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July 6, 1999

Kevin Ludeke
COORDINADOR PROYECTOS ESPECIALES
Standard Fruit Company of Costa Rica
Apartado 4595-1000
San José, Costa Rica

Dear Mr. Ludeke:

Enclosed is our report entitled Energy Demand and Conservation for Standard Fruit Company of Costa Rica. This report was written at the Costa Rica Project Center in San José, Costa Rica during the period of May 18th through July 7th, 1999. Preliminary work was completed in Worcester, Massachusetts prior to our arrival in Costa Rica. Copies of this report have been submitted to Dr. Thomas Keil for evaluation. Upon faculty review, the original copy of this report will be catalogued in the Gordon Library at Worcester Polytechnic Institute. We greatly appreciate the time that you and your staff have devoted to us.

Sincerely,

Tien Vu

Heather Moran

Felipe Guelfi

Report Submitted to:

Dr. Thomas Keil

BY

TIEN VU _____
HEATHER MORAN _____
FELIPE GUELFI _____

In cooperation with

MR. KEVIN LUDEKE, COORDINADOR PROYECTOS ESPECIALES
STANDARD FRUIT COMPANY OF COSTA RICA, A SUBSIDIARY OF
DOLE FOOD COMPANY

ENERGY DEMAND AND CONSERVATION FOR STANDARD FRUIT COMPANY OF COSTA RICA

July 7, 1999

This project is submitted in partial fulfillment of the degree requirements of Worcester Polytechnic Institute. The view and opinions expressed herein are those of the authors and do not necessarily reflect the positions or opinions of Standard Fruit Company of Costa Rica or Worcester Polytechnic Institute.
This report is the product of an education program, and is intended to serve as partial documentation for the evaluation of academic achievement. The reader should not construe the report as a working document.

ABSTRACT

Standard Fruit Company of Costa Rica is a banana exporting company. The Company wanted to reduce its electrical consumption. The project team collected and analyzed data from Company packaging plants to determine their patterns of electrical consumption. The project team also determined the sources of electrical consumption in Company residences and offices. From the data collected, the project team recommended technical installations and a set of improved managerial policies regarding electric usage.

AUTHORSHIP PAGE

HM = Heather Moran
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EXECUTIVE SUMMARY

Between May 17 and July 8, 1999, we worked with Standard Fruit Company of Costa Rica (SFCO) to complete the project **Nature of Electrical Demand and Energy Conservation** within particular Standard Fruit operations. Standard Fruit S. A., a subsidiary of Dole Food Company, Inc. began its operation in 1956 in Valley de la Estrella, in Limón. One of the Company objectives focuses on profitable growth of its core products and markets as well as opportunities to build earnings and expand. Therefore, the Company decided to study the nature of electrical demand and methods to conserve energy.

To meet Company objectives, we gathered data through visiting nine of its banana packaging plants. We interviewed the general managers of each plant and the employees residing in the housing facilities for each plant to determine electric consumption and sources of electric usage. Additionally, we used the SFCO Global Accounting Database to obtain information on periodic electric bills and the number of boxes of bananas produced in each period.

We observed that the number of electric appliances varies thoughout the different packaging plants and, more importantly, that no schedule exists for operating these electric appliances. From the interviews we conducted in the Estrella region, we discovered that SFCO pays a larger sum of money for the residential housing electric bills of this region than the other two regions, Perla and Bananito. After analyzing the data obtained from the packaging plants, residences, and offices, we provided the Company with recommendations to maximize energy conservation in all of its operations.

We developed a model that can calculate the theoretical energy consumption for each packaging plant. From this model, one can observe the amount of money that SFCO can save depending on the implemenation and usage of specific electric appliances. If the Company were to use our organizational recommendations, we calculated that $44,000 would be saved each year. Moreover, if the Company were to also upgrade its electrical equipment as well as implement the organizational recommendations, $122,000 would be saved each year.

For the packaging plants, we recommend that SFCO implement a schedule for operating electrical equipment, assign one person the responsibility of turning on and off the electrical equipment, and establish rules and incentives for energy saving. We have five technical recommendations for the packaging plants as well: to install more energy-efficient lights, to use natural lighting when feasible, to reallocate the lights on the basis of necessity, to place all light switches in one central location and label them appropriately, and to wire the switches so that they will turn on clusters of lights as opposed to entire rows. For the operation of refrigerated containers, we recommend that the Company create a schedule of operation in which peak hour usage is avoided.

We have four recommendations that SFCO may apply to the worker residences, offices, and management homes. We recommend that the Company issue instructive pamphlets to the workers and their families to guide them in conserving energy in their homes. The Company could supplement this instruction by hosting periodic information sessions for the workers and their

families. SFCO ought to review its policies on subsidization to rationalize the need for variability among regional subsidies. In their homes offices, the managers ought to be role models for their employees, making the same effort to conserve energy on a daily basis. Managers should not abuse the benefit of free electricity. Finally, we recommend that SFCO install timers and control devices for the regulation of electrical equipment in the offices.

In conclusion, we recommend that Standard Fruit Company of Costa Rica implement our organizational recommendations, particularly because their implementation does not result in any high cost for the Company. SFCO should also study the feasibility of our proposed energy conservation plans, determining which is the most practical investment. Finally, the Company ought to further analyze the cost structure at the fincas, comparing the electrical usage at the packaging plants and the electrical usage at the residences and offices.

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1 Introduction

This report was prepared by members of Worcester Polytechnic Institute Costa Rica Project Center. The relationship of the Center to the Standard Fruit Company of Costa Rica and the relevance of the topic to the Standard Fruit Company of Costa Rica are presented in Appendix A.

This project is designed to fulfill the requirements of an Interactive Qualifying Project, or IQP, for Worcester Polytechnic Institute. The goal of all IQP projects is to integrate aspects of technology and society in solving a problem. The IQP enables students to understand their place in society, as citizens and career professionals. The IQP also provides unique opportunities in engineering education for significant international education and pre-professional experience.

