

THE PL 480 FOOD AID PROGRAMS' COMMODITY PROCUREMENT SYSTEM

*Understanding the “LP” to Win More
Business*

Executive Summary

USDA and USAID buy millions of dollars of food commodities and transportation services each year for the food aid export programs. The procurement decision-making process is largely supported by a linear programming (LP) optimization system. Companies that learn how this system works can improve their bid win percentages and pricing levels at the same time.

A linear program is an application that seeks to find an optimal solution given a goal, variables, and constraints. In the case of the USDA LP, the goal is to minimize the “lowest landed cost”. The “lowest landed cost” is the least expensive way to buy and ship the food commodities from the mills to the final foreign destinations each month. USDA has to take into account small business set-asides as well as US flag cargo preference rules.

Companies can leverage their understanding of the LP logic and the USDA historical data that goes into the LP. Ocean carriers and commodity suppliers can see how to partner together to create competitive landed cost options for USDA. Also, companies can perform ad hoc analysis around their competitors’ key capacity limitations to improve their pricing levels.

USDA has a current Notice of Proposed Rule Making that will change aspects of the current bid process for ocean carriers. The current two round bid system for ocean carriers may be replaced by a one round bid system. The proposed one round bid system would make ocean carrier cargo awards more dependent on the USDA LP’s logic.



Why Should You Understand the “LP”?

The PL 480 food aid market is a large, and often complex, marketplace for food commodity suppliers, ocean carriers, and ports. Monthly, USDA and USAID are spending millions of dollars on packaged commodities, domestic transportation, and ocean freight to support their overseas relief and development efforts.

It is sometimes difficult to understand clearly USDA’s and USAID’s purchasing decisions. Nevertheless, their procurement efforts are supported by a very structured and complex decision support system based on linear programming. USDA refers to this system simply as “the LP”.

By better understanding this decision-making process, companies can win more bids at better price levels. However, there are more factors than just one’s price in deciding how much, if any, business a company will receive each month.

Linear Program Basics

Before diving into the structure and logic of USDA’s Linear Program (LP) it’s helpful to take a step back and explain how Linear Programs work. A linear program or LP is a generic application that finds the best way of doing something in a modeled “world”. The best solution it can find is called the **objective function** and the LP seeks to either maximize it (e.g. profits) or minimize it (e.g. costs).

A constraint is either a limitation or a requirement. For example, at least 10,000 metric tons of flour to Riga must be bought or no more than 25% of the total tonnage can be bought against foreign flag rate indications.

When the LP is running, it is exploring different ways of reaching the objective function until it “bumps up” against a constraint. It then moves along the edge of the constraint looking for a better solution.

In the end, the LP will come up with the one, best solution for the problem presented to it. There are three parts to the output.

LP Outputs

- Numerical Solution Value
- Optimal Variable Value
- Sensitivity Analysis

In the case of USDA, the **numerical solution value** is the total spend necessary to buy and ship the entire product on the invitation. This will be a single value like \$24,359,145.29.

Second will be the **optimal value** for each of the variables. Any optimal value greater than zero will result in a purchase and a port allocation. For example, the LP may tell USDA to buy 500 metric tons from supplier A on a JACI basis against US flag rate indications at \$300.00/mt.

An LP should produce a **sensitivity analysis**. This analysis examines all of the constraints in the LP as well as their impact on the optimal solution. Here you will find which constraints kept the model from finding even better results, which constraints had no impact (and how much it could be increased or decreased before they had an impact), and the calculated benefit of “loosening” a binding constraint.

For example, the sensitivity analysis could tell how much savings could be achieved if the US-foreign flag split was shifted to 70%-30%, or if Supplier X could produce 1,000 mt more than their 5,000 mt monthly plant capacity.

How the “LP” Works Today

USDA KCCO has a mandate to consider the **lowest landed cost** with respect to cargo preference rules and small business set-asides when procuring food aid commodities each month. This means that not only must they consider the food commodity price, but also the domestic transportation to a port, and the ocean and foreign inland transportation to the foreign point of delivery. The total lowest landed cost is the objective function.

USDA takes formal bids from the food commodity suppliers through an on-line system called EBES and receives rate indications from ocean carriers through a faxed form (KC-324). All of this data is then entered into USDA’s procurement LP.

In the case of the USDA’s LP, its objective function is landed cost (commodity price + US domestic transportation + ocean freight + foreign inland transportation). The goal is to minimize it: *the search for the lowest landed cost solution*.

Commodity Price
+ US Domestic Transportation
+ Ocean Freight
+ Foreign Inland Transportation
<hr/>
= Lowest Landed Cost

Restrictions Not Considered in the LP

Although the KC-324 form has input fields for minimum and maximum tonnage on a trade route, discharge port, and U.S. port (bid term) basis, these constraints are rarely input by USDA into their linear program. This sometimes results in product being purchases and allocated against invalid rates.

