Redesigning the Upstream Emergency Relief Supply Chain: An Empirical Assessment

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ABSTRACT

This paper empirically studies (i) forecasting emergency relief aid shipments and (ii) redesigning upstream humanitarian supply chains as means to improve the efficiency and effectiveness of disaster response. The United States Agency for International Development provided unique data about its emergency food aid shipments over a period of about eleven years. We find that while it is not possible to forecast USAID's future food aid shipments at commodity and country level, there is a trend of shipping most food aid to Africa, which could be useful in prepositioning decisions. Moreover, we provide evidence that global sourcing could offer significant benefits over sourcing only in the donor country. Sourcing location decisions should be based on the type of commodity as well as the geographic location and economic situation of the recipient country. We believe that our findings will contribute to the ongoing discussion about the efficiency of USAID's international food aid programs and its mandate to source only US grown food commodities.

Key words: Humanitarian logistics, Supply Chain Management, Procurement Processes, Earmarking
I. INTRODUCTION


However, being the world's No.1 health risk, even a greater number of people suffered from hunger in 2011, i.e. roughly 1 in 7 people went to bed hungry everyday (WFP 2012). The WFP also reported that food emergencies have increased tremendously over the past three decades. Part of the increase can be attributed to the greater magnitude of events, increased international media coverage of calamities, as well as the rising number of these events. While, in the 1980s, about 15 emergencies were reported each year, the number has doubled in the early 2000s (WFP, 2006) and was expected to rise in the future. An increase that dramatic strains resources making the assessment of the current practices and management improvements essential. In light of this increase in the number of challenges, humanitarian relief agencies need to reevaluate their operations to assess potential areas of improvement.

There has been an ongoing series of catastrophes necessitating food relief shipments from relief organization. Since famine was declared by FSNAU and FEWS NET in July 2011, millions of people have suffered from food insecurity in Somalia. Millions more in the Sahel region of Africa and South Sudan are currently under serious drought and famine conditions which is exacerbated by local conflicts (WFP 2012: http://www.wfp.org/hunger-hot-spots?icn=hunger-hot-spots&ici=homepage-link). In addition to famine, world attention has in the past decade focused on several major natural catastrophes – Katrina in the Gulf of Mexico, the earthquake in Haiti, flood in
Thailand, and the earthquake and Tsunami in Japan, being the most prominent examples. When a natural catastrophe hits, first aid organizations, both public and governmental, as well as national armies are generally asked to provide emergency assistance.

The United States Agency for International Development (USAID) is a governmental organization tasked with providing, among others, food relief shipments to areas affected by such immediate disasters. The organization is a component of the process of the food relief supply chain (see Figure 1). Initially, a government donor like USAID sources needed products and provides an international agency such as the Red Cross/Crescent with information about the available aid. Next, international NGOs are tasked with the finding local NGOs to provide the aid in the recipient country as well as dealing with the logistics of receiving the physical aid. Further down the supply chains, community-based organizations are responsible for the final leg of the distribution of providing the aid shipments to final recipients. The current study focuses on the highlighted, upstream aspects of the humanitarian supply chain.

Similar to other relief aid organizations, USAID struggles with the unpredictability of these emergency situations while accounting for financial and other constraints. USAID’s motivation for its involvement in helping is twofold; On the one hand, the organization provides humanitarian relief aid for altruistic reasons to five main regions of the world: sub-Saharan Africa, Asia, Latin America and the Caribbean, Europe and Euroasia, and the Middle East (USAID, 2011). On the other hand, their goal is
confined by restrictions to the sourcing of the aid. Earmarking, conditions that restrict the use of funds and/or gifts within the recipient organization (Barman, 2008), poses a significant problem to many relief organizations. In the case of USAID, one obligation is the support of the US agricultural economy by sourcing from the US market. USAID delivers the aid shipments to its partner organizations including the United Nations World Food Program (WFP) in these areas trying to alleviate the hardship the affected people are facing. Unlike other relief organizations, it is the responsibility of their partner organizations to fulfill the final leg of logistics: the delivery of food aid to the recipients.

A growing number of scientific research in the field of humanitarian relief organizations emerged, especially, in the past decade. Long and Wood (1995) provide an initial overview of the state of affairs of humanitarian logistics or better, the lack thereof from an academic perspective. Kovacs and Spens (2007) discuss a graphic depiction of the humanitarian supply network interlinking the involved parties, while Oloruntoba and Gray (2006) use a more sequential approach of a supply chain as depicted in Figure 1. Following the latter’s model, we can observe some studies that focus on the final leg of logistics in the humanitarian supply chain, the distribution of the aid with recipients (Balcik, Beamon, Krejci, Muramatsu, & Ramirez, 2010), while others emphasize the big picture and focus on the supply chain as a whole (Balcik et al., 2010; Beamon & Balcik, 2008). Although there has been a call for better understanding the relationship management (Day et al., 2012) and collaboration mechanisms of relief organizations during disasters (Kovacs and Spens, 2011) research with a focus on the upstream humanitarian relief chain is lacking. Whybark (2007) explicitly calls for a more detailed understanding of managing relief inventories while making use of forecasting techniques.
available for commercial use as well as the discussion of ownership and location of inventories.

The implication of earmarking recently surfaced in the literature of disaster relief (Besiou, Stapleton, & Van Wassenhove, 2011; Vayrynen, 2001). While the advantages and disadvantages of earmarking as a technique to control funds have long been discussed in the literature (McCleary, 1991; Minear & Weiss, 1992), its implication to the field of humanitarian operations has its unique implications. Atwood, McPherson and Natisous (2008) clearly outline the detrimental effects of earmarking on USAID’s developmental abilities in countries in need as well as its ability to leverage political strength as a governmental institution. In addition, Wakolbinger and Toyasakis (2010) emphasize its effect on “increased competition, increased prices and wasted resources” as well as the potential reallocation of resources from where they are needed resulting in the inefficient delivery of humanitarian relief.

