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**"PROPOSAL FOR A REVERSE LOGISTICS MODEL HORTICULTURE PRODUCE
WAREHOUSE IN THE BRAZILIAN MARKET"**

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ABSTRACT

Horticulture warehouses in Brazil lack equipment and packaging that minimizes the physical and economic losses of commercialized produce. The current needs for cost reductions and environmental awareness have made a package's specification and handling an activity that demands the implementation of public and private policies aimed at the improved optimization of its production chain. The objective of this paper is to introduce a reverse logistics model for horticulture produce used by the Uberlândia (MG), Brazil warehouse, which manages a Package Center through a Crate Bank system, responsible for sanitization and for closing the logistic chain's reverse flow. The model's success is related to adoption of plastic crates that replace wooden ones.

Keywords: Horticulture Warehouses; Production Chain; Reverse Logistics.

1. INTRODUCTION

The Brazilian horticulture distribution sector is comprised of companies that sell products in the wholesale market and are physically and geographically established outside municipal warehouses and markets, although many of these companies are located very near them. The distributor is the wholesale merchant that purchases products at warehouses or directly from producers and resells them to retailers (green grocers and small supermarkets), commercial and industrial restaurants, processors, public institutions, schools, day care centers, hospitals and prisons. Wholesale commerce is what occurs between merchants; regardless of quantities and retail commerce occurs between a merchant and the final consumer, regardless of quantities.

The merchant in the horticulture distribution sector differs from wholesalers at warehouses and municipal markets precisely because it is outside the warehouse area and has more restricted

sales options: smaller number of clients, with a closer relationship, where the quality of the commercialized product is tied to the clients' demands and needs.

For small companies, warehouses are still the most responsible for distributing vegetables, and for fruits the situation is not much different, since the warehouses are still the large suppliers of both domestic and imported fruits. In the case of the Brazilian domestic product, there is already a significant portion of supermarkets buying from warehouses and directly from producers.

According to Mourão (2007), the warehouses, also called CEASAs (Supply Centers), were created by the Federal Government in 1972 to reduce commercialization costs; improve production, classification service and product standardization; gather data for the Agricultural Market Information Service; reduce costs for retail to reduce supply fluctuations; improve price formation mechanisms; increase agriculture company income, and eliminate urban problems that stemmed from the 1960s.

The commercialization of horticulture produce was concentrated in CEASAs in major Brazilian cities until the 1980s, especially the warehouse in São Paulo. As the cities in the interior began to grow, state governments also had to invest in the creation of warehouses in those regions. In 1985, the CEASAS system began to decline as it became part of the group of privatizable entities, and thus the garden vegetable sector stopped receiving attention and recognition of its importance from the Federal Government. With this backdrop, each state and municipality began to run its own CEASA, thus losing the system concept that had existed until then.

According to Cunha (2008), the current CEASAS system moves about 14 million tons of horticulture products and financial activity exceeds US\$ 10 billion per year, also considering the other products and services they commercialize. That exceeds total sales of the two main retailers in the Brazilian market: Pão de Açúcar and Carrefour.

The CEASAS still try to survive performing the same function with basically the same infrastructure that has existed since the 1970s. However, every year, the wholesalers at these Supply Centers face a gradual reduction in profitability due to reduced sales prices (greater competition with other forms of distribution), increases in commercialization costs (labor, freight), default (inefficient financial management), spreading about of production, high perishability of the product, producer's great fragility in commercialization, non-existence of an active link to coordinate the chain and improve packaging of these products, which causes great losses of food.

It is necessary to implement a program that encompasses everything from the modernization of each step in the process to the innovation of the techniques for each link in the production chain.

The horticulture market lacks packages that are palletizable and modular, appropriate for different products, clean, cheap, and if returnable, with a guarantee of return and disinfection, with guaranteed availability, and when empty, do not enter the commercialization area. The creation of a national box system is still a project that is just beginning to be discussed by several food warehouse representatives in Brazil. Some CEASAs are advanced in implementing a Box Bank, using the project developed CEAGESP – São Paulo General Warehousing and Storage Company technicians as a model.

The Uberlândia (MG) CEASA is one of these supply centers that uses the box bank system model where horticulture producers and produce buyers purchase credits that grant them conditions to remove packages from the distribution center. This model proposes the adoption of plastic boxes to replace wooden ones and also includes a sterilization center that operates near the supply center and where nearly 25 thousand plastic boxes are sterilized per day as per environmental protection and safety norms.

With this embryonic project in mind, this paper aims at presenting the reverse logistics model proposal for horticulture packages used at the CEASA in Uberlândia (MG).

2. LITERATURE REVISION

2.1 Logistics

The Concept of Logistics has been around since the 1940s, primarily used by the USA army. Its main function was to supply, or better, guarantee the supply of all American troops in the Second World War. This included everything from material acquisitions to their distribution to the correct site at the desired time.

At present, logistics refers to the process of planning, implementing and efficiently controlling the flow and storage of products, as well as associated information services, covering the point of origin to the point of consumption, with the objective of meeting consumer requirements (NOVAES, 2001).