For example, carrier X offers \$100/mt from JACI to Mombasa with a minimum of 10,000 mt and a maximum of 15,000 mt but the without the min/max constraint in the system, the LP might purchases 1,000 mt against this rate indication.

EXAMPLE

There are 500 metric tons of Wheat-soy blend going to Jakarta. USDA receives two rate indications both US flag from two different carriers and two different suppliers:

Carrier A	\$ 50/mt	OAKL
Supplier A	\$300/mt	SEAT
Carrier B	\$200/mt	JACI
Supplier B	\$600/mt	JACI

There is no supplier offering to ship their product to Oakland and no carrier offering to receive the product in Seattle.

Therefore, by default, the LP would select JACI with a landed cost of \$800/mt, even though with a little collaborative work Carrier A and Supplier A probably could have won the business and saved USDA a couple of hundred thousand dollars.

In addition, it is *vital that suppliers, ocean carriers, and ports collaborate to ensure that they are building landed cost options that will merit consideration in the LP.* The best ocean carrier rate indications and supplier bids only will be a landed cost option if they unit at a common hand-off point. These are hand-off points are FAS ports, intermodal bridge points, and suppliers’ mills and warehouses and are known as the bid terms (e.g. LCHI, JACI, and RMEM).

USDA has to ensure that the LP’s solution can be implemented. They have to buy as much food as is needed. They can’t exceeded commodity suppliers’ or ports’ operational capacities. They must adhere to SBA and US maritime regulations. So at this point, constraints are added to the program. [see table]

The linear program considers how much to buy against each landed cost variable by exploring thousands of landed cost options. Ultimately, it settles on one combination usually comprised of a couple hundred commodity supplier and ocean carrier price pairings.

At the end of the process, USDA knows how much to buy from each supplier, where to send the product, and whether the cargo should be moved via US or foreign flagged vessels in order to maintain the 75%-25% split. Usually within a week, the freight

USDA LP Constraints

- Disport commodity tonnage – the amount of tonnage of a product advertised to a given disport
- JWOD set-aside
- SBA set aside
- 8(a) set aside
- Cargo preference constraint (minimum 75% US flag)
- MSA Section 17 minimum constraint (used in the second running of the LP)
- Port capacity constraints (USDA checks the maximum tonnage capacity for given bid terms)
- Minimum supplier bid increment constraint
- Maximum supplier bid increment constraint
- Carrier minimum tonnage constraint (used only on rare occasions)
- Carrier maximum tonnage constraint (used only on rare occasions)

forwarders acting on behalf of their PVO clients will issue second round RFP's to the ocean carrier community. In second round of bids, the origin/receipt term is known and additional PVO requirements such as fumigation, delivery terms, LDA and DDA requirements are also published and considered. Also, behind the scenes, USDA and USAID have a good sense for which cargoes will be booked US flag and which might be booked foreign based on the LP's solution (which is summarized in the Cargo Available for Flagging or Guideline report).

At the end of the bid process, contracts are finalized with both commodity suppliers and ocean carriers and a very complex and diverse supply chain engages. Also at this time it is more often than not the start of the first round of bids again for the next invitation and the cycle begins anew. Truly, this supply chain never comes to a halt but instead experiences peaks and values dictated by the USDA and USAID budgetary process along with the call forward requests from the PVO's in the field.

Many Choices, Few Solutions

In recent invitation 125, the LP used 592 carrier rate indications along with 3,520 commodity supplier prices to generate 4,406 landed cost variables. Only 152 of these landed cost variables had tonnage purchased against them (that's just 3.5% success rate!).

MSA Section-17 and Its Impact on the Process

MSA Section-17 has caused a great deal of confusion in the ocean carrier community, and to a lesser extent commodity supplier community. USDA has been tasked with promoting activity in the Great Lakes ports without incurring any additional costs to the program. It is not unusual to see almost exactly 25% (the entire foreign flag maximum allocation) of the invitation tonnage for Title II allocate on a LCHI (Lakes Chicago) basis. These allocations usually move on foreign flag ships. In fact, in the Title II program, very few foreign flag shipments originate outside of the Great Lakes ports.

USDA has found a simple solution for meeting the MSA Section-17 goals within its parameters: the LP is run twice. The first time the LP is run USDA intentionally excludes the cargo preference constraint. This run shows how USDA could buy and ship the products if they could always use the low-price carriers' rate indications without respect to the 75%-25% split rule. They then evaluate how much tonnage would be optimally allocated to the collective Great Lakes port terms (LCHI, LMIL, LDUL, and LGB). They will take the lesser of the optimal total tonnage figure over the Great Lakes ports or 25% of the total invitation tonnage and use it as a constraint in the second running.

In the second running, the cargo preference constraint is inserted along with the newly determined Great Lakes port constraint. The LP is run again and the new solution conforms to both the US cargo preference and MSA Section-17 requirements.

Did you know?...