Improving aspects of humanitarian relief organizations and their logistics is aligned with the understanding of the humanitarian supply chain. In the 1980’s and 1990’s, commercial businesses recognized the need to streamline processes in order to reduce costs and remain competitive. However, relief organizations have only recently become more conscious of such potential strategic advantages (Overstreet et al., 2011) (Beamon, 2004, 2005; Van Wassenhove, 2006). In more traditional business sectors, potential cost savings and the resulting financial benefits (among others) have motivated research on demand forecasting and operating efficient, lean supply chains (Lamming 1996). Another important aspect in the redesign of supply chain is the focus on a reduction in uncertainty (van der Vorst & Beulens, 2002; van der Vorst, Beulens, de Wit,
van Beek, 1998). Both lean supply chains and a reduction of uncertainty are closely linked as increased inventory levels are generally used to buffer uncertainties; a trade-off that is directly contrasting the lean supply chain concept. However, especially in a relief aid context, organizations face high levels of uncertainty as well as stockout costs that are almost immeasurable (Beamon, 2004).

Therefore, the current study contributes to the literature in two ways. First, we provide an empirical assessment of a relief aid organization's supply chain: We discuss the potential of improving the upstream emergency relief supply chain by forecasting USAID's future shipments based on past data. Second, we explore the potential to source globally rather than locally in the donor country to address the issue of ever increasing emergencies, assessing both cost and lead-time implications for the upstream part of the supply chain. And finally, we discuss the implications of earmarking in a specific setting of humanitarian disaster relief aid.

In the following, we investigate humanitarian logistics issues using an empirical rather than the more common analytical approach to assess the performance of global supply chains in a relief aid setting. Specifically, we study whether the relief organizations can use past shipment data to predict future demands in order to improve its supply chain performance and contrast these findings with local versus global sourcing that might enhance the effectiveness of the supply of relief aid. The study focuses on a single relief agency: United States Agency for International Development (USAID) provided us with their emergency relief shipment records for the period from October 1993 until July 2005. We elaborate on USAID, their supply chain and the unique environment faced by relief organizations by evaluating the ability of different
forecasting techniques to improve the relief efforts of USAID. Next, the study discusses sourcing in the United States of America versus sourcing in the emergency recipient country. The paper concludes with an interpretation of the findings and suggestions for emergency relief supply chains.

II. USAID

The USAID, an independent federal US agency, is used in this study as an example of a food relief organization. One of the programs for which USAID is responsible is Food for Peace (FFP), which was established in 1954 under President Dwight D. Eisenhower, as a program to combat hunger around the world - while ensuring US agricultural exports (USAID, 2009). These dual, at times conflicting, objectives create unique challenges for USAID.

Today, there are two aspects of Food For Peace. One is concerned with the long-term assistance to developing countries. FFP develops food security plans with these countries over a 5-year period. The other aspect of the program provides emergency relief in situations such as famines, earthquakes or hurricanes. FFP’s budget for FY 2005 was an estimated $141M US Dollar (Hanrahan, 2006). As part of its mission to provide aid to people around the globe, USAID has worked with various organizations such as the UN World Food Program as well as private voluntary organization (PVO: e.g., American Red Cross, Save the Children Federation, CARE, OXFAM). In cooperation with these partners (Long et al., 1995), FFP’s emergency support program aims to provide short term relief after catastrophes. Its partner organizations are responsible for the actual distribution of the goods, while USAID is responsible for sourcing.
In 2005, USAID operated two major permanent warehouses: Port Rashid (United Arab Emirates) and Lake Charles, LA (United States of America). The warehouse at Port Rashid was set up in 2004. Its location was chosen based on its proximity to many countries in need of food aid as well as the political and economic stability of the UAE. The storage facility at Port Rashid provides food in accordance with the food security plans for the countries in its geographic region (i.e., the Middle East, Europe, Africa, and Asia). The warehouse at Lake Charles stored food to supply aid in unforeseen emergencies. Most of the products kept at the warehouses are commodities in bulk. As this study is solely interested in patterns of emergency responses to food shortages, we focus on the storage facility at Lake Charles.

Most of the products stored at Lake Charles are perishables (e.g., grains) and, therefore, must be turned over regularly. In order to be able to respond to emergencies in a timely manner, USAID keeps a safety stock, as the Lake Charles warehouse is facing extended procurement lead-times. Lead-times are long due to (a) complex bureaucratic ordering cycles and (b) the requirement to purchase products from US farmers. As a federal agency, USAID must follow all applicable US laws, regulations, policies, and procedures, including the purchase of goods from US agricultural markets, in accordance with PL-480 (public law) (Long and Wood 1995). An overview of USAID’s procurement process for food products is depicted in Figure 2.

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Insert Figure 2 Approximately Here

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Figure 3 provides a timeline over the period from a request (call forward) by one of the partner organizations (Red Cross, CARE, OXFAM) or the WFP until the arrival of the goods at the destination port. The partner organization is responsible for the distribution on-site. The approval of a request takes about 15 days, while the procurement process in USAID’s supply chain takes about four months. Depending on the destination, the actual shipping adds up to two months, making the total time, from request to arrival of the goods at the port of destination, more than half a year.¹ This implies that rapid responses to emergency needs rely on goods purchased *ex ante*: USAID acquires food aid for emergency purposes and stores it. Generally, lead-times can be shortened, at increased cost, by shipping the goods by air, however, this fails to address the issue of the long procurement cycle.

¹ The procurement process of USAID’s long-term development program and its emergency relief program is very similar.

Due to these long lead-times, USAID holds a certain level of food available for emergency shipments. Stock-outs are a major challenge to USAID, or any relief organization, and extremely costly. They cause the death of people, leading to large and difficult to quantify costs (Beamon, 2004; Beamon & Kotleba, 2006). Therefore, one solution for the effectiveness of USAID is to have good forecasting methods in place that allow the organization to estimate food demands and inventories over several months. Accurate forecasting could significantly lower inventory levels, which in turn imply a reduction of warehousing costs.
In the following, we investigate the USAID’s supply chain in more detail to determine its efficiency and effectiveness as a global relief aid organization. One measure of effectiveness in the case at hand is the ability to accurately forecast demand in order to account for the long lead-times in the supply chain. Another measure is weighing local versus global sourcing strategies for their cost efficiency and their rapid response times.

III. ANALYSIS

3.1. Forecasting

The ultimate goal of demand forecasts is better management of future demand while simultaneously decreasing inventory levels, increasing customer satisfaction (Zhao, Xie, & Lau, 2001) and reducing cost. Although relief organizations are not profit-maximizing firms, the more efficiently food-relief supply chains operate, the shorter the lead-times and the less human suffering. Cost savings from better inventory management can translate into additional food supplies for those in need.