As consultants to Standard Fruit Company of Costa Rica (SFCO), under the supervision and guidance of Special Projects Coordinator Mr. Kevin Ludeke, we have investigated the nature of electrical demand and energy conservation within specific Standard Fruit operations. SFCO is a subsidiary of Dole Food Company, Inc. which produces and exports DOLE brand bananas. In particular, we analyzed electrical energy use at DOLE-owned banana plantation packaging plants dispersed throughout Costa Rica and the residences at these packaging plants. Standard Fruit operates the majority of these plants. The total yield from these banana plantations constitutes about 80% of Standard Fruit revenue. This study does not include the Standard Fruit boxing plant and container yard in Limon. The container field in Moin, near Limon, is where bananas are kept

refrigerated in preparation for shipment. In Decar, also near Limon, there is a plant where DOLE boxes are made and sent to all the packaging plants. Results from our investigation will be formally presented to the management of Standard Fruit Company and will be shared with the management at each packaging plant.

Our major goal in studying the nature of electrical demand within Standard Fruit operations was to create a benchmark for the maintenance and/or development of energy conservation techniques in Standard Fruit operations. This involved comparing what the electrical consumption is expected to be (i.e. "theoretical usage") and the actual usage of electricity.

Initially, the demand for electricity was characterized by determining the consumption per packaging plant. The major purpose was to quantify the nature of demand as it varied between packaging plants. We attributed the electrical consumption at each packaging plant to lights, motors, fans, and water pumps.

The purpose of comparing theoretical and actual usage, or electrical consumption, was to see which packaging plants is more or less energy efficient. An "energy efficient" plant would have high product yield and low energy consumption, relative to the other packaging plants. The energy-saving techniques utilized by this plant would constitute a model to be emulated by the other plants. We have suggested a variety of methods for conserving energy throughout *all* Standard Fruit operations.

This study was designed so that its methodology is replicable. We have made suggestions for how our work may be expanded and our investigations continued.

2 Literature Review

This chapter is a review of research literature related to energy conservation principles and techniques. Applicable conservation methods, alternate energy sources, and their associated benefits are analyzed. The current situation with the banana markets is discussed because of the effect that it will have in the cost structure of the Company. A brief description of the ISO 14001 policy requirements is also included.

2.1 Energy Conservation

Energy has many purposes in a company such as Standard Fruit Company of Costa Rica (SFCO). SFCO uses energy to operate lights, motors, fans, water pumps, and machinery in their packaging plants throughout Costa Rica, container yard in Moin, and boxing plant in Decar. When a company decides to conserve energy, it will save money and increase profits.

Energy conservation procedures can be divided into two categories: general 'housekeeping' and energy-oriented changes (Sawhill and Cotton, 71-72). Housekeeping strategies do not involve technical investments or production changes. These general strategies include turning off excess lights and machinery when they are not in use and using natural lighting as much as possible. The most basic approach to conserving energy is not running electrical machinery when the operator is not present. While this may seem simple, it is often overlooked when evaluating the needs and problems of a company.

The placement and composition of windows, lights, and fans are important when trying to minimize energy use. For example, windows not only provide

natural light to reduce a company's energy needs, but the actual composition of the window, glass and coating combinations, is important when deciding if installing windows is beneficial. Another basic approach to saving energy is to ensure that equipment is maintained and kept clean. Such practices include inspecting all wiring and lighting fixtures on a regular basis.

Energy-oriented changes involve the improvement of the production process and equipment upgrades. This type of change includes co-generation of energy and the upgrading of lighting systems, windows and insulation. "By using energy-efficient techniques and practices, companies can reduce energy use by an average of 35%" (Dolin, 28). For example, reset controllers and computer programs are available that can manage light switches so that lights are only turned on when it is dark. The long-term benefit of these devices outweighs their cost of installation (Reay, 113).

2.1.1 Lighting

Fluorescent lights that are energy saving will reduce the electric bill. The ideal light is durable and long lasting, has minimum heat emission ('light color temperature'), and is environmentally friendly. Long lasting lights will improve efficiency and reduce the frequency and troublesome task of bulb replacement. Light color temperature creates the mood of the space that is being lighted and can influence work performance. Light color temperature bulb also creates less heat, fostering a pleasant atmosphere for the workers. Not only is the concept of saving energy environmentally friendly, but minimizing energy consumption has

direct and positive effects on the environment as well. Electric power plants create high magnitudes of electricity and they are the biggest industrial source of air pollution. Gas emission from electric power plants leads to acid rain and the Green House Effect (www.fanlocator.com).

Two methods to upgrade lighting are improving the actual lighting system and replacing the type of lamps. Lighting systems can be one of four standard types: general/uniform, localized, local, and visual display units (VDU). General lighting gives a uniform illumination over the entire workplace. Localized lighting provides lighting to the required high levels of lights and the areas that require low levels. Local lighting illuminates only a small, discrete area directly around the area of activity. VDU shines light off a screen to illuminate an area.

Choosing the type of lamps is also important. Fluorescent lamps give five times more light and last 10 times longer than incandescent bulbs (www.fanlocator.com). Fluorescent lamps are also cooler. For more light, one large bulb may be used rather than several smaller ones. A 100-watt bulb produces 50% more light than four 25-watt bulbs for the same amount of energy.

There are alternatives to the standard white lamps and natural fluorescent bulbs. Pluslux and Polylux lamps are up to 70% more efficient than conventional white bulbs (Roaf and Hancock, 74). The Pluslux lamps contain argon and krypton as opposed to just argon and can pay for themselves at least three times over before they are used up. The Polylux lamps have rare-earth phosphors coating and have a better color and light production than standard bulbs. Compact fluorescent lamps are also high on the energy efficiency list. These

bulbs operate at a much safer temperature. Other examples of energy efficient lamps include high-pressure sodium lamps and low-voltage tungsten halogen lamps.

