental of Warehouse Building operated by the NGO

The other common warehousing option is to lease a warehouse building and operate it using NGO personnel and resources. In this case, the warehouse is rented on a monthly lease and all operational costs are paid directly by the NGO. Besides the lease cost of the warehouse itself, money should be budgeted for utilities (electricity, water, telephone), equipment, materials, and supplies.

## *Method of Calculation*

Monthly rental of the warehouse X the number of months required =

Total cost of Warehouse rental

Estimated Monthly Utilities X the number of months required =

Total cost of Utilities

Equipment/Materials = Number of items X unit cost of each item

Supplies = Quantity consumed over a time period X number of time period needed

Or a total amount budgeted based on best estimate for minor items

### **Example**

District A is renting a 500-ton capacity warehouse in which to receive food aid shipments from the Regional Hub and dispatch them to distribution points. The warehouse is rented at the cost of US\$ 500 per month and will be rented for a period of 3 months (to allow for cleaning and preparation prior to the arrival of food aid to be distributed during two months). The landlord has agreed to provide utilities at a cost of \$150 per month for electricity and water. Telephone service can be installed at District A's discretion and cost and is estimated at US\$ 100 per month.

US\$ 500 per month rental cost X 3 months = US\$ 1,500

US\$ 150 per month for utilities X 3 months = US\$ 450

US\$ 100/month for telephone X 3 months = US\$ 300

1 platform scale (200 kg capacity) X US\$ 200 = US\$ 200

10 brooms X US\$ 2 per broom = US\$ 20

10 dustpans X US\$ 1 per dustpan = US\$ 10

4 ladders X US\$ 50 per ladder = US\$ 200

100 pallets (4 X 8 feet) X US\$ 15 each = US\$ 1,500

2 Sifters for cleaning grain X \$50 each = US\$ 100

Needles/twine = US\$ 50

1 bale of 100 empty bags = US\$ 100

Cleaning supplies = US\$ 200

Stationary/inventory forms = US\$ 300

Miscellaneous supplies = US\$ 250

**Total Warehouse Operations – District A = US\$ 5,180**

The Storage and Warehousing Budget should detail all the costs associated with the storage of food aid throughout the supply chain. This would include both the cost of warehousing services as well as the cost of warehouse rental and operations. In many cases, warehousing at distribution sites may be provided by the local community. When this is the case, an effort should be made to "value" that contribution and list it in the budget as a community contribution to the program, as this is a real cost in the supply chain. Using the examples above, the warehousing budget would look like this:

**Storage and Warehousing**

Primary Transit Storage at Port of Entry (4 weeks @ US\$ 3.00/ton/week for avg. of 1000 Mt.)	\$ 12,000
Secondary Transit Storage at Regional Hub (4 weeks @ US\$ 2.00/ton/week for avg. of 1000 Mt.)	\$ 8,000
Warehousing at Districts:	
Warehouse Rental – District A (3 months @ \$500/month)	\$ 1,500
Warehouse Rental – District B (3 months @ \$400/month)	\$ 1,200
Warehouse Rental – District C (3 months @ \$ 400/month)	<u>\$ 1,200</u>
Total Warehouse Rental At Districts	\$ 3,900
Warehouse Utilities (3 Warehouses @ \$250/wh/month)	\$ 2,250
Warehouse Materials/Equipment/Supplies (3 Warehouses @ \$2,000 per warehouse)	<u>\$ 6,000</u>
Storage at Distribution Points provided Free of Charge by Local Communities – no cost to program	
<i>Total Storage and Warehousing</i>	<i>\$ 32,150</i>

For ease of budgeting, the Materials/equipment/Supplies line item was based on the list of materials generated for District A, which totaled a little less than \$ 3,000. As District A was the largest district operation, it was assumed that materials, equipment, and supplies for the other two district warehouses would be less, and an "average" amount of \$ 2,000 was used as a per warehouse budgeting figure. Note that the above is exclusive of any personnel costs for managing the district warehouses. These may be shown in this section of the budget, or in a separate section for Personnel – Management, Administrative, and Monitoring in the total program budget. Also note that the storage costs at the Primary and Regional Hubs are variable costs, while the Warehouse Rental at District level is a fixed cost. The Utilities are a mixed cost, with the flat-rate for electricity and water being fixed and the telephone being variable.