With the increasingly globalized and highly competitive economy, companies have been facing discontinuities (trade-off: situation of cost compensation in which the optimization of individual costs is sought to minimize total costs) and often conflicting expectations (suppliers, clients, shareholders) who demand much more efficient and effective organizational management than in the past. These changes demand new foci and new forms of administration.

According to Christopher (1997), it is fundamental to change the paradigms that have defined industrial organization standards for so long. He believes that are five areas that need changes in paradigms, as shown in table 1.

Table 1 - Necessary Changes in Paradigms.

Current Paradigm	Proposed Paradigm
1-Functions	1- Processes
2- Profit	2- Profitability
3- Products	3- Clients
4- Transactions	4- Relationships
5- Stocks	5- Information

Source: Adapted from Christopher (1997)

According to Ballou (2006), logistics is an efficient and effective planning, implementation and control process of the flow of merchandise, services and related information from the point of origin to the point of consumption, aimed at meeting client demands. The flow of merchandise must be accompanied from the point it exists as raw materials to the point it is disposed.

According to Christopher (1997), the process of strategically managing the acquisition, movement and storage of materials, parts and finished products (and the correlated information flows) through the organization and its marketing channels in order to maximize present and future profitability by filling orders at low costs.

Logistics is the process of efficiently and economically planning, implementing and controlling the flow and storage of raw materials, semi-finished materials and finished products, as well as information related to them, from the point of origin to the point of consumption, aimed at meeting client demands (CLM *apud* RAZZOLINI FILHO, 2001).

According to CLM (*apud* BRAMKLEV *et al.*, 2001), logistics is the process that plans, implements and controls the efficient and effective flow and storage of goods, services and related information, from the point of origin to the point of consumption to meet client demands. Machado (2008) explains that well-applied and understood logistics helps the company reduce costs, increasing the products or services offered the client. Logistics provides a competitive differential in the markets in which it operates. This is the path used by several sectors of the Brazilian economy, such as the automobile industry and large retail. Over recent years, several automobile companies have been building productive complexes, using the most modern concepts of logistics. They are compact factories, with high operational efficiency, and they produce automobiles for the whole world. Companies are not the only ones investing in logistics. So are entire countries, like the United States and Japan, which have been using these logistics concepts for several decades, and they are researching and developing new concepts, a determining factor in their economic development.

According to Fleury (2006), logistics is still recent in Brazil. Factors like economic stability, globalized markets and the wave of privatizations have driven this change process. Brazil's foreign trade grew nearly 50% in three years, obliging industries to adjust to the foreign market. The privatization of infrastructure like railroads, highways and ports has generated great demand for international logistics, a little explored and barely known area in Brazil. But, without a doubt, the end of inflation in Brazil was a major driving force for logistics in Brazil. With high inflation and constant price changes, it was nearly impossible to plan stock controls or have a perspective of raw material purchases for a specific period. Speculation dominated and made such controls impossible. With the end of inflation, companies began to better control their stocks and even create cooperation between clients and suppliers in the supply chain. Logistics in Brazil is about to create a revolution in terms of efficient business practices, quality and transportation and

communication infrastructure, necessary elements for modern logistics. Brazilian companies entail risks with the changes that need to be implemented due to their lack of experience; however, there are opportunities such as improvements in services and products and increases in productivity that are creating competitive advantages over their competitors.

Machado (2008) says that for Brazilian reality logistics costs are high, about 18% of annual GDP, whereas in other countries this cost is between 8% and 10%. Factors like the precarious infrastructure, concentration on highway transportation of freight (the most expensive of all), lack of specialized labor and few incentives for researching the sector, all contribute towards Brazil's poor performance. He goes on to say that to reduce this percentage, the federal government and private enterprise need to join forces to develop logistics in Brazil with the construction of partnerships for highways, ports and railroads. Otherwise, the Brazilian market will remain in the background in a strong global market. Companies need to improve their production bases and implement logistics concepts in all sectors in order to compete as equals with their domestic and most of all their international competitors. After all, with the increase in globalized trade, the chances for foreign products to invade our markets keep getting stronger.

2.2 Reverse Logistics

Technology advances generated an increase in the level of product disposability in general, accelerating their obsolescence. As a consequence, there is disequilibrium between the quantities of discarded and reused waste, making urban garbage one of today's most serious problems. That is because there are often no duly structured and organized reverse distribution channels at companies.

Bowersox and Closs (2001) report that reverse logistics needs also stem from legislation that prohibits the indiscriminate disposal of waste in the environment, encouraging recycling. The

most important aspect of reverse logistics is the need for maximum control when there is a possible responsibility for damage to human health.

According to Stock (1998:20 *apud* LEITE, 2003), reverse logistics refers to logistics role in returning products, reductions at the source, recycling, replacement of materials, disposal of waste, reforming and manufacturing repairs.

Figure 1 shows two large areas of operation for reverse logistics that have been treated independently up to now by the literature. They are differentiated by the returned product's useful life cycle stage or phase. Although there are countless interdependencies, this distinction is necessary because the logistics product and the reverse distribution channels through which they flow, as well as the strategic objectives and operational techniques used in each area of operation are different.