2.1.2 Natural Lights

Natural lights are beneficial to SFCO because they minimize the Company's energy needs. The conductivity of the material from the natural lights indicates the amount of energy or heat that can pass through the window during a given period of time. The lower the conductivity indicates that less energy can be transferred through the window. This can help save energy since changing to a lower conductivity window will decrease the loss of heat or coolness and therefore require less energy to maintain the temperature in the building. But too many or too few natural lights can result in poor productivity. Too many natural lights can make the workers hot and uncomfortable when the sun is high but the lack of natural light can make the workers tired and sleepy. Therefore, the use of natural light and artificial lights should complement each other. The perfect combination will enhance worker performance.

2.1.3 Motors

An electric motor is a device that produces a force when electricity is applied. An attraction or repulsion between magnets causes the force. This produces rotary motion and torque. There are many different kinds (about 20 main types) of electric motor, but nearly all use the attraction or repulsion of

magnets. Either one or both of the magnets is an electromagnet, composed of a coil of wire with electric current flowing through it. To make the effect stronger, the coil is wound around an iron core. Some motors use the attraction of a piece of steel to a magnet; this type of motor is called a "reluctance" motor (www.west.net).

Firstly, the Company must know the motor's speed in order to decide if any speed reduction between the motor and the application is possible. Reducing the speed will make the motor smaller and lighter. Induction motors can run at a variable speed with a special controller, but it is important to remember that motor size for a given job will be smaller when using higher revolutions per minute (RPM). Oversized motors are not recommended because they consume more power and their running cost will be significantly higher when the motors run continuously (www.west.net).

Currently, the induction motor and DC "Brushless" are preferred, although the Switched Reluctance (SR) is gaining popularity. The SR does not require magnets for operation and the electronic controls are less expensive. The induction motor is simple, cheap, and reliable. For sizes over 1 horsepower (HP), it is better to opt for a three-phase motor. When choosing a motor, it is important to consider options such as variable speed, power, torque and RPM, size, and shape. One must take into account the target cost, and whether or not is meant to be a new addition or a replacement. The end application is often important because of safety, weatherproofing, and reliability. Give the motor manufacturer all the necessary information you have and they will be able to

design the perfect motor for your application. The final product will be a more cost-efficient motor that, in the long term, will cover the initial investment and generate savings (http://peerlesselectric.com).

2.1.4 Water Pumps

In September of 1998, members of TAISA (see Appendix C) visited the fincas at the Estrella Valley with the objective of studying the equipment and operation of the water pumps. This study was subcontracted by the Valley Engineering Department to assess the condition, maintenance, and operation of the pumps and the installations to make the necessary recommendations for optimization. There is a total of 25 wells that are used to supply water for the boxitos (packaging plants) and the cuadrantes (workers' homes) in the Valley. The typical system consists of a well with the pump, a small weatherproof and theft-proof station, and a switchboard with automatic control in some cases, disinfecting system and the corresponding tubes.

The engineers' conclusions include recommendations for several things to make the systems more efficient. They observed several problems that could be solved easily and inexpensively. For example, some of the equipment was outdated and/or needed repair. Preventive maintenance, replacing some of the older and more inefficient pumps with new ones, installing automation in every pump (presently only in 5) is their major recommendations (Trejos y Acunia Ingenieros). These recommendations have not yet been implemented.

2.1.5 Fans

Ceiling fans have existed for approximately 100 years and are one of the world's most useful appliances (www.fanlocator.com). They have been used for moving air to create a more comfortable atmosphere. The ceiling fan is an investment that pays for itself. In some businesses and companies, ceiling fans are an essential accessory to create comfort for the workers.

A fan is a device for creating a current of air or for causing a breeze. It uses an electric motor to rotate fan blades to move air from the ceiling, where the warmer airs will be, toward the floor (www.fanlocator.com). This breeze or mixing of air will have a cooling effect on human skin. As air moves across, it evaporates body moisture, making one feel cooler and more comfortable. Fan can air out or freshen a room. Fans are a great source of energy-efficient climate control. Fans save on air conditioning bills and conserve valuable energy.

Efficient airflow from a ceiling fan is a function of four factors:

- Motor RPM: high RPM is only meaningful if the other three factors are optimized
- Blade surface area: if a blade is too narrow or short, it won't move much air
- Blade angle pitch: blade holders should be precision matched, aligned, and have exact degrees of pitch
- Blade sweep diameter: fan or blade sweep is also an important component

Fans that have the greatest airflow have the largest blade pitch and greatest RPMs. The more blade surface, the more air it will catch and the larger the pitch, the more air it will move. As the pitch or blade surface increases, the motor size must be increased or the RPMs of the motor will drop. The motor size must be engineered to match the blade pitch and blade length in order for a fan to operate efficiently and effectively (www.fanlocator.com). Fans that have inadequately sized motors can cause over-heating and motor burnout.

For long or large rooms depending on the dimension, one may consider more than one fan to handle the cooling requirements. For maximum comfort, the fan should be placed as close to the center of the room as possible. Blade tips should be at least 18 inches from any wall for the best air movement and clearance. For ceilings above eight feet, the fan should be hung by a downrod to eight or nine feet from the floor. This is important because, the higher the fan is hung, the less air circulates near the floor.

Ceiling fans are purchased for three reasons: cooling, heats reclamation, and fashion (www.fanlocator.com). Cooling is the idea of "wind chill". Ceiling fans move counter-clockwise to cool and provide a breeze that makes the air feel cooler, even though they don't actually lower the air temperature. With a ceiling fan working, 78 or 80 degrees can feel as comfortable as 72 degrees, which leads to big energy savings. Even at high speeds, a ceiling fan typically uses less energy than a 100-watt light bulb and less than a 25-watt bulb at low speed (www.fanlocator.com).

Heat reclamation occurs when a ceiling fan pushes warm air down from the ceiling. For this to happen, the fan must be set to the lowest speed, and operate in reverse, so there will be no wind chill effect. Ceiling fans also enhance the character of any room. With the variety of styles and models available today, finding one to fit your need is easy.