**Handling**

Handling costs must be calculated and budgeted for each node in the supply chain. For warehousing service contracts, handling costs may be included in the base rate, or may be billed separately. At NGO-operated warehouses, handling costs are generally shown at labor-rates for casual laborers.

# Handling Costs for Service Providers

These are generally billed on a per ton, or per unit basis and can either be for each handling (handling in and handling out) or may be combined (handling in/out) assuming that what goes in will come out. Handling charges will include unloading, stacking and reloading, as well as any reconstitution/salvage and inventory reporting, as agreed in the service contract. Similarly, Survey and Tallying services provided by independent surveyors may be based on a per-ton rate.

## *Method of Calculation*

Total tonnage handled at the node X the rate per ton for handling X the number of handlings =

Total Handling charges at the node

## *Example*

At the Primary Warehouse, the service provider charges US\$ 1.00 per ton for handling in/out

2,000 tons to be handled X US\$ 1.00/ton X 1 handling = US\$ 2,000

At the Regional Hub, handling charges are billed on a per-handling basis at the rate of US\$0.75 per ton

2,000 tons to be handled X US\$ 0.75/ton X 2 handlings = US\$ 3,000

# Handling at NGO-Operated Warehouses

If a labor contractor or porter's cooperative is used to provide labor for commodity handling, then the method for calculating costs and for budgeting is the same as with the warehousing service providers, and is expressed on a per-ton or per-unit basis. If the NGO employs casual day laborers to do the handling, then the calculation is based on estimated person/days required.

## *Method of Calculation*

Number of working days X Number of Laborers/day X Daily Labor Rate =

Total Cost of Handling at the Node

## *Example*

At District C, the NGO used casual day laborers for handling at the warehouse. District C dispatches food to distribution points along a river using contracted river barges. Handling at the local port is done by a Porter's cooperative and is billed on a per-unit basis at the rate of US\$ 0.02/per 50 kg bag.

40 working days X 15 laborers/day X \$ US\$ 1.50/person/day = \$ 900

Cost of Handling at Warehouse – District C

500 tons = 10,000 50 kg bags

10,000 bags X US\$ 0.02/bag = US\$ 200

Cost of Handling at River Port

Total cost of Handling at District C = US\$ 1,100

The Handling Budget should reflect all points in the supply chain where the commodities are received, dispatched, and transshipped. Using the example above, the Handling Budget could be shown as follows:

<b>Handling</b>		
Primary Warehouse (2,000 Mt. x US\$ 1.00 per ton)		\$ 2,000
Regional Hub (2,000 Mt. x US\$ 1.50 per ton)		\$ 3,000
District A – 1,000 Mt (40 labor days x 30 laborers x \$1.50/day)	\$ 1,800	
District B – 500 Mt (40 labor days x 15 laborers x \$1.50/day)	900	
District C – 500 Mt. (40 labor days x 15 laborers x \$1.50/day) (Loading at port; 10,000 bags x US\$ 0.02/bag)	900 200	
<b>Total District Handling</b>		<b>\$ 3,800</b>
Handling at Distribution Points provided by recipient community At no cost to project		
<b>Total Handling</b>		<b>\$ 8,800</b>

Handling costs generally act as variable costs and will increase or decrease with the amount of tonnage handled. This is especially true of handling costs billed on a per-ton or per-unit basis. Handling costs where handling is performed by day-laborers will increase, but not at a constant rate, as tonnage increases. (i.e. for an increase in ½ ton, you cannot increase ½ laborer, you must recruit and pay a whole laborer, or a whole gang). A specific number of laborers may be able to handle up to a certain level of activity. Above this level, it may be necessary to employ another gang of laborers to handle additional tonnage.