Using past shipment data from USAID, we attempted to forecast future emergency relief shipment patterns. However, analysis of the data indicated that a pattern for shipments cannot be accurately predicted at commodity or country level based on past shipments alone. Next, we aggregated commodities into product groups\(^2\) and country level into regions to smoothen demand patterns, but the improvements in results were limited. As can be observed in Table 1, there is a trend of shipping most food aid to Africa. Thus, we suggest that USAID pre-position the food inventory closer to Africa to faster respond to the emergencies in that continent. We believe that this is a viable

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\(^2\) For example, the product group Beans is comprised of black, garbanzo, great northern, kidney, navy, pinto and red beans.
solution as it does not violate the mandate of USAID to source food commodities from US farmers. USAID should especially consider revising its policy of shipping emergency shipments from its Lake Charles warehouse in the US. Due to its closer geographic proximity, the Port Rashid warehouse in the UAE, which is currently used for long-term food security aid shipments, could better fulfill the needs of the African continent.

Insert Table 1 Approximately Here

Pre-positioning its emergency and long-term inventories together in the Port-Rashid warehouse could bring statistical pooling benefits to USAID. Sharing and pooling of inventory across the emergency and long-term food security programs may help overcome some obsolescence problems, as well as increasing the responsiveness of USAID in times of emergency. Due to the relative stability of demand pattern of the long-term program, its inventory planning is simpler, resulting in regular inventory turnovers. Commonly used SKUs across both programs could be managed in coordination at the warehouses, such that the long lead-times of emergency shipments from the US could be absorbed by the existing stocks in the development programs.

3.2. Supply Chain Redesign

We next investigate the efficiency of USAID’s current sourcing strategy. Literature in the field of supply chain management has stressed the advantages of global sourcing as it can provide a competitive edge (Dubois & Araujo, 2007; Gelderman & Semeijn, 2006). Global purchasing and sourcing are associated with reduced costs and
cycle times, higher productivity, as well as better quality, delivery and response time to customer demands (Arroyo-Lopez & Bitran, 2009; Loppacher, Luci, Cagliano, & Spina, 2006; Quintens, Matthyssens, & Faes, 2005). While global purchasing emphasizes only the internationalization of the procurement act, global sourcing includes the strategic perspective of the organization (Trent & Monczka, 2003).

In the field of relief aid, today’s consensus is that procuring globally increases efficiency (Brause 2009; Rienstra 2004). Global purchasing in a relief context refers to sourcing close to demand rather than in donor countries. As observed earlier, the majority of aid is required in Africa. In 2003, 60% of the United Nations relief aid went to Africa, however, only 10% was sourced from Africa that same year (Rienstra, 2004). Sourcing in the areas affected by catastrophes supports the local economy (WFP, 2006) but requires clear guidelines and strategies. Advocates argue that procuring from recipient countries (RC)’ markets enables affected regions to become independent of aid in a shorter time period than otherwise (Hoffman, Gardner, Just, & Hueth, 1994). In 2003, the United Nation’s General Assembly passed a procurement reform that encourages sourcing from developing countries and countries with economies in transition (United Nations, 2009). Since the passing of the resolution, purchases from these countries have slowly increased: from about 45% in 2004 to 54% in 2008 (United Nations 2009). Additionally, food purchases for emergency relief aid are generic and as such the organizations require limited product expertise in the purchasing process, facilitating procurement in foreign markets (Trent et al., 2003). Another advantage of sourcing in RCs is that due to closer proximity to the emergency, transportation costs can be reduced (WFP, 2006).
However, there are several advantages to procurement from a known, single market. Restricting sourcing to the donor’s country (DC) market allows organizations to develop an intimate knowledge of the market and its suppliers as well as the quality and prices of the commodities (Rienstra, 2004). DCs are mostly located in the industrialized nations implying a level of predictability and stability of the market that is not necessarily present in developing countries (Trautmann et al. 2009) – especially those affected by emergencies. Moreover, sourcing from RCs can lead to an increase in commodity prices creating additional hardship for the local population. Introducing additional supplies can help avoid inflation and stabilize prices (GAO, 2009). Using a centralized sourcing approach like USAID allows firms to exercise more control in the procurement process capturing economies of scale and scope (Arnold, 1999) making the process less costly. Finally, lobbying efforts from both producers and shippers from the donor country create additional incentives, especially for government dependent organizations such as USAID, to source in the DC market.

The literature argues that global sourcing is more common with centralized purchasing (Loppacher et al., 2006). However, relief organizations are different: USAID is centrally managed from the USA but its founding objectives require the organization to source from the US market, in order to achieve its second objective of subsidizing the US agricultural sector. Hence, although having a centralized organizational structure, the organization applies a focused donor country (DC) rather than global recipient country (RC) sourcing approach. A shift in sourcing strategy towards procurement in RCs would entail a shift in control of the purchase from USAID.
to its partner organizations who have a better understanding of the RC’s market; hence, towards a decentralized sourcing model.

Another difference from traditional businesses, emergencies take place in various countries around the world. Although we narrowed down the main geographic scope to the continent of Africa, it is difficult to predict where exactly an emergency will occur. This leads to several drawbacks with respect to a global sourcing strategy. For one, the relief organization is required to have a supplier network available immediately in times of an emergency in order to supply quick relief. This, at times, can entail the procurement of goods from unknown and potentially unreliable sources. Especially taking into account, that once the emergency hits, the suppliers on the market may take advantage of the situation by increasing prices or delivering questionable quality. For another, unlike a traditional business that can use past observations about its procurement to judge a supplier for the future and, hence, build and have trust in the relationship (Kotabe, Martin, & Domoto, 2003), procurements in the emergency relief aid setting are one-time procurements and, hence, hold little incentives for the supplier to build a long-term relationship.

The focus of the second aspect of this study is the comparison of USAID’s sourcing options: procuring commodities from the USA (DC) versus sourcing in RCs. In the following, we investigate whether global sourcing provides the expected advantages over local sourcing for USAID in particular and apply these findings to relief organizations in general.
3.2.1. Methodology

The dataset used in this study is provided by USAID and documents commodity shipments from its Lake Charles warehouse, listed by date of shipment (October 1993 to July 2005). Information is available for 52 different stock-keeping units (SKU) by region (Africa, Asia, Europe, Near East, and South America) and by nation (69 countries). Most of the SKUs are perishable and need to be cycled through the warehouse within a 12 months time frame. The shipment data are measured both in weight (metric tons) and value (US Dollar)\(^3\).