To search for the brand of fan that gives the most for the money, one needs to compare to see which ones are most efficient and have the best warranty. Depending on its features, a fan can dramatically reduce energy costs. Other features to consider are low initial cost with high quality materials, low maintenance and operating costs, minimal replacement costs, and dependable performance. The most important part of any ceiling fan is the motor. Therefore, one also needs to find the most reliable and most durable ceiling fan motor that provides optimal performance and longevity.

The final characteristic one needs to look for is warranty. When you hear "Lifetime Warranty", be careful to read the warranty papers. Normally, it will be a "Limited Lifetime" warranty and the only part of the ceiling fan that exceeds one year will be the motor. All the component parts will normally be guaranteed for only one year.

2.1.6 Wiring

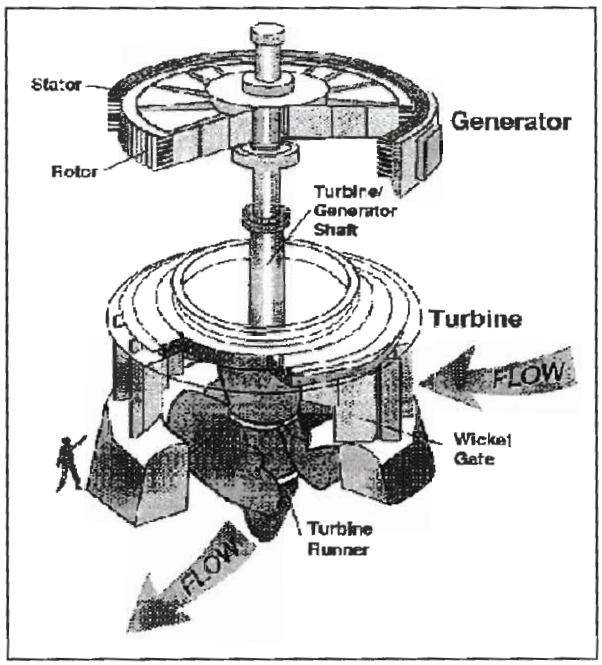
When trying to conserve energy, the wiring of the building should also be examined. There are many plans for wiring a building, but the most economical

is branch circuit wiring. Branch circuit wiring minimizes the length of conductors and conduit wires (Zackrison, 12).

2.2 Alternate Energy Sources

Even though there are many new ideas proposed to reduce energy consumption through alternative energy sources, many companies opt for the usage of publicly supplied electricity for its safety and dependability (Chateau, 155). While other energy sources such as a private hydroelectricity plant may be economical in the long run, they often require an initial large investment.

2.2.1 Hydroelectric



Force of falling water through the opening in the penstock turns and spins the turbine. This turns the rotor in the generator to produce electricity. The generator works by converting the mechanical energy of the rotating turbine shaft into electrical energy. The water used for hydroelectric generation is not changed in any way. The natural cycle of evaporation and precipitation assures a continued supply of water for power (Wagner, 1984). Hydropower may be a primary or a reserve source of electricity.

2.2.2 Wind

Windmills rotate to produce electricity from the mechanical energy of wind (Corbitt, 1993, p.200). In areas of strong wind, this method is very effective. Less windy climates will not provide sufficient mechanical energy to run a factory.

2.2.3 Geothermal

Steam accumulates within the Earth as a result of the Earth's core being hotter than its surface. Once this steam is brought to the surface, it will cause the turbines to generate electricity. Another method of accomplishing the same task is to heat water by passing it through deep hot rocks. This method can be very expensive since it involves drilling holes to reach these deep rocks (Corbitt, 1993, p.201).

2.2.4 Solar

The sun is an incredible source of energy. Light and heat energy can be converted to electrical energy through use of solar panels. This is one of the cleanest and cost-effective alternate sources of energy. Moreover, the use of solar power for electrical energy generation does not involve the use of any limitless resource (Corbitt, 1993, p.200). The greatest investment for a Company would be an initial one, specifically, the building and design of solar panels to install in a pre-existing setting.

2.3 ISO 14001

ISO 14001 is a certification granted by the International Certification Service (SGS) that verifies that a corporation has met the EMS (environmental management system) requirements.

2.3.1 Description

In July of 1998, Standard Fruit Company de Costa Rica (SFCO) became the first banana exporter and the first agricultural producer in the world to become certified under the environmental management system (EMS) requirements of ISO 14001 by the world renowned International Certification Service. SFCO's extensive program of scientifically based and environmentally friendly methods of banana production were objectively verified by the International Certification Service to be functioning effectively (Rojas, 1998). ISO 14001 requires that a Company have an operating EMS based on the principles of management and employee commitment, continuous improvement in environmental performance, open communication on environmental matters, and periodic review of the management system based on key performance measures. This means that Dole incorporates environmental considerations into all aspects of its banana operations, ensuring that it produces the highest quality fruit in the most environmentally responsible manner. Also, it signifies that SFCO is giving adequate attention to solid and liquid waste management, careful application and management of crop protection products, strict control over worker occupational and safety conditions, constant worker training reforestation

projects, and environmental protection. SFCO is the first certified EMS system in the world that is focused primarily on the management and monitoring of the environmental impacts and practices of its materials and independent fruit suppliers. As stated by Dole Food Company, Inc.: "It is our goal to have Dole's other fresh fruit divisions in Latin American and Asia certified to the ISO 14001 by the end of 1999. Elements of Dole's program include management commitment; operating policies that go beyond compliance (stressing pollution prevention, waste minimization and risk reduction); a Company-wide organization of professionals; specially developed technical guidance and training; regular self-assessment and goal-setting; and a dedication to continuous improvement" (www.dole.com).

The Company has created a program addressed to workers' occupational health and to the environment. SFCO has promoted different projects that embrace topics like reforestation, control and recycling of chemical containers and plastic, waste disposal, water monitoring, organic fertilizer production and seminars to nearly 3.000 (3,000) workers. These seminars cover topics from safe chemicals handling to environmental conscience and occupational security and health. Currently, SFCO scientists are part of a multinational team researching invertebrate biodiversity in banana farms, and the use of reforested areas set aside from banana production to protect waterways as movement corridors by tropical birds, and as stopover and wintering habitats neotropical migrant birds (www.dole.com).