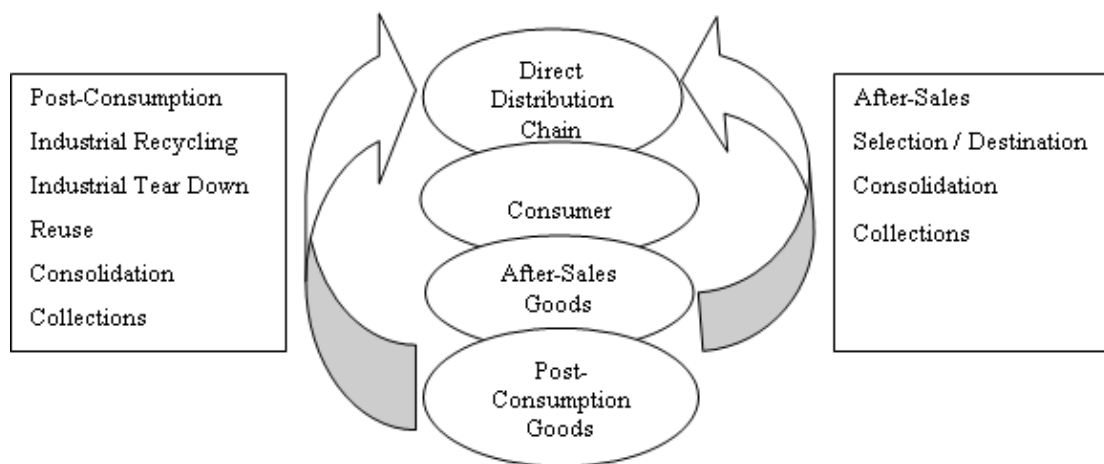


Figure 1 – Reverse Logistics – Area of Operation and Stages.

Source: Leite (2003).

Leite (2003) affirms after-sales reverse logistics is the area of operation that equates and operationalizes the physical flow and the information on unused or little used after-sales goods, which, for diverse reasons, return to the direct distribution links with the objective of adding

value to a product that is returned due to several commercial reasons, order processing errors, manufacturer warranty, defect, damage from transportation and many others.

After-consumption goods are products at the end of their useful lives, or are used with the possibility of reuse, as in the case of horticulture packages.

According to Ballou (2006), packaging material can be returned to the origin due to impositions in Brazilian environmental legislation, as in the case of Normative Instruction no. 09, or because its reuse makes sense in economic terms.

The strategic objective of these products is to add value to a product constituted of goods that do not serve the original owner, or that may still be used by discarded products because they reached the end of their useful lives. These after-consumption products may stem from durable or disposable goods and flow through reverse channels for reuse, tear down, recycling and even final disposal.

Table 2 shows the differences between management of forward and reverse logistics flows.

Table 2 – Differences between forward and reverse logistics.

Differences Between Forward and Reverse Logistics	
Forward Logistics	Reverse Logistics
Forecasting relatively straightforward	Forecasting more difficult
One to many distribution points	Many to one distribution points
Product quality uniform	Product quality not uniform
Product Packaging uniform	Product packaging often damaged
Destination / routing clear	Destination / routing unclear
Disposition options clear	Disposition not clear
Pricing relatively uniform	Pricing dependent on many factors
Importance of speed recognized	Speed often not considered a priority
Forward distribution costs easily visible	Reverse costs less directly visible
Inventory management consistent	Inventory management not consistent
Product life cycle manageable	Product lifecycle issues more complex
Negotiation between parties straightforward	Negotiations complicated by several factors
Marketing methods well known	Marketing complicated by several factors
Visibility of process more transparent	Visibility of process less transparent

Source: Reverse Logistics Executive Council.

Management of operations that comprise the reverse flow is part of Product Recovery Management (PRM).

The PRM is defined by Daher *et al.* (*apud* Krikke, 1998) as the management of all products, components and materials used and discarded for which the manufacturer is responsible legally, contractually or any other manner. Some of its activities are in part similar to those that occur in the case of in-house returns of defective items due to unreliable production processes. It also works with a series of administrative problems, including Reverse Logistics. PRM's objective is to recover the economic and ecological value of products, components and materials as much as possible.

Krikke (1998) establishes four levels at which returned products can be recovered: the product, module, part and material levels. Recycling is the recovery level of material, which is the lowest.

Table 3 provides a summary of product recovery options.

Table 3: Summary of product recovery options.

PRM Options	Level of Disassembly	Quality Demands	Resulting Product
Repair	Product	Restore the product to full function	Some repaired or replaced parts
Renovation	Module	Inspect and update critical modules	Some repaired or replaced modules
Remanufacturing	Part	Inspect all modules/parts and update them	Used and new modules/parts in a new product
Cannibalization	Selective recovery of parts	Depends on the use of other PRM options	Some parts reused, others discarded or sent for recycling.
Recycling	Material	Depends on remanufacturing use	Materials used in new products

Source: Krikke (1998)

2.3 The Package

For Bjöörn (1990 *apud* BRAMKLEV *et al.*, 2001), packaging cost is between 5 and 10% of a product's logistics costs. Lancioni and Chandran (1990) say these same costs represent about 8%, and can range between 15 and 20% of logistics costs in export operations.