In order to compare different procurement locations, we supplement the USAID data with information published by the Food and Agriculture Organization (FAO) (FAOSTAT 2009). FAO provides average yearly information about historical crop and livestock producer prices in various countries in US Dollar per metric ton. We gathered the prices for the period from 1995 to 2004 for six commodities: beans, corn, green peas, lentils, wheat and rice, and compared them to prices paid by USAID for a set of countries\(^4\): Bosnia-Herzegovina, Rwanda, Ethiopia, El Salvador and Nicaragua\(^5\). In Table 2, average USAID costs of commodities are listed next to the recipient countries’ prices.\(^6\) Although providing a comparison for critical countries such as Iraq and Afghanistan is desirable, these countries are war-torn and no reliable national data is available.

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\(^3\) Based on the average commodity price for the past six months, as calculated by the US Department of Agriculture.

\(^4\) Provided that prices were available from both sources.

\(^5\) These countries are geographically located in three different continents which make the sample more representative.

\(^6\) For some country-commodity pairings, not all information was available resulting in missing observations marked by N/A.
3.2.2. Results

Deriving the cost of procurement for a number of recipient countries by multiplying the weight (MT) of commodities in USAID’s emergency shipments and the national commodity prices in RCs over years, we contrast these to the value (US$) of shipments in the USAID dataset. Column A and B in Table 3 provide a summary. For example, USAID procured over US$24 million worth of lentils for Ethiopia between 1994 and 2004. Had the lentils been purchased in Ethiopia, these costs would have been reduced to US$16.9 million. Then again, the wheat shipped to Rwanda over the investigated time period was purchased for about US$1.3 million, significantly less than the estimated US$4.5 million in the Rwandan market. Overall, it can be observed that the costs of USAID in-kind food aid may be both higher and lower than in the destination countries – depending on commodity and recipient country.
into account. Therefore, we investigate the impact of different levels of transportation cost on USAID’s cost efficiency in US versus recipient countries’ sourcing. Walker (Walker, 2004)’s Ocean Freight Rates (FR) for heavy grain provide some guidelines for long-distance transportation cost but also show that there is significant fluctuation in shipment cost from about $10 to $80/MT. Thus, we employ a set of different FR scenarios: US$15, US$30 and US$75 per metric ton. US$30 per metric ton is an approximation of the average freight rate between 1998 and 2004 (Walker, 2004). US$15 per metric ton is used as a low transportation cost scenario reflective of the relatively low cost at the end of 1998 and mid 2002. In recent years there has been a sharp increase in transportation cost: the third scenario’s US$75 per metric ton provides an estimate for these higher FRs. Applying these freight rates to the commodities in our dataset, we compute total costs (combination of purchase and transportation cost) in columns C, D and E in Table 3. Next, we compare USAID’s total procurement cost (purchasing and ocean freight) to the costs they would incur when procuring commodities in the recipient countries by providing the total cost ratios for the different scenarios.

Overall, we have four different scenarios. Scenario 0, base scenario, reflects just the procurement cost in both the RC and the USA. We find that based on these costs alone, sourcing from the USA is cheaper in the majority of country-commodity pairs, i.e. beans sourced in the USA are about 44% of the costs of Bosnia-Herzegovina. Corn and wheat are procured cheaper in the US than in the RC and beans are also generally less costly in the US. Rice and lentils are significantly more expensive and green peas are slightly more expensive in the USA than in the recipient countries. Scenario 1 provides insights into total cost with relatively low shipping cost of US$15 per metric ton. Here,
we find similar results to the base scenario. The only difference is that wheat for Ethiopia is now 8% more expensive when procured from the USA rather than the RC. Scenario 2 reflects average shipping cost. With this increase to US$30 per metric ton FR, we find that total cost of wheat for Bosnia-Herzegovina is slightly cheaper (3%) when procured in the RC. Scenario 3 is a reflection of high transportation costs of US$75 per metric ton. In this setting, even corn can at times be procured more cost efficiently in the RC. Costs of rice shipped from the US market to both Nicaragua and El Salvador is about twice the cost of that in the RC’s markets. Overall, we observe across the different scenarios that both type of commodity as well as recipient country impact the cost efficiency ratio between US and RC procurement.

In Table 4, the data is aggregated across commodities to observe country level cost (dis)advantages of sourcing in the recipient country’s national market over sourcing from the US agricultural market. Again, we employ different freight cost scenarios. We find that in the base scenario (no freight cost), sourcing from Bosnia-Herzegovina, El Salvador and Rwanda is more expensive than sourcing from the USA, while sourcing from Ethiopia and Nicaragua would result in some savings. These results are consistent in Scenario 1 (low freight rates) and Scenario 2 (average freight rates). Only in Scenario 3 (high freight rates) do we observe a change in this pattern. In this setting, sourcing from El Salvador becomes more cost efficient than sourcing in the USA.

Contrary to expectations, the results display no clear cost advantage of sourcing in recipient countries over sourcing from the USA. Rather, the results show that for certain countries, sourcing from the USA is more cost efficient (across the different scenarios) while in others RC sourcing is cheaper. The civil war in Bosnia-Herzegovina and the
severe famine in Rwanda resulted in elevated market prices providing some explanation for these findings. For Ethiopia, the biggest aid recipient in our dataset, one can observe that despite all the hardship it faces, procurement on site is a cost efficient alternative to the current USAID policy of sourcing locally from US markets.

Next, we test for cost efficiencies to sourcing in recipient countries at a commodity level. We aggregated shipments across countries and the results suggest that the US market has a distinct cost advantage for procuring corn and beans (Table 5) across all freight cost scenarios. Lentils, rice and green peas, on the other hand, can be sourced more cost efficiently in the recipient countries. The findings are not as distinct for wheat, which accounts for the largest volume of all emergency aid shipments. In the base scenario we find that sourcing wheat on the US market is slightly cheaper (2.7%) than sourcing it from the recipient countries’ markets. However, in scenarios 1 to 3, the additional freight charges significantly increase the cost resulting in cheaper procurement costs in the RC’s market.

In Table 6, we provide an overview of potential savings relief organizations can realize when using flexible sourcing rather than a pure RC or donor country sourcing. Using USAID data, we find that sourcing in the RC provides savings over sourcing in the
US. However, optimizing procurement cost by choosing the source from the country with the lower cost, can provide additional savings. We find that in the base setting, USAID could realize savings of 3.2%. These savings increase as FRs increase. In the final scenario with transportation cost of US$75 per metric ton, USAID could save as much as 29.1%.