The entire SFCO organization considers the EMS to be a top priority of utmost importance for the future of its operations. To fully meet the goals of the EMS, their materials suppliers have been encouraged to actively participate and to comply with Company goals and objectives. Standard Fruit Company of Costa Rica, a producer and exporter of DOLE brand bananas along with many other products, continues to demonstrate its permanent commitment to its worker community and to the entire nation of Costa Rica.

2.3.2 Energy Reduction Program

SFCO has an energy reduction program that is in accordance with ISO 140001 specifications. The objective of the program is to ensure that all SFCO offices, packaging plants, and storage facilities reach at least the minimum energy-saving requirements as specified by current law. It is the responsibility of all finca managers, supervisors, or superintendents of the offices and plants to ensure that the system is operating with the highest energy efficiency possible.

SFCO has issued detailed instructions to finca authorities that explain the motives behind the Energy Reduction Program. These instructions are as follows (SFCO Sistema de Manejo Ambiental, 1998):

1. It is the responsibility of all finca managers, Superintendents, and Supervisors in the entire Costa Rica Division to see that all organizations, for which they are in charge, comply with all SFCO guidelines for energy-saving.
2. All facilities and installations ought to have an energy audit to test for "reasonable" and effective energy consumption. These tests

are the responsibility of the Department of Engineering in each Zone.

3. If organizations are noticed to be operating at a sub-standard level, a system of effective energy saving must be implemented as soon as possible.
4. All new additions must meet the energy-saving standards in accordance with current law of Costa Rica, and the engineering Superintendents have the responsibility to ensure that these standards are reached.

2.4 General Overview of the Banana Markets

The crisis in the banana markets is worsening with a new fall in prices in the order of 67%. The box of bananas (18.14 kilos) in the East Coast of the United States went from U$10.50 in 1998 to U$4 in June 1999. This presents the banana producers with a very grim picture. This is not just recent, banana prices have been falling since the early 90's, and the profit margins have been diminishing. Currently, it is believed that all banana producers are operating at a loss. There are several causes of this downward trend, but the most important is the increase in the planted areas by the banana producing countries, mixed with an increase in crop productivity.

The world economic crisis, especially in such large consumer markets as Russia and China, is not helping this situation. The lack of economical demand has had a significant impact on SFCO. The Company needs to restructure its organization in order to reduce its costs and to meet its bottom line or at least reduce its losses (see Appendix B – interview with Felipe Vargas).

Consequently, our project is of great importance to SFCO. Although electricity in the fincas is not a major cost, it may still represent a significant percentage when we are dealing with low profit or loss margins.

REFERENCES

1. Chateau, Bruno. (1982). Energy Demand: Facts and Trends. New York: Springer-Verlag.
2. Corbitt, Parker. (1993). McGraw-Hill Encyclopedia of Environment Science & Engineering (3rd ed.). New York: The McGraw-Hill Companies, Inc.
3. Cotton, Richard, and Sawhill, John (1986). Energy Conservation: Successes and Failures. Washington, D. C.: The Brooking Institution.
4. Dolin, Eric. (1997, September). EPA's Energy Efficiency Programs. Environment, 39(7), 28-89.
5. Long, Robert (1989).
6. Reay, D. A. Industrial Energy Conservation: A Handbook for Engineers and Managers. New York: Pergamon Press, Inc.
7. Rojas, Juan Carlos. (July 8, 1998 *Press Release*). Standard Fruit Company de Costa Rica S.A., Leader of Environmental Development in the Banana Industry Receives ISO 14001 Certification.
8. Smith, Thomas E. (1979). Industrial Energy Management for Cost Reduction. Ann Arbor, MI: Ann Arbor Science.
9. Wagner, Susan. (1984). Small Hydropower Fluid Machinery. New York: The American Society of Mechanical Engineers.
10. Zackrison, Harry B. (1984). Energy Conservation Techniques for Engineers. New York: Van Nostrand Reinhold Co.
11. Diario "La Nacion" Costa Rica, June 24th 1999

12. Diario "The Tico Times" Costa Rica, May 29th 1999

13. (Trejos y Acunia Ingenieros – TAISA) for Dole "EVALUACION EQUIPOS DE BOMBEO DE POZOS FINCAS VALLE DE LA ESTRELLA", October 1998.

14. Internet Address: www.dole.com

15. Internet Address: www.fanlocator.com

16. Internet Address: www.hgatrains.com/cost-benefit

17. Internet Address: www.west.net/~rondec/motfaq

18. Internet Address: peerlesselectric.com

3 Methodology

Our goal for this project was to determine the nature of electrical demand and consumption and to examine energy conservation on banana plantations of the Standard Fruit Company of Costa Rica (SFCO). We became familiar with the people, the machinery, and the processes of the company. This familiarity was achieved by interviewing the managers and engineers, observing the packaging operation, and learning the basic layout of the plant. We were able to visit many farms in different regions of Costa Rica with the help of our liaison, Kevin Ludeke. We toured each of the packaging plants, which allowed us to better determine where the energy is being used and wasted. We prepared a list of questions to ask the managers of every packaging plant and a chart to record all the sources of electrical consumption in each finca (farm).

3.1 Banana Plantation Visits

There are 32 packaging plants distributed among the banana plantations. Each plant covers approximately 250 Hectares (Ha). The plants vary in size and employ an average of 40 to 50 individuals according to the production needs. The plants we visited were chosen on the basis of size and geographical location. SFCO has banana plantations throughout the entire Atlantic side of the country, and these plantations are

divided into zones of independent management. The characteristics of the land at each location vary greatly. Some of these variations are the quality of the soil, the rainfall, irrigation and drainage systems, and the age of the plantations. In addition, the regions differ greatly in their employees' cultural background and therefore in their style of working and methods of administration.