According to Jönson (1990 *apud* BRAMKLEV *et al.*, 2001), the packages are classified as follows as to their interactions with the environment: physical (exposed to damage through collisions, vibrations and other physical phenomena), environmental (gases and moisture are factors that cause the potential deterioration of the package as well as the product it contains), human (package interactions with the user, due to function, information or imposition by legislation).

Packforsk (2000 *apud* BRAMKLEV *et al.*, 2001) mentions the integration of the package in the supply chain considering that regardless of the material, they are produced to contain, protect, deliver and present goods, from raw materials to the final product. He also adds it is way to ensure the safe and efficient delivery of a good for final consumption, followed by the efficient reuse of the package, recovery or elimination of the material, at a minimum cost. An appropriately packages product results in less damage, less waste of resources and even makes the workplace safe from an environmental and sanitary vantage, generating more added value.

2.3.1 Package life cycle

According to ABRE (2006), the Brazilian Packaging Association, the life cycle approach is used to identify environmental aspects and impacts that occur during the package's complete life cycle (from the extraction of raw materials, manufacturing, use and disposal), thus helping to define project guidelines for environmental improvements.

As per Figure 2, a project's life cycle is divided into four stages: introduction, growth, maturity and decline. Introduction is a low growth period in sales since the product is being introduced in the market and there are no profits in this stage due to heavy expenses for product introduction. Growth is a period of rapid market acceptance and substantial improvement in profits. Maturity is a period with low growth in sales because the product has already achieved acceptance by most

potential buyers. Profits stabilize or decline due to stiff competition. Decline is when sales show a sharp drop and profits disappear.

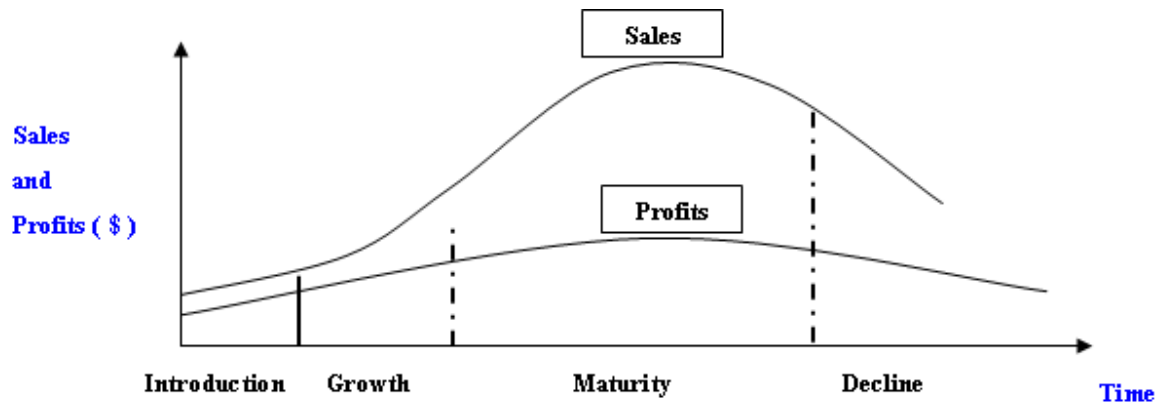


Figure 2 – Product Life Cycle

Source: Kotler (2000)

From a financial perspective, it is evident that besides the raw material, production, warehousing and storage costs, a product's life cycle also includes other costs that are related to all the management of its reverse flow.

It is important to consider all package life cycle stages as well as know how they may affect the environment in these different stages. It is important to guarantee that any improvement in a specific manufacturing process stage or packaging structure does not harm, even involuntarily, the environmental impact in other stages.

According to CETEA/CEMPRE (2002), in returnable systems for foods and beverages, it is necessary to sterilize primary and secondary packaging between the use cycles for food security reasons. It is thus necessary to consider energy utilization and water consumption for washing packages between use cycles. Through the product's life cycle, different environmental criteria can be considered, assessing improvements from a broad variety of potential impacts, such as:

- reduction in package mass or volume (raw material savings, reducing the volume of generated waste, optimizing its transport).

- improvement of energy efficiency in the package manufacturing process or definition of new productive processes and recycling;
- prolonging package and product life (forms of reutilization and use, reducing the need for extracting new natural resources);
- choice of raw materials with less environmental impact and that are compatible with each other in terms of recycling or that are easily separated (resulting in the reuse of some parts or enabling its recycling).

2.3.2 Package trade off

According to ABRE (2006), disposable packaging can have a less robust structure, requiring fewer raw materials in its composition and energy for its processing, which results in environmental gains. A large variety of raw materials and existing technologies satisfy this demand. They have different properties in terms of barriers, shapes, features and presentation among others.

Since this package is discarded after consumption of the product, it should foresee forms of disassembly and recycling or reuse of raw materials employed in its structure.

According to Leite (2006), packaging discarded by society has a considerably negative "ecological visibility" in some urban centers due to increased use and the fact it is often disposed of improperly, generating pollution, while also offering important economic opportunities.

According to ABRE (2006), the returnable package is the one that returns to the industry for reuse. It needs to undergo reverse logistics transportation stages and the washing and sterilization process.