Proponents of RC sourcing argue that purchasing closer to the source reduces procurement cost. We find that, overall, they are correct. However, additional savings can be realized by taking each commodity-country pair into account when making sourcing decisions. The final column in Table 6 shows that across scenarios, additional savings range from 6.8% (no freight charges) to 2.5% (US$75/MT) when sourcing from the lowest cost alternative.

IV. DISCUSSION

In this study, we have used historical emergency food aid shipment data of USAID to (i) predict future USAID shipments (ii) assess cost efficiency of USAID's emergency relief supply chain in terms of global vs. recipient country sourcing. Our findings show that other than the majority of the food aid going to a single continent (Africa), there is no clear pattern in USAID's food aid shipment at commodity and country level. We suggest that relief agencies analyze their historical shipments data for trends and pre-position the aid closer to the common disaster areas to reduce lead-times
and increase responsiveness. However, alternative means to predict the demand for emergency relief are still needed. Historical data have only limited applicability. Combining independent forecasts generally improves accuracy due to a decrease in forecast error (Clemen, 1989; Goodwin, 2000; Makridakis & Winkler, 1983) particularly if the combination follows an explicit procedure (Lawrence, Edmundson, & O'Connor, 1986). Forecasting could improve from the inclusion of war news and weather reports for the regions affected by food aid: a kind of judgmental forecasting. Judgmental forecasting describes a heuristics methodology for predicting and assessing future demand (Gardner, Anderson-Fletcher, & Wicks, 2001). It includes expert opinions, panel consensus, market surveys, as well as “soft” information, such as rumors, hearsay, and news. Sometimes, it is referred to as subjective forecasting, as it does not follow strict statistical rules (Sanders & Ritzman, 2004). Relating judgmental forecasting to our study, we have observed that forecasting based on historical shipments data did not work and other subjective forecasting techniques, such as judgmental forecasting need to be studied in the context of relief aid shipments.

Sourcing commodities where the emergency occurs rather than in the donor country is increasingly being practiced by the United Nations and some European countries. The closeness in proximity to the calamity allows quicker response time. Hence, we contrasted procuring from the US market to a select number of recipient countries and found that the type of commodity and local market prices are key determinants in efficient sourcing decisions. The US market has a cost advantage for some products such as corns and beans, while other goods such as rice and lentils can be sourced more cost efficiently in RCs. Therefore, we conclude that there is no standard
sourcing solution in emergency relief. Rather, relief organizations need to carefully consider costs and availability on a commodity and country basis to achieve the greatest cost efficiencies. In cases where sourcing is more cost efficient in the USA or where there are no significant cost differences, sourcing from a known market with known, stable prices can provide additional benefits that are not captured here such as reducing search cost and improving the quality of commodities purchased. This is especially true for products that are sourced for long-term food project or prepositioning. However, when costs are significantly cheaper in the RCs, sourcing from markets close to the affected area is the more cost efficient option.

Proximity of the recipient country to the donor country is an important factor influencing response time and shipping rates. Shipping from the US to Africa can take up to two months, a significant amount of time, especially when dealing with emergencies. Sourcing closer to the emergency eliminates part of the lead-time. In addition with decreased transportation cost, this leads us to propose that, for emergency relief organizations, the use of recipient country sourcing can provide significant cost efficiencies. RC sourcing is appropriate for certain product-country pairs, especially those in geographically distant recipient countries.

Finally, our findings also point to the inefficiencies created by earmarking of donor funds. Most relief agencies are funded by public resources and they are subject to constraints in their procurement and logistics policies similar to USAID. Our findings show that USAID's mandate to source US grown food commodities results in significant supply chain cost inefficiencies. With rising oil prices, the magnitude of these inefficiencies is likely to further increase. A Government Accountability Office report (
V. IMPLICATIONS

This study has significant implications to relief agencies in general and to USAID in particular. We show that there is an untapped potential in the supply chains of relief agencies to reduce procurement, logistics and inventory related costs through three means: global sourcing, variety reduction and use of past shipment data. These measures can increase the agility of the emergency relief supply chains. For example, sourcing food commodities in the geographic vicinity of the recipient country can significantly reduce lead-times. Alternatively, relief organizations can choose to pre-position commodities in closer proximity to the beneficiaries as well as use joint management of inventories across emergency and long-term food aid programs. In terms of USAID, this entails the pre-positioning of potential emergency relief goods in the Port Rashid warehouse rather than the Lake Charles warehouse. Due to its closer geographic proximity to Africa, lead times from this warehouse to the majority of beneficiaries are shorter. In addition, USAID can more easily interchange inventories stocked for the emergency program with the FFP program, thereby, further reducing the likelihood of obsolesce of SKUs.

Our study contributes to the ongoing discussions about the Food for Peace Act (PL-480), which mandates USAID to combat global food insecurity through US-grown food donations (comparable to in-kind donations). Recently, the interpretation of this

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7 Relief organizations need to, among others, consider issues of local corruption, political and economical stability when choosing the location of these pre-positioning warehouses.
mandate has been more lenient: the Food for Peace Act of 2008 released some of the tight US-sourcing requirements and allowed USAID to provide grants to non-profit, international and private voluntary organizations for some very specific purposes, such as the preparation and distribution of the aid food. The US Congress at times appropriates funding for USAID through other acts, which then can be used to source food products globally. Our findings suggest that the dual objectives of the Food for Peace Program to provide food aid and support the US farmers do not lead to the most efficient delivery of the food aid. While acknowledging that earmarking of funds to purchase only US grown agricultural products has been instrumental in continuation of congressional support to the funding of food for peace program, we would still like to underline the fact that earmarking also results in both misallocation of resources and inefficient aid delivery. However, unlike critics of the USAID system, we stress that using a hybrid approach of sourcing both from the DC as well as RCs provides the best solution. In addition to being cost efficient, it allows this organization – as well as other relief organization that accept in-kind donations – to provide timely help while balancing the needs of the donors country interest as well. Overall, we recommend that USAID be given more flexibility to source its emergency relief food requirements across the globe while the organization in turn agrees to source in the donor country when appropriate.