With the help of our liaison, we chose locations because they had quite different characteristic. This diversity allows for a representative sample of all the different characteristics of the banana farms. Our sample included packaging plants ("boxitos") of three regions: Estrella Valley, Bananito, and Perla. We visited four boxitos in Estrella: Finca 15 and Cartagena of the Cerere/Duruy

Farm, and Finca 2 and MP of the Fortuna Farm. We visited La Paz and Los Rios packaging plants in Bananito and the following plants in Perla: Boxito 1, Boxito 3, and Porvenir. MP in the Estrella Valley was designed to sustain the production for the whole valley. The theory that a major centralized packaging plant would be the most efficient design was implemented 30 years ago when the Company started to ship bananas in boxes. MP is thus significantly larger than the other boxitos that have been added to Estrella over time. In fact, it is the largest packaging plant in the Company. This difference is apparent from visiting the plants and comparing their sizes.

Other differences were not as obvious until we interviewed general (administration) and divisional managers ("capatazes") at each finca. The

managers provided us with information regarding the age of the plantations, the quality of soil, flood control issues, modes of operation and supervision within the plant, and worker satisfaction. Estrella is the oldest of the SFCO fincas and therefore has problems with the aging of soil and also has been deteriorated by periods of extreme flooding. This age is also reflected in the boxitos, which were the first to be built by the Company. On the other hand, Bananito is the newest SFCO farm with the most modern boxitos. SFCO has activated a new plan at Bananito for worker urbanization with the purpose of creating a model community. According to the general and divisional managers at Bananito, implementing a series of urban developments has elevated worker satisfaction. The plan includes a variety of benefits, including added recreational facilities and modern housing that all contribute to the building of the neighborhood.

Perla and Porvenir in the Pacuare region have exceptional productivity achieved by a combination of factors not present in other fincas. Some of these factors are that the properties of the soil are conducive to banana production, that flooding issues have been solved with a dike system and pumping facilities, and that the workers' cultural background has fostered a relationship of solidarity between personnel and their supervisors. This region's unique general manager has accelerated this latter development. Much of this progress can be attributed to the Perla General Manager, Felipe Vargas.

Table 2.3.2-1 Packaging Plants

Region	Boxito (packaging plant)
Estrella Valley	Finca 15, Cartagena Finca 2, MP
Bananito	La Paz, Los Rios
Perla	Boxito 1, Boxito 3, Porvenir

3.2 Quantitative Electrical Consumption

In order to quantify electrical consumption at the packaging plants, electric bills for each boxito were obtained and compared with each boxito's production and number of employees. We retrieved this information from Rafael Herrera at Duruy (see Appendix B). He prepared a report in his computer that is connected to the centralized accounting system, called the Global Accounting System. We accessed it through SFCO's administrative database. The information includes the electric bill for each period, the number of banana boxes produced, and an average number of workers employed in the packaging plant.

The report could be reproduced for any other boxito for which we could get a *call number.* This call number is a designated number that is assigned to take control of the costs of each individual plant. We met with administrative managers at the other fincas (see Appendix B) and asked for the call numbers of the other boxitos we were studying. After we had the call numbers for all the boxitos that we had visited, an SFCO information technology expert used these numbers and retrieved this specific information for us. This method was very

efficient, allowing us to maximize our time with the finca managers in discussing additional topics.

Our methodology for collecting quantitative residential data differed significantly from that used for collecting packaging plant data. We needed to know the values for electrical consumption per month per house at each finca. This information (see Appendix E) is not recorded in the SFCO Global Accounting System, and hence we had to ask for it at each finca. We were able to obtain this information in Estrella and Perla, but not in Bananito. The Bananito administrative manager had recently transferred from another location and, understandably, did not know where these records are kept.

The consumption in the houses is classified as "low demand", causing it to differ from that of the packaging plants. "Low demand" means that the electric bill is directly proportional to the amount of energy consumed, and is measured in KiloWatt-Hours (KWh). Consumption in the boxitos is "high demand" (industrial usage) and is measured by the amount of energy consumed, plus the demand during peak hours. Peak hours are from 10:30-12:30 and 5:30-7:30 where there is a charge for demand apart from the energy consumed. For this usage, ICE (Instituto Costaricense de Electricidad), the local electricity supplier, measures the demand of the equipment being used and determines the surcharge for this usage during the peak hours. We obtained this information from a contact (Mr. Jose Damian, ICE of Estrella Valley) in ICE to whom Augusto Bolañoz (see Appendix B) referred us.

3.3 Interviews

We interviewed the divisional managers and residents at each packaging plant to explore the possibility of energy conservation at the plantation and at the residences.

3.3.1 Divisional Managers (Capatazes)

To determine energy demand and consumption and to investigate the possibility of energy conservation at a plantation, we asked the divisional managers, who are the individuals in charge of supervising the operation of the packaging plant, the following questions:

- Who is in charge of turning on and off the lights/motors/fans/water pump?
- Is there a schedule or procedure for turning on and off the lights/motors/fans/water pump?
- Where are the switches located? Is this a convenient location?
- Who does the maintenance of the electric installations? Are there any reoccurring problems? How often are appliances replaced?
- What are the hours of operation of this farm?
- How many breaks do the workers have per day? How long is each break?
- Are the lights/fans/motors left on during the breaks?
- Is there enough natural lighting? Is the artificial lighting efficient?
- What lights is left on at night (security concern)?
- Any other concerns regarding the electrical usage or installation?

The answers to the questions gave us a clear idea of the use of energy from the point of view of the divisional managers ("capatazes"), who are the individuals directly in contact with the processes. Although we were not able to question the workers directly, the individuals in charge of turning on and off the electric appliances are the capatazes. No technical data was requested from the capatazes because they are not in charge of the installation and maintenance of electrical equipment. The Department of Ingenieros (engineers) is in charge of these tasks.

3.3.2 Residents

In addition to our interviews with the finca managers, we also visited housing facilities that Standard Fruit provides to its workers. Standard Fruit pays a portion of the workers' electric bills. To determine the usage of electricity in the households, we developed an informal survey for the owners. The following questions were asked of the owners of fifteen houses in total (3 in Estrella, 2 in Bananito, and 10 in Perla). Our ability to interview residents was limited by the number of residents to whom our supervisor was able to introduce us, as well as the number of residents who were available during the interviewing periods. Our sampling size in Perla is significantly larger because there are five different types of houses at this

we decided to interview two owners of each type. The homes were nearly identical in Estrella and Bananito.