Reverse logistics and the sterilization process for packaging need to be optimized. Its structure and technology for opening and closing must foresee product repackaging at an industrial scale.

ABRE (2006) also defines reusable packaging as the kind that can be reused by the consumer for packaging other products. It must have a structure that is appropriate for safe reuse.

In summary, the ideal package is considered the one that best meets the proposal for the product it protects. For such, it is necessary to study package positioning in every stage: production, distribution, commercialization, consumption and final disposal. It is important to justify the decision and for it to be based on the product's real life proposal.

2.3.3 Types of Horticulture Packaging

In the Brazilian horticulture market, there are several types of packaging using different materials and models, the main ones being: wood, undulated cardboard and plastic.

Silva (2006) reports that wooden boxes are broadly used and the most traditional, as per figure 3, are the M, K and “torito” boxes and crates. The main advantages of these packages, their price and high resistance, are responsible for their broad and generalized reutilization, which at times can reach five reuses.

The wooden box does not permit unitizing the cargo. It is heavy, dirty, with an unpleasant appearance, and it damages the product, resulting in losses and contamination. It absorbs water from washed horticulture products and without proper drying it can represent up to 37% of package weight, increasing the risk to the worker's health from an ergonomic perspective (SILVA, 2006).

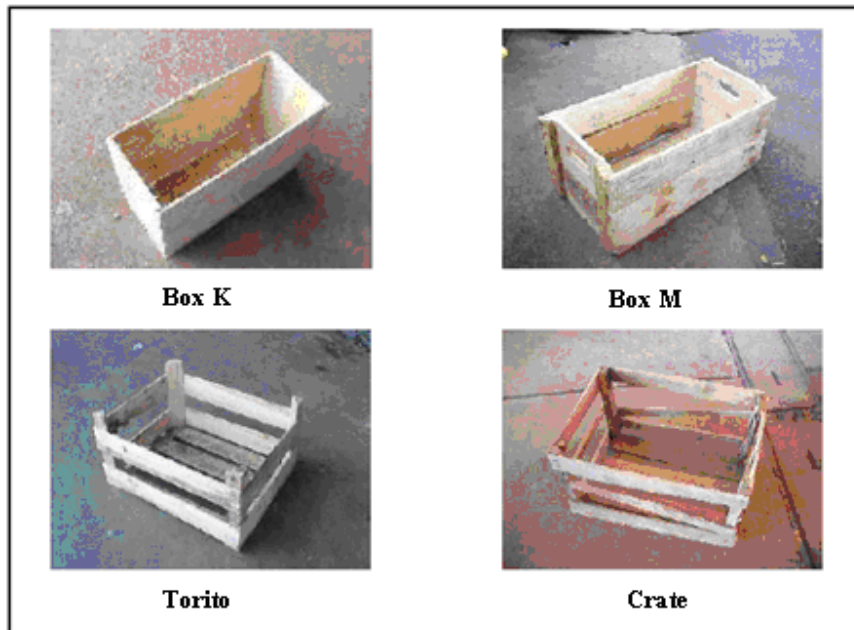


Figure 3 – Types of Wooden Boxes

Source: Silva (2006)

According to Silva (2006), cardboard boxes are mostly used as secondary packaging in the horticulture transportation market. They rarely reach the product's final consumer. Retailers are almost always the final stop for large volume cardboard packaging, a factor that facilitates collection and revalorization of these packages.

At supply centers, undulated cardboard packages (Figure 4) are broadly used to pack fruit, products with greater worth, which increase box unit costs. This use obeys the norms in effect due to how it unitizes the cargo. They can also be used to expose the product, thus significantly reducing the need for handling the product. Besides their cost, another disadvantage with cardboard boxes is controlling the water content that remains after washing the fruit so that their structure can remain intact.



Figure 4 – Undulated Cardboard Box

Source: Castro (1999)

Besides offering greater durability, resistance and permitting palletizing, plastic boxes (Figure 5) also contribute towards reducing horticulture waste since they have better finishing (no edges that can damage the product, easy to wash and sterilize, and since they do not absorb water, hamper the proliferation of microorganisms). Since they can be reused, their purchase cost can be amortized over their useful life. Although they are more expensive, they provide long-term benefits. The supermarkets and large retailers are normally the ones who buy the plastic boxes and rent them to producers, using an exchange system that is identical to beer bottles. Tests run by Embrapa Hortaliças, in Brasília, show that plastic boxes, specific for horticulture, reduced after-harvest losses by up to 17%.



Figure 5 – Plastic Boxes

Source: Silva (2006)

The packages can be classified as reusable, returnable and disposable. If we consider product quality and hygiene, as well as consumer health, we can conclude that reusable boxes are the biggest problem. If we consider market administration, the priority should be returnable packages.

Table 4 highlights the main characteristics of the types of existing boxes currently in the horticulture market.

TABLE 4 – Characteristics of box types.