VI. CONCLUSION

In conclusion, we find that focusing on the upstream supply chain operations could help relief agencies substantially increase the efficiency and responsiveness of their

---

8 For example, the 2009 Omnibus Appropriations Act provided $75 million to USAID for global food security.
emergency relief aid programs. These organizations are facing many uncertainties and they are operating under conflicting pressures. The findings suggest that assessing and re-designing some aspects of relief supply chains can help relief agencies achieve their missions faster and more efficiently. Historical shipment data could be used to pre-position emergency relief supplies in warehouses located closer to the beneficiaries and bundling certain product groups in these warehouses could help relief agencies have a more robust and agile supply chain, even under some legal sourcing constraints. However, the big bang for the buck lies in agencies adopting a global sourcing strategy. Sourcing only in the donor country’s commodity market or buying only in the recipient country are both not optimal solutions and have cost implications.

In making choices for global sourcing, USAID and other organizations like it should clearly distinguish between commodities and situations. As demonstrated, at times, time and money savings can be realized when purchasing the commodities in either of the donor or recipient markets. Developing a global sourcing strategy supported by stringent administrative and inventory management tools will allow relief agencies to use their resources more effectively while increasing the amount of aid provided. Finally, as being one of the few empirical studies using actual USAID shipment data, we expect that our findings will contribute to an ongoing discussion about changing USAID’s mandate and providing the agency with more flexibility to source some of the food aid commodities globally.

6.1. Limitations and Suggestions for Future Research

A limitation of the USAID dataset is that it includes actual shipments made, not requested shipments (i.e., the actual demand versus realized demand): No information is
available about fill rates of aid requests. The data lacks information about the level of safety stock generally held at the warehouse. This is a potential reason for the limited findings in the forecasting section. In addition, there is a lack of information on search cost. Sourcing in the RC implies finding suppliers, which can introduce additional cost into the relationship that are not captured in our model.

The current study addresses the issue of relief aid from a sourcing organization’s perspective. We compare RC sourcing to global sourcing and provide suggestions for the redesign of relief aid supply chains without addressing issues in the actual distribution of the aid. Given that the majority of recipient countries have limited or completely missing infrastructure, the final leg is often challenging and expensive. Therefore, additional research is needed to address the redesign of the down-stream relief aid supply chain: a distributor’s perspective.

This study disregards US federal requirements to ship a certain percentage of commodities with carriers operating under a US flag. Additional insights into the effect of these requirements on the sourcing decision can provide further support for loosening the regulations governing organization like USAID due to the need to comply with conflicting objectives. Similarly, we simplify the issue of transportation cost by using the scenario approach. However, shipping to Sudan on the east coast of Africa is most likely more costly than shipping to El Salvador in Central America. Generally, more empirical research in the field of relief aid is needed to help improve the speed with which aid reaches those in need. The constantly changing environment implies that successful operations need to have flexible and adaptive supply chains in place.
This paper investigates the redesign of the supply chain by suggesting a combination of DC and RC sourcing and pre-positioning closer to the beneficiaries. While we considered varying transportation cost, future analysis of issues relating to liability litigations that arise in an international context and when changing purchase and storage location of the goods could provide additional rational for sourcing in the donor countries rather than recipient countries.
FIGURE 1
A Typical Humanitarian Supply Chain

Adapted from: Okuruntoba and Gray 2006 [emphasis on Government donor, International agency and International NGOs added]
FIGURE 2
Flow Chart of USAID's Procurement Process

Title II Commodity Procurement Flow Diagram

START

CALL FORWARD ORIGINATION

CALL FORWARD ORIGINATION

USDA/ECO enters requested commodity information into USDA Food Aid Request Entry System (FARES). This is called a Call Forward.

COMMODITY & FREIGHT OFFERS RECEIVED BY INDUSTRY

If offer is reasonable, procurement is made. If offer is unreasonable, the FP-HR panel makes a decision.

USDA/ECO REVIEW and TENDER

USDA in Kansas City reviews and prepares the industry tender for commodity and freight procurement.

AG-HCC GROUP MAKES PROCUREMENT DECISION

USDA FP-HR makes joint decisions on what to purchase. Desired purchase may be the result for unacceptable prices.

COMMODITY ARE PURCHASED AND SHIPPED

FINISH

Source: Milano, USAID, 2006

9 FFP CBO: Country Backstop Officer – regional program managers
POD – Program Operations Division
USDA – United States Department of Agriculture
EOD – Export Operations Division
KCCO – Kansas City Commodity Office, USDA
OAA – Office of Acquisition and Assistance
FIGURE 3
Procurement Timeline

Food for Peace - Call Forward Timeline

- 2/4 - 2/10: USDA/Kansas City finalizes and issues the purchase
- 2/17 - 2/23: USDA/Kansas City finalizes and issues the purchase
- 3/8: Bids are accepted and commodity contracts are awarded; USDA/USAID consult on capacity/price; volume adjustments may be made at this point
- 3/14: Cargo is released by USDA to PVOs for freight solicitation
- 3/27 - 3/30: PVO awards freight contracts & notifies USDA of carrier terminal nomination
- 5/25: ETA of commodities at US port (B)

Program budget is approved; Call Forward is entered into FARES by the 4th monthly.

Vendor bids are due.

Freight indications due to USDA.

Vendor shipping period (B)

Vendor shipping period (A)

Vendor shipping period (A)

Cargo is released by USDA to PVO for freight solicitation.

ETA of commodity at US port (B)

ETA of commodity at US port (A)