- Name all the electric appliances in your house.
- How much do you pay a month for your electricity? How much does the company pay?
- How new are these appliances you have mentioned above?
- At what time during the day do you consume the most electricity?
- During the day, do you try to conserve energy? How?

The interviews we conducted with farm residents were designed to supplement our quantitative residential data. The results from these interviews are relevant because they enable us to characterize household electrical consumption. Knowing the amount that a resident pays per month for electricity is useful, but, only through conversing with the resident can one determine what the major sources of electrical consumption are in that household.

3.4 Data Collection

We initially characterized the electrical consumption at each packaging plant. The consumption is mainly from lighting, motors, fans, and water pumps.

3.4.1 Sources Of Electrical Consumption At The Boxitos, Qualitative Data

In observing the patterns of their usage, we were able to verify our quantitative data for electrical consumption. In other words, we were able to see

how the electricity is being used in each boxito and how the Company's money is being spent. Furthermore, we will make recommendations for energy conservation based on these observations. If there were situations in which electrical consumption was not necessary, we reported that energy was being wasted. The following is a sample form used for collecting this pertinent data.

Table 3.4.1-1 Sample Form for the Qualitative Analysis of Electrical Consumption

FINCA:	Sample Boxito A	Sample Boxito B
Lights		
#artificial*		
#natural		
Position		
Window Composition		
Light Type**		
Motors		
#		
Purpose		
Power Unit		
Fans		
#		
Placement		
Size		
Power Unit		
Water Pumps		
#		
Power Unit		

* Lights are pairs of two 40-Watt fluorescent bulbs.
** Coated fluorescent lights are present in rows with many workers. This is in the area where bananas are being packed in the boxes. The brightly-colored coating is design to repel insects.

Our studies began by physically counting all of the artificial and natural lights at the packaging plant, upstairs and downstairs. The type of light was recorded, as well as a description of the medium for natural light transit (e.g. – screening, plastic, etc.). We needed to know these characteristics in order to make recommendations for more energy saving, efficient modes of lighting in the workers' environment. The position of the lights was also an important factor to note. There are operational areas in the plant that require more lighting, particularly the area in which bananas are being packed in the boxes before loading them into a container. It was also necessary for us to note areas in which a surplus of lights was present.

The number and purposes of the motors, fans, and water pumps were recorded to verify the sources of electrical consumption and to justify their necessity in the plant. For example, we came to fully understand the purpose of each motor and conveyor in order to confirm that each played a critical role in the entire packaging process.

3.5 DATA ANALYSIS AND MODEL CONSTRUCTION

After we investigated all the farms and collected the above data, we created a model for comparing the energy consumption at each boxito. We achieved this by finding the boxito with the largest gap between high productivity and low electrical consumption. In other words, we were searching for the most energy efficient and most productive packaging plant. This consumption was measured in dollars per box spent on electricity to follow the industry standards of measuring costs and profits in terms of dollars per box. With our observations and the data collected from the global accounting system, we created a model to calculate theoretical energy consumption. This model would aid us in weighing the options for improving efficiency, differentiate investment yields and calculate savings.

4 Results and Analysis of Results

This chapter contains information we gathered from: visitations to banana packaging plants, interviews with the general managers of each plant, interviews with the employees residing in the housing facilities of each plant, and the existing computer database from Standard Fruit Company de Costa Rica (SFCO). Additionally, this chapter discusses the examination and analysis of the data gathered from these four sources (see Appendix E-Data and Data analysis).

We visited nine packaging plants to gain an understanding of their electric consumption; however, due to the limited availability of relevant data from several of these plants, we performed detailed analysis on only six of the nine plants. Table 4.0.1 shows the plants (boxitos) that we thoroughly analyzed in the later sections of this chapter.

Table 3.4.1-1 Packaging Plants Analyzed

Region	Boxito (packaging plant)
Estrella	Finca 15, Cartagena
Bananito	La Paz, Los Rios
Perla	Boxito 1, Porvenir

4.1 Packaging Plants

To characterize the nature of electrical demand in the six packaging plants listed above, both quantitative and qualitative analyses were performed. Our

quantitative data includes the electric bill dollar amounts spent by SFCO each period for every packaging plant. There are thirteen billing periods per year. The data also consists of the number of boxes produced by each boxito per period.

The entire banana industry measures profit, production, and cost in dollars or cents per box. By dividing the dollar amount spent for energy per period by the amount of boxes produced in that time, we derived a value that reflects one boxito's energy efficiency in comparison to the other boxitos. A high value can result from either a large amount of money spent on electrical usage, low production, or a combination of the two. Furthermore, a high value for one boxito in comparison to the rest implies that it is less efficient. Observing the patterns of electrical usage in the six packaging plants not only contributed to our study of electrical demand, but highlighted areas in which the plants may be able to conserve more electricity.

4.1.1 On-site Qualitative Observations

The following data was gathered at three separate sites: Estrella Valley, Bananito, and Perla. Electrical usage at nine banana packaging plants ("boxitos") four in Estrella Valley, two in Bananito and three in Perla-Porvenir

were surveyed by counting the number of lights, motors, fans, and water pumps and observing the patterns of their usage.