WOODEN BOXES	CARDBOARD BOXES	PLASTIC BOXES
non-palletizable (generally)	palletizable (generally)	palletizable (generally)
large and heavy for stacking	resistant and with appropriate size	relatively light and resistant
more labor for handling	less labor	less labor
disposable	disposable	reusable
occupy much space (packing house)	occupy little space if assembled at that moment (packing house)	occupy space (packing house)
high level of product losses	zero losses (disposable)	low level of losses
average ventilation	low ventilation	high ventilation
high cost	high cost	low cost (per operation)
difficult sterilization	hygienic (disposable)	easy sterilization

Source: Silva (2006)

3. THE PACKAGING CENTER

The feasibility of the Packaging Center had strong support in the project on the part of strategic planning at CEAGESP, under the coordination of the CQH – Horticulture Quality Center in São Paulo. The Packaging Center rents the plastic packaging through a minimum contract of 24 months, and it stores, sterilizes and repairs empty boxes. The Packaging Center proposal is a success in the retail market where large chains like Pão de Açúcar, Sé Supermercados, Carrefour and Wal-Mart require their suppliers to use plastic boxes from the Packaging Center. As a guarantee, they require the supplier to present a rental contract for the number of boxes needed for the proper flow of boxes. This number can reach up to five times the volume of each delivery. Gutierrez (2000) reports that this system still has many problems:

- the box cannot be purchased, only rented;
- even if the supplier only has production 60 days per year, he must continue to pay rent for 24 months;
- the lessee of the boxes is responsible for administering their return;
- lost boxes are the exclusive responsibility of the lessee. Most of the large chains will not assume responsibility for losses within their own premises;
- the boxes are not being sterilized, which is contrary to the project proposal, where box rental would guarantee necessary disinfection;
- rental cost for the box is very high. After approximately six months of rental, it is possible buy a good, new box;
- some large chains are renting the box, and passing it on to the supplier at a good profit margin;
- removal of the empty box from large retail chains takes too long;
- the large number of rented boxes required by retail (up to five times the volume of each delivery) serves as a “lung” for large chains;

- package administration difficulties and cost are charged the supplier;
- most products packed in plastic boxes reach the market in reusable boxes and they are sent to the wholesaler before being delivered to retail. Unnecessary handling increases losses and reduces the product's shelf life.

Gutierrez (2000) underscores that the market needs palletizable packaging that can be used for different products and is clean and cheap. If returnable, there must be a guarantee of return and disinfection, with guaranteed availability, and when empty, they do not enter the sales area. In an attempt to improve the above-described system, the CEAGESP Box Bank is created.

4. PLASTIC BOX BANK

The Box Bank is responsible for the selling and guaranteeing of the Box-Voucher. The system offers a family of palletizable and modular boxes of different sizes and the identification of the box is made individually using a bar code or some similar technology.

Any person who acquires a box-voucher will own a box and can remove or negotiate the box whenever he feels it is necessary since the box voucher has no expiration date. At CEASA, the empty box will always be stored in the Box Deposit. Entry of empty boxes will only be permitted in the market if they are being sent to the Box Bank.

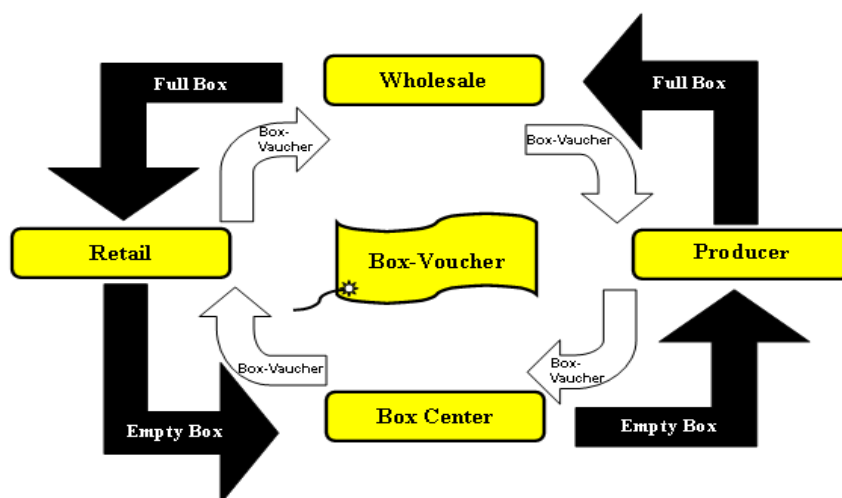
The Box Deposit is responsible for the availability, maintenance and appropriate sterilization of empty boxes, 24 hours per day. In practice, whoever buys a box-voucher will own a virtual box, with a guarantee of availability.

The box voucher is used like currency at the Box Bank, and every one of the users needs to hand in a box voucher when removing boxes. When returning the boxes, the user will receive a box voucher, making it possible to repurchase the box voucher. There should be a box-ballast, since the box voucher will be issued with the first sale of the box.

The Box Deposit does not need to be located in CEASA. The needed area is very large. The CEASA-Campinas Box Center occupies nearly 13,000 m². The Box Voucher shall keep a representative at the deposit. The Box Deposit is responsible for supplying and delivering the package for permissionaires who need boxes to transfer the package or for repackaging. The formation of a pool of empty boxes will free the producer or the permissionaire from the need to stock boxes due to delays in returning boxes. Today, it takes from 5 to 8 days to return a box, which means a stock 5 to 8 times greater than the number of boxes put up for sale.