ETA arrival/leadship of vessel

Prepared by FFP/POD, G. Milano. 5/06

Source: Milano, USAID, 2006 ()
TABLE 1
Shipments (in MT) per Continent by Year

<table>
<thead>
<tr>
<th>Year</th>
<th>Africa</th>
<th>Asia</th>
<th>Europe</th>
<th>Latin America</th>
<th>Near East</th>
<th>Unspecified</th>
</tr>
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<tbody>
<tr>
<td>1993¹</td>
<td>320,060</td>
<td>97,200</td>
<td>5,480</td>
<td>3,270</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1994</td>
<td>719,595</td>
<td>14,000</td>
<td>157,530</td>
<td>33,180</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1995</td>
<td>800,400</td>
<td>79,590</td>
<td>231,260</td>
<td>9,500</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1996</td>
<td>438,180</td>
<td>64,050</td>
<td>90,510</td>
<td>6,300</td>
<td>36,500</td>
<td></td>
</tr>
<tr>
<td>1997</td>
<td>471,650</td>
<td>264,710</td>
<td>70,540</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1998</td>
<td>425,010</td>
<td>304,500</td>
<td>105,810</td>
<td>109,397</td>
<td>1,500</td>
<td>19,620</td>
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<tr>
<td>1999</td>
<td>440,117</td>
<td>387,820</td>
<td>87,147</td>
<td>29,162</td>
<td>1,070</td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td>726,000</td>
<td>55,110</td>
<td>129,240</td>
<td>10,000</td>
<td></td>
<td>1,202</td>
</tr>
<tr>
<td>2001</td>
<td>260,600</td>
<td>154,780</td>
<td>99,770</td>
<td>9,830</td>
<td>2,000</td>
<td>90</td>
</tr>
<tr>
<td>2002</td>
<td>803,510</td>
<td>200,850</td>
<td>7,000</td>
<td>15,270</td>
<td>2,000</td>
<td></td>
</tr>
<tr>
<td>2003</td>
<td>2,520,870</td>
<td>157,550</td>
<td>67,500</td>
<td>29,450</td>
<td>190,060</td>
<td></td>
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<tr>
<td>2004</td>
<td>1,671,080</td>
<td>117,350</td>
<td>2,530</td>
<td>8,820</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2005⁶</td>
<td>501,520</td>
<td>62,400</td>
<td>2,600</td>
<td>15,580</td>
<td>73,630</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>10,098,592</td>
<td>1,862,710</td>
<td>1,148,637</td>
<td>266,389</td>
<td>250,910</td>
<td>95,612</td>
</tr>
</tbody>
</table>

| %      | 73.59   | 13.57    | 8.37     | 1.94          | 1.83      | 0.70        | 100      |

¹ 1993 and 2005 only includes data for some months of the year (1993: October to December, 2005: January to July)
TABLE 2

Comparison of Recipient Countries' versus USAID's Commodity Prices

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Beans</td>
<td>Corn</td>
<td>Wheat</td>
<td>Wheat</td>
<td>Green Peas</td>
</tr>
<tr>
<td>1995</td>
<td>462/460</td>
<td>195/106</td>
<td>N/A</td>
<td>253/148</td>
<td>N/A</td>
</tr>
<tr>
<td>1996</td>
<td>323/600</td>
<td>147/122</td>
<td>N/A</td>
<td>214/200</td>
<td>N/A</td>
</tr>
<tr>
<td>1997</td>
<td>634/550</td>
<td>N/A</td>
<td>N/A</td>
<td>192/165</td>
<td>N/A</td>
</tr>
<tr>
<td>1998</td>
<td>542/550</td>
<td>347/133</td>
<td>567/166</td>
<td>205/152</td>
<td>251/238</td>
</tr>
<tr>
<td>1999</td>
<td>N/A</td>
<td>228/122</td>
<td>N/A</td>
<td>220/167</td>
<td>252/201</td>
</tr>
<tr>
<td>2000</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>199/148</td>
<td>227/210</td>
</tr>
<tr>
<td>2001</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>145/138</td>
<td>N/A</td>
</tr>
<tr>
<td>2002</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>122/181</td>
<td>203/375</td>
</tr>
<tr>
<td>2003</td>
<td>185/388</td>
<td>108/147</td>
<td>N/A</td>
<td>179/182</td>
<td>214/312</td>
</tr>
<tr>
<td>2004</td>
<td>N/A</td>
<td>102/102</td>
<td>N/A</td>
<td>179/168</td>
<td>254/289</td>
</tr>
</tbody>
</table>
### TABLE 3
Comparison of Recipient Countries' versus USAID's Total Costs – 3 Freight Rate (FR) Scenarios

<table>
<thead>
<tr>
<th>Country</th>
<th>Commodity</th>
<th>RC Purchase Cost</th>
<th>USAID Purchase Cost</th>
<th>B + $15 FR/MT</th>
<th>B + $30 FR/MT</th>
<th>B + $75 FR/MT</th>
<th>USAID/RC Total Cost Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
<td>Scenario 0</td>
</tr>
<tr>
<td>Bosnia-Herzegovina</td>
<td>Beans</td>
<td>5,598,000</td>
<td>2,448,480</td>
<td>2,520,710</td>
<td>2,592,940</td>
<td>2,809,631</td>
<td>0.44</td>
</tr>
<tr>
<td></td>
<td>Wheat</td>
<td>6,158,850</td>
<td>5,353,250</td>
<td>5,843,072</td>
<td>6,332,894</td>
<td>7,802,362</td>
<td>0.87</td>
</tr>
<tr>
<td>El Salvador</td>
<td>Beans</td>
<td>822,920</td>
<td>584,050</td>
<td>601,279</td>
<td>618,509</td>
<td>670,197</td>
<td>0.71</td>
</tr>
<tr>
<td></td>
<td>Corn</td>
<td>1,231,440</td>
<td>656,460</td>
<td>733,922</td>
<td>811,385</td>
<td>1,043,771</td>
<td>0.53</td>
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<tr>
<td></td>
<td>Rice</td>
<td>530,280</td>
<td>842,940</td>
<td>879,186</td>
<td>915,433</td>
<td>1,024,172</td>
<td>1.59</td>
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<tr>
<td>Ethiopia</td>
<td>Green Peas</td>
<td>1,403,820</td>
<td>1,489,220</td>
<td>1,543,577</td>
<td>1,597,933</td>
<td>1,761,003</td>
<td>1.06</td>
</tr>
<tr>
<td></td>
<td>Lentils</td>
<td>16,916,040</td>
<td>24,058,660</td>
<td>25,393,916</td>
<td>26,729,171</td>
<td>30,746,967</td>
<td>1.42</td>
</tr>
<tr>
<td></td>
<td>Wheat</td>
<td>285,438,235</td>
<td>281,690,550</td>
<td>307,465,235</td>
<td>333,239,921</td>
<td>410,563,977</td>
<td>0.99</td>
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<tr>
<td>Nicaragua</td>
<td>Beans</td>
<td>2,900,950</td>
<td>1,839,320</td>
<td>1,893,580</td>
<td>1,947,840</td>
<td>2,110,620</td>
<td>0.63</td>
</tr>
<tr>
<td></td>
<td>Corn</td>
<td>1,175,430</td>
<td>1,004,670</td>
<td>1,123,221</td>
<td>1,241,772</td>
<td>1,597,425</td>
<td>0.85</td>
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<tr>
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<td>Rice</td>
<td>4,513,360</td>
<td>7,465,055</td>
<td>7,786,052</td>
<td>8,107,050</td>
<td>9,070,042</td>
<td>1.65</td>
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<tr>
<td>Rwanda</td>
<td>Beans</td>
<td>14,762,740</td>
<td>15,780,800</td>
<td>16,246,334</td>
<td>16,711,867</td>
<td>18,108,468</td>
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<td></td>
<td>Corn</td>
<td>28,726,010</td>
<td>16,173,720</td>
<td>18,082,219</td>
<td>19,990,718</td>
<td>25,716,215</td>
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<td></td>
<td>Wheat</td>
<td>4,536,000</td>
<td>1,328,000</td>
<td>1,449,512</td>
<td>1,571,024</td>
<td>1,935,560</td>
<td>0.29</td>
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</table>
TABLE 4  
Comparison of Recipient Country Sourcing vs. US Sourcing for Selected Countries