Table 4.1.1-1 Estrella Valley Packaging Plants

FINCA:	Cerere/Duruy: Finca 15	Cerere/Duruy: Cartejena	Fortuna: Finca 2	Fortuna: MP
Lights				
#artificial*	7 upstairs, 57 downstairs	4 upstairs, 35 downstairs	6 upstairs, 49 downstairs	4 upstairs, 73 downstairs
#natural	4 upstairs, 7 downstairs; Entry way	NONE	Entry way	NONE
Position	Symmetrical rows	Symmetrical rows	Symmetrical rows	Symmetrical rows
Window Composition	Plastic windows, Screen mesh at entry way	N/A	Screen mesh at entry way	N/A
Light Type**	Normal fluorescent (non-energy-saving)	Normal fluorescent (non-energy-saving)	Normal fluorescent (non-energy-saving)	Normal fluorescent (non-energy-saving)
Motors				
#	5	5	5	5
Purpose	Conveyors/ Water Pump	Conveyors/ Water Pump	Conveyors/ Water Pump	Conveyors/ Water Pump
Fans				
#	3 upstairs, 7 downstairs	2 upstairs, 0 downstairs	4 upstairs, 4 downstairs	3 upstairs, 4 downstairs
Placement	Ceiling, Symmetrical	Ceiling, Symmetrical	Ceiling, Symmetrical	Ceiling, Symmetrical
Size	Round appr. 120 cm	Round appr. 120 cm	Round appr. 120 cm	Round appr. 120 cm
Water Pumps				
#	1	1	1	1

Table 4.1.1-2 Bananito Packaging Plants

FINCA:	La Paz	Los Rios
Lights		
#artificial*	4 upstairs, 60 downstairs	4 upstairs, 60 downstairs
#natural	NONE	NONE
Position	Symmetrical rows	Symmetrical rows
Window Composition	N/A	N/A
Light Type**	Normal fluorescent (non-energy-saving)	Normal fluorescent (non-energy-saving)
Motors		
#	5	5
Purpose	Conveyors/ Water Pump	Conveyors/ Water Pump
Fans		
#	2 upstairs, 0 downstairs	0
Placement	Ceiling, Symmetrical	N/A
Size	Round appr. 120 cm	N/A
Water Pumps		
#	1	1

Table 4.1.1-3 Perla Packaging Plants

FINCA:	Boxito 1	Boxito 3	Porvenir
Lights			
#artificial*	6 upstairs, 28 downstairs	4 upstairs, 57 downstairs	4 upstairs, 69 downstairs
#natural	0 upstairs, 16 downstairs; Entry way	NONE	NONE
Position	Symmetrical rows	Symmetrical rows	Symmetrical rows
Window Composition	Plastic windows, Screen mesh at entryway	N/A	N/A
Light Type**	Normal fluorescent (non-energy-saving)	Normal fluorescent (non-energy-saving)	Normal fluorescent (non-energy-saving)
Motors			
#	4	4	4
Purpose	Conveyors/ Water Pump	Conveyors/ Water Pump	Conveyors/ Water Pump
Fans			
#	2 upstairs, 4 downstairs	2 upstairs, 3 downstairs	2 upstairs, 0 downstairs
Placement	Ceiling, Symmetrical	Ceiling, Symmetrical	Ceiling, Symmetrical
Size	Round	Round	Round appr. 120 cm
Water Pumps			
#	3 (recycle water)	3	3

* Lights are pairs of two 40-Watt fluorescent bulbs.
** Coated fluorescent lights are present in rows in the area where bananas are being packed in the boxes. The brightly-colored coating is designed to avoid attracting insects.

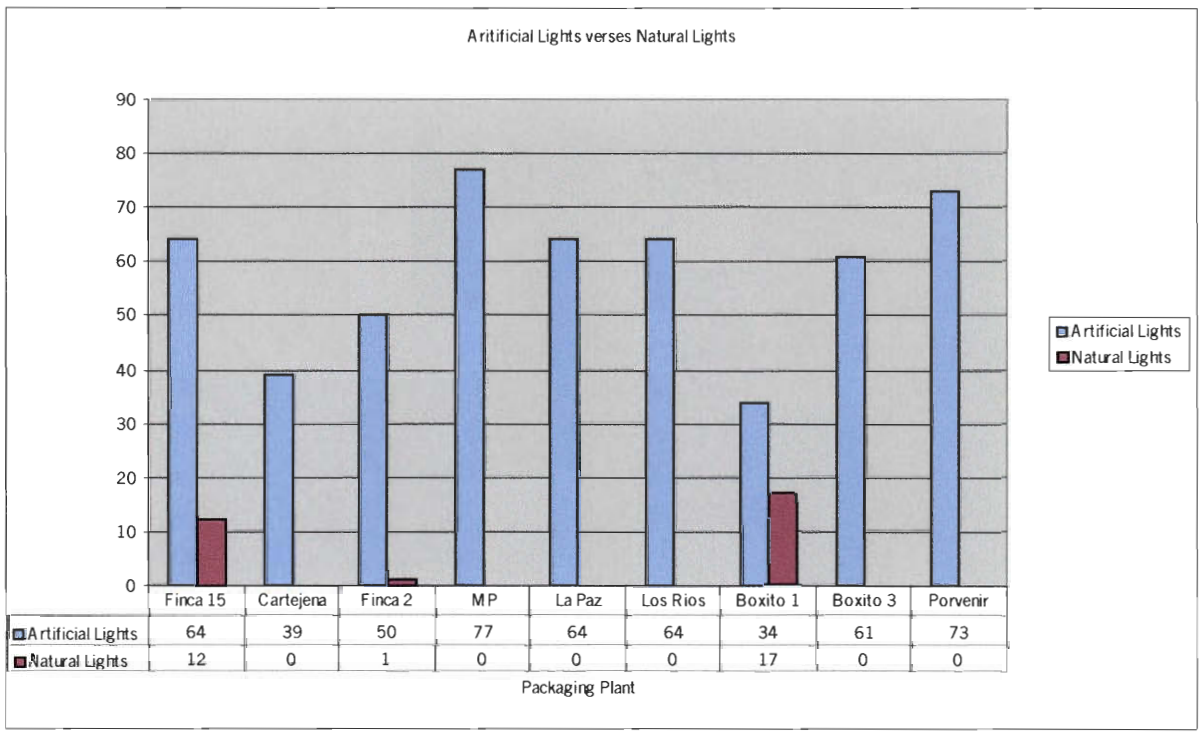
4.1.2 Artificial Lights and Natural Lights

The number of artificial lights and natural lights vary throughout each of the nine packaging plants that we visited. Artificial lights are