The Box-Voucher will be responsible for a system that guarantees and inspects box sterilization and stimulates use of the Box Bank. More than one company can be admitted in the system. CEASA's contribution will be to prohibit entry of empty boxes in the Deposit. This will only be permitted if they come from the Box Bank. It is advisable for companies to finance the purchase of packages and to pay in installments.

Figure 6 shows the logistics flow of a Box Bank operating at a packaging center.



Box Bank	
Box Voucher	Box Center
<ul style="list-style-type: none"> • Registers users. • Sells box voucher. • Buys box voucher. • Guarantees availability of boxes. • Guarantees the exchange of damaged boxes. 	<ul style="list-style-type: none"> • Stores empty, sterilized boxes. • Replaces damaged boxes. • Sterilizes the box. • Exchanges the box voucher for empty boxes. • Exchanges empty boxes for box vouchers. • Administers the return of boxes.

Figure 6 – Box Bank Flow

Source: CQH-CEAGESP

5. THE EXPERIENCE AT CEASA-UBERLÂNDIA

According to Silva Filho (2008), technical assistant at CEASA-Uberlândia, the Box Bank (BB) concept is different from the Packaging Center (PC). The PC owns the boxes and works at renting them for periods of 30 days or more. The PC sterilizes the boxes if sent for such during the rental period, whereas the BB administers the exchange of packages and sterilizes and stores those not in use at the moment. The clients, as well as any buyer, producer and merchant established at CEASA can own their own boxes (50% of each), and use the same logistics:

- the client (buyer) unloads its boxes at the BB before delivery to the market;

- after depositing the boxes at the BB, it receives the corresponding number of boxes in a box-voucher card;
- upon accessing the market, it makes its purchases and for each box of product purchased, it gives the seller a voucher. Meanwhile, the boxes are sterilized at the BB.
- at the end of commercialization, the seller in possession of the vouchers, goes to the BB and exchanges them for sterilized ones;
- it is called a bank because there is a “ballast”, that is, for every outstanding voucher in the market, there must be a corresponding box in the bank.

The process has already been working successfully for the past four years at the market in Uberlândia and it was installed to meet ANVISA’s (National Health Surveillance Agency) Joint Normative Instruction (2002). The boxes are standardized in color and size, have no owner logo, and have box vouchers. Table 5 indicates the standardization of available measures.

When they were installed, studies were not carried out regarding losses with wooden packages and therefore there was no chance to make comparisons with the current process.

In reality, CEASA-Uberlândia agents are satisfied with the new system except for the fact that no other Ceasa in the country has yet been able to install it. This fact could restrict the market only to its area of influence, which is Triângulo Mineiro, Alto Paranaíba, southern Goiás, north of the state of São Paulo and some cities in the state of Mato Grosso.

The process can and must be improved, including with the introduction of correct practices, such as labels, and the modernization of the boxes, thus permitting a national process, without losing sight of the fact that ANVISA does not prohibit the use of other packages. It only prohibits the return of wooden and cardboard packages, demanding the sterilization of returnables and advising they should be palletizable.

Oliveira (2008), manager of the company that operates the BB, reports the system operates with the following efficiency:

Yield of the Sterilization Machine

600 boxes/h (3 stages)

1,100 boxes/h (4 stages)

2,200 boxes/h (4 stages – two lanes)

Minimum Maintenance / Low Cost (GLP) / Prolonged Useful Life

6. FINAL CONSIDERATIONS

The results observed in this study permit concluding that the replacement of wooden boxes with plastic boxes in most CEASA's in the country is fundamental when considering the hygiene, environmental and optimization of logistics resources aspects. Plastic packaging is the most expensive, but it brings long-term benefits. This fact permitted plastic boxes to gain space. They can also be sterilized (demanded by legislation) and they are more resistant. Furthermore, supermarkets have given preference to them since they reduce food waste.

Cardboard boxes, in turn, are efficient when used only once, and where it is important to observe the needs and characteristics of each product. It is important to underscore that cardboard boxes, like wooden ones, must undergo a recycling or incineration process after disposal, thus avoiding the formation of large deposits of waste. This rarely occurs.

The solution to modernize packages at CEASAs would be to create the box bank. The box bank has been used with success in regional units in the states of Minas Gerais and São Paulo, but specialists are still studying a way to install the process in large *in natura* food distribution centers, interconnecting the service in several states in Brazil.

At CEASA-Uberlândia, all producers use only plastic boxes. The expected, and in a large part achieved results with the new model, are: standardization of packages; modernization of the

commercialization system; greater efficiency in the process; reduction in post-harvest food loss; guarantee of quality and hygiene of foods sold at CEASA; meeting the norms established by the Ministry of Agriculture (IN. N.09); significant reduction in box theft at the market; cost reductions in stock and empty packaging; more organization and cleanliness at CEASA; long-term reduction in packaging costs on the part of producers and wholesalers. The model also provided true sterilization, stock control, safety and satisfaction of involved agents. But it can still be improved with the introduction of effective measures in practicing the law, such as the appropriate labeling.

A more in-depth study of the model presented a proposal for continuing this study, will bring subsidies for adopting the model at other CEASAs, suggesting improvements, and taking into consideration each unit's own characteristics.