<table>
<thead>
<tr>
<th>Country</th>
<th>USAID/RC Procurement Cost Scenario 0</th>
<th>USAID/RC Cost at $15 FR/MT Scenario 1</th>
<th>USAID/RC Cost at $30 FR/MT Scenario 2</th>
<th>USAID/RC Cost at $75 FR/MT Scenario 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bosnia-Herzegovina</td>
<td>0.66</td>
<td>0.71</td>
<td>0.76</td>
<td>0.9</td>
</tr>
<tr>
<td>(Beans &amp; Wheat)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>El Salvador</td>
<td>0.81</td>
<td>0.86</td>
<td>0.91</td>
<td>1.08</td>
</tr>
<tr>
<td>(Beans, Corn &amp; Rice)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ethiopia</td>
<td>1.01</td>
<td>1.1</td>
<td>1.19</td>
<td>1.46</td>
</tr>
<tr>
<td>(Gr. Peas, Lentils &amp; Wheat)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nicaragua</td>
<td>1.2</td>
<td>1.26</td>
<td>1.32</td>
<td>1.49</td>
</tr>
<tr>
<td>(Beans, Corn &amp; Rice)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rwanda</td>
<td>0.69</td>
<td>0.75</td>
<td>0.8</td>
<td>0.95</td>
</tr>
<tr>
<td>(Beans, Corn &amp; Wheat)</td>
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### TABLE 5
Comparison of Recipient Country Sourcing vs. US Sourcing for Selected Commodities

<table>
<thead>
<tr>
<th>Scenario</th>
<th>USAID/RC Procurement Cost at $15 FR/MT</th>
<th>USAID/RC Cost at $30 FR/MT</th>
<th>USAID/RC Cost at $75 FR/MT</th>
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<tbody>
<tr>
<td>Scenario 0</td>
<td>0.57</td>
<td>0.64</td>
<td>0.71</td>
</tr>
<tr>
<td>Scenario 1</td>
<td>0.86</td>
<td>0.88</td>
<td>0.91</td>
</tr>
<tr>
<td>Scenario 2</td>
<td>0.97</td>
<td>1.06</td>
<td>1.15</td>
</tr>
<tr>
<td>Scenario 3</td>
<td>1.06</td>
<td>1.10</td>
<td>1.14</td>
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<tr>
<td>Corn</td>
<td>1.06</td>
<td>1.10</td>
<td>1.14</td>
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<td>Beans</td>
<td>1.42</td>
<td>1.50</td>
<td>1.58</td>
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<tr>
<td>Wheat</td>
<td>1.65</td>
<td>1.72</td>
<td>1.79</td>
</tr>
<tr>
<td>Green Peas</td>
<td>1.65</td>
<td>1.72</td>
<td>1.79</td>
</tr>
<tr>
<td>Lentils</td>
<td>1.65</td>
<td>1.72</td>
<td>1.79</td>
</tr>
<tr>
<td>Rice</td>
<td>1.65</td>
<td>1.72</td>
<td>1.79</td>
</tr>
</tbody>
</table>
## TABLE 6  
Savings from Flexible Sourcing

<table>
<thead>
<tr>
<th></th>
<th>US Sourcing only</th>
<th>Recipient Country Sourcing only</th>
<th>Rational Purchase Decision Min (US, RC)</th>
<th>Savings from Rational Choice over US Sourcing A/C</th>
<th>Savings from Rational Choice over RC Sourcing B/C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total procurement cost: No FC</td>
<td>360,715,175</td>
<td>374,714,075</td>
<td>349,204,380</td>
<td>3.2 %</td>
<td>6.8 %</td>
</tr>
<tr>
<td>Total procurement cost at $15 FC/MT</td>
<td>391,561,815</td>
<td>374,714,075</td>
<td>355,811,990</td>
<td>9.1 %</td>
<td>5.0%</td>
</tr>
<tr>
<td>Total procurement cost at $30 FC/MT</td>
<td>422,408,457</td>
<td>374,714,075</td>
<td>358,431,171</td>
<td>15.1 %</td>
<td>4.3%</td>
</tr>
<tr>
<td>Total procurement cost at $75 FC/MT</td>
<td>514,960,410</td>
<td>374,714,075</td>
<td>365,184,749</td>
<td>29.1 %</td>
<td>2.5%</td>
</tr>
</tbody>
</table>
REFERENCES


Our responsibility is to provide strong academic programs that instill excellence, confidence and strong leadership skills in our graduates. Our aim is to (1) promote critical and independent thinking, (2) foster personal responsibility and (3) develop students whose performance and commitment mark them as leaders contributing to the business community and society. The College will serve as a center for business scholarship, creative research and outreach activities to the citizens and institutions of the State of Rhode Island as well as the regional, national and international communities.

The creation of this working paper series has been funded by an endowment established by William A. Orme, URI College of Business Administration, Class of 1949 and former head of the General Electric Foundation. This working paper series is intended to permit faculty members to obtain feedback on research activities before the research is submitted to academic and professional journals and professional associations for presentations.

An award is presented annually for the most outstanding paper submitted.

The University of Rhode Island started to offer undergraduate business administration courses in 1923. In 1962, the MBA program was introduced and the PhD program began in the mid 1980s. The College of Business Administration is accredited by The AACSB International - The Association to Advance Collegiate Schools of Business in 1969. The College of Business enrolls over 1400 undergraduate students and more than 300 graduate students.

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Univ. of Rhode Island
Kingston, Rhode Island