In applying MSA Section-17 constraints within the LP a foreign flag ocean carrier could possibly lose foreign flagging on a parcel of cargo by offering both a LCHI and a non-LCHI (e.g. NORF) offer at the same time. If the non-LCHI rate indication resulted in a lower landed cost than the LCHI offer, it would not contribute to the MSA Section-17 minimum constraint and most likely be re-selected in the second running of the LP against a US flag rate.

Benefits to Understanding the “LP”

Perhaps the best way that a company can take advantage of understanding USDA’s procurement system is to examine closely where it stands in the landed cost equation and which ports, commodity suppliers, and ocean carriers are part of the same landed cost solution.

Are you working together to create and maintain a competitive landed cost solution each month?

Certain suppliers and carriers have a natural alignment within this program because of the mill location, domestic transportation costs, and port preference.

Learning who one’s partner is, and working to create a competitive landed cost offering to USDA in conjunction with each other can have the greatest impact on the bidding success.

Another way to benefit from understanding this system is to scrutinize and track constraints that are to one’s advantage.

Does a competitor’s port have a capacity constraint below the available volumes?**Is the tonnage likely to be purchased against US flag or foreign flag rate indications?****Does another supplier have guaranteed tonnage through a small business set-aside or JWOD set-aside?**

Understanding the impact of constraints of ocean carriers, ports, and suppliers on competitors’ landed cost supply chain can also give companies an advantage.

The Future of the “LP”

On December 16, 2005 USDA published a Notice of Proposed Making that outlines their intention to move from this two round bid system to a one round bid system. In addition to streamlining the bid process, their proposal includes new bidding features for ocean carriers.

New features include

- carrier min/max tonnage requirements
- incremental tonnage discount/premium pricing
- bundling parcels

Each of these changes on their own will have a significant impact to carrier bid strategy and outcomes; the three factors converging together could turn the ocean transportation market (and perhaps the food supplier market) on its head.

When USDA moves to a one round bid system there could be additional pitfalls in the running of their LP. In certain situations, an ocean carrier could employ bid parcel bundling along with min/max tonnage constraints to generate a competitive advantage where they had none before.

Another potential hazard to the new system involves lump sum charges. Some carriers have lump sum charges of so many dollars to call an additional foreign disport or US load port. This method of pricing is not considered linear because the revenue is no longer a straight function of tonnage. It will either be excluded under the new system or will result in a conversion of the LP to a non-linear program: a more complex and less transparent system.

USDA LP Data – Pulling it all together

The LP's results are often difficult to interpret because of the sheer size and scope of the calculation. However, the concept behind the LP is basic and the data (thanks to FOIA) is available. Usually, there is not a simple, clear answer to why a supplier won a bid or a carrier allocated a particular cargo because each is just a part of the larger solution.

Fortunately, by using the data inputs that are publicly available, aspects of the USDA LP can be recreated and modeled. This enables ocean carriers and suppliers to better understand the results and increase their future wins.

Ocean carriers can determine which products they have the best chance of allocating to their preferred bid term at a given price by analyzing the suppliers' costs to move product to the various ports and bridge points.

Commodity suppliers can gauge their likelihood of success for a given foreign disport by examining ocean rate indications from nearby and far away US ports.

By using the data and better understanding the LP system ocean carriers and suppliers can learn to more effectively price and bid, and find opportunities to partner with others in the supply chain to increase success within the programs.

The new, proposed system raises more questions than it immediately answers, but it is critical to think in terms of basics of linear programming when considering the impact on one's business.

About the Author

John H. Trestrail

John has a passion for bringing order and efficiency to chaotic systems. He understands that beneath the apparent complexity of problems lies a logical system. Once the system is understood, improvements can be achieved in financial performance, supply chain efficiency, and customer service.

John has exceptional analytical ability leading to good, sound business decisions. He knows how to mine data to enable clients to make better decisions and has a talent for improving the bottom line by reducing costs to the company and generating profitable business. He is also an expert in linear and optimization programming and database application development.

John has dedicated the last ten years of his life to improving logistics, transportation, and operations at companies such as Cendian Chemical Logistics, APL (American President Lines) and Maersk Sealand.

John received his undergraduate degree from the University of Michigan, his MBA with a concentration in Decision Science from Georgia State University, and is CPIM certified through APICS and ASBA certified in Cargo Brokerage and Ship Chartering.

About Next Wave

Next Wave acts as a partner with ocean carriers helping them find, price, and win attractive cargoes. We specialize in US Government-sponsored packaged food aid cargoes. Our intimate knowledge of the industry and extensive database puts our clients a step ahead of the rest.

Since its founding in 2001, Next Wave has supported clients such as Maersk Sealand, Safmarine, UPS Supply Chain Solutions and Manhattan Associates.

In addition to brokerage and agency services targeted at the US Government-sponsored food aid programs, Next Wave also delivers comprehensive consulting services to solve problems, drive out inefficiencies and improve supply chain performance. Using decision sciences methodology, Next Wave enables clients to improve strategic, tactical, and operational decision-making for complex supply chain operations—helping clients reduce costs, increase efficiency, improve customer service—and, ultimately, win more business.