7. REFERENCES

ABRE-ASSOCIAÇÃO BRASILEIRA DE EMBALAGEM. *Integração de aspectos ambientais no projeto e desenvolvimento da embalagem*. São Paulo. jan. 2006.

ANVISA-AGÊNCIA NACIONAL DE VIGILÂNCIA SANITÁRIA. *Instrução Normativa Conjunta nº09*, de 12 nov.2002. Disponível em: <http://www.anvisa.gov.br/legis/IN/09_02.htm> Acesso em: 25 mai. 2008.

BALLOU, R. H. *Gerenciamento da cadeia de suprimentos/logística empresarial*. 5ª ed. São Paulo: Bookman, 2006.

BRAMKLEV, C., OLSSON, A, ORREMO, F. and WALLIN, C. *Unveiling the concept of packaging logistics*. 13TH INTERNATIONAL NORDIC CONFERENCE ON LOGISTICS RESEARCH (NOFOMA), 14-15 Jun. 2001, Reykjavik, Iceland. Disponível em: <<http://luur.lub.lu.se/luur?func=downloadFile&fileOId=625939>>. Acesso em 28 jun.2008.

CASTRO, L. R. *Influência de aspectos da classificação, embalagem e refrigeração na conservação pós-colheita do tomate Santa Clara e Carmen*. FEAGRI/UNICAMP. Dissertação de mestrado. Universidade de Campinas. Campinas, 1999.

CETEA/CEMPRE-CENTRO DE TECNOLOGIA DE EMBALAGEM/COMPROMISSO EMPRESARIAL PARA RECICLAGEM. *Avaliação do Ciclo de Vida: Princípios e Aplicações*. Campinas. 2002.

CHRISTOPHER, M. *Logística e gerenciamento da cadeia de suprimentos*. São Paulo: Ed. Pioneira, 1997.

CUNHA, A. R.A.; CAMPOS B.J. *Sistema CEASA-Uma rede complexa e assimétrica de logística*. In: Seminário Cedeplar, 53. Anais eletrônicos. Diamantina, 2008. Disponível em: <http://www.cedeplar.ufmg.br/seminarios/seminario_diamantina/2008/D08A053.pdf>. Acesso em: 17 dez.2008.

FLEURY, P.F. *Perspectiva para a logística brasileira*. Disponível em: <http://www.remade.com.br/pt/revista_materia.php?edicao=96&id=902>. Acesso em: 13 ago. 2008.

GUTIERREZ, A.S.D. Banco de caixas. *CQH. dep.CEAGESP*. 19 jan.2000.[mensagem pessoal] Mensagem recebida por <cfanale@ceagesp.gov.br> em 20 fev.2008.

KOTLER, P. *Administração de Marketing*. 10ª edição. São Paulo: Pearson-Prentice Hall, 2000.

KRIKKE, H. *Recovery Strategies and Reverse Logistics Network Design*. BETA – Institute for Business Engineering and Technology Application. Holanda.1998.

LEITE, P.R. *Logística reversa: meio ambiente e competitividade*. São Paulo: Prentice Hall, 2003.

MACHADO, R. *A Logística como estratégia para a obtenção de vantagem competitiva*. Disponível em: <http://www.administradores.com.br/comunidades/logistica/143/forum/logistica_uma_vantagem_competitiva/1567/>. Acesso em: 26 ago. 2008.

MOURÃO, IVENS R. DE ARAÚJO. *Análise de um Mercado Hortigranjeiro e Sugestões de Intervenção*. Brasília, 14 mai.2007. Disponível em: <<http://minas.ceasa.mg.gov.br/scriptcase/file/docprhartigos/doc01.pdf>>. Acesso em 23 dez.2008.

NOVAES, A.C. *Logística e gerenciamento da cadeia de distribuição: estratégia, operação e avaliação*. Rio de Janeiro: Editora Campus, 2001.

OLIVEIRA, E. de. *Banco Caixas CEASA-MINAS* [mensagem pessoal]. Mensagem recebida por <eduardodeoliveira@gmail.com> em 29 mai.2008.

PORTAL DA ADMINISTRAÇÃO. *Obtendo vantagens competitivas através da logística*. Disponível em: <<http://www.htmlstaff.org/xkurt/projetos/portaldoadmin/modules/news/ar.php?storyid=742>>. Acesso em: 26 ago. 2008.

RAZZOLINI FILHO E. *Supply Chain Management – SCM: uma tentativa de conceituação*. artigo. Curso de Administração. Universidade Tuiuti do Paraná, 2001. Disponível em: <http://www.utp.br/tuiuticienciaecultura/FCSA/FCSA%2024/PDF/Art%2003%20-%20Supply%20Chain.pdf>. Acesso em 08 ago.2008.

SILVA FILHO, J.M. da. *CEASA-MINAS – Banco de Caixas* [mensagem pessoal]. Mensagem recebida por <gustavo@ceasaminas.com.br> em 21 mai. 2008.

SILVA, G.V. da. *A complexidade do sistema de adoção de embalagens adequadas para o setor hortifrutícolas*. Monografia do programa de pós-graduação da Universidade Federal de Lavras. Minas Gerais, 2006.