### **Combining the Internal Transport, Storage, and Handling Costs**

From the examples detailed above, one can combine all the costs to arrive at a per-ton cost for delivery of the food aid to distribution points. This will provide an average cost per ton. Sub-totals for each district can be derived, as well as sub-totals for each intermediate node. With this information, the logistics manager will then be able to make some comparisons and determine the feasibility and cost effectiveness of certain alternatives.

*From the example above:*

Total Cost of Internal Transportation		\$ 102,750
Total cost of Storage and Warehousing		32,150

Total Cost of Handling		<u>8,800</u>	
Total ITSH Costs for 2,000 tons		\$ 143,700	
Cost per Ton ITSH		\$ 71.85/ton	
Primary Node			
Storage	\$ 12,000		
Handling	2,000		
Transport	<u>40,000</u>	\$ 54,000	
Out			
Regional Hub			
Storage	\$ 8,000		
Handling	3,000		
Transport	<u>48,750</u>	\$ 59,750	
Out			
District A			
Storage	\$ 4,250		
Handling	1,800		
Transport	<u>6,500</u>	\$ 12,550	
Out			
District B			
Storage	\$ 3,950		
Handling	900		
Transport	<u>3,000</u>	\$ 7,850	
Out			
District C			
Storage	\$ 3,950		
Handling	1,100		
Transport	<u>4,500</u>	<u>\$ 9,550</u>	
Out			
<b>Total Cost</b>		<b>\$143,750</b>	

<i>Cost per Ton per Node</i>				
Cost per Ton	Primary	(for 2,000 Mt.)	(\$54,000/2000)	\$27.00/ton
Cost per Ton	Regional	(for 2,000 Mt.)	(\$59,750/2000)	\$29.88/ton
Cost per Ton	District A	(for 1,000 Mt.)	(\$12,550/1000)	\$12.55/ton
Cost per Ton	District B	(for 500 Mt.)	(\$ 7,850/500)	\$15.70/ton
Cost per Ton	District C	(for 500 Mt.)	(\$ 9,550/500)	\$19.10/ton

<i>Total Cost per ton per District</i>		
District A	$(\$27 + 29.88 + 12.55)$	\$69.43/ton
District B	$(\$27 + 29.88 + 15.70)$	\$72.58/ton
District C	$(\$27 + 29.88 + 19.10)$	\$75.98/ton

By segmenting and combining the internal transport, storage, and handling costs along the supply chain, the logistics manager has a much better perspective and can begin to ask certain questions and think about some alternatives. For example, why is the cost to serve distribution points in District C higher than Districts A and B? What would be the impact on total costs to serve all districts, if a different transport option was chosen (e.g. smaller, more expensive trucks) that allowed goods to bypass the regional hub and be delivered directly to the districts from the Primary Warehouse? Would Districts B and C benefit from leasing their transportation rather than hiring on a per-ton basis? What are the cost implications of an increase in tonnage for any one district?

By having a good idea of the costs contained in the supply chain and how they behave, the logistics manager can accurately budget and have sufficient resources to deliver the goods to the right place at the right cost. The logistics manager must then be able to monitor performance in the supply chain and monitor costs and be able to take any corrective action should costs begin to vary from those in the logistics budget.

### **Budgeting Tips**

- Using contracted service providers can make budgeting much easier and simpler.
- Try to keep most of the costs variable, especially if you are unsure as to the amount of food aid you will be receiving.
- When transportation and warehousing assets are leased on a fixed cost basis, try to make maximum use of them as the more activity (e.g. tons transported, throughput through the warehouse) that can be undertaken, the lower the per-ton costs become.
- When budgeting, use best estimates, standard costs, and averages based on previous experience and/or cost data collected from other agencies and potential service providers. Then monitor actual expenses to see if they are in line with the budget.
- Use spreadsheet programs (Excel, Lotus) to create budgets. This avoids mathematical errors and allows for easy revision later.
- Consult and involve your Financial controller and accounting staff when preparing the logistics budget, as they will have a lot of historical cost information in their records. Discuss any special coding or sorting that may be required to track logistics expenses and provide management information for decision making.



# Embedded Secure Document

The file <http://carenet.care.org/help/foodaid/handbook.PDF> is a secure document that has been embedded in this document. Double click the pushpin to view handbook.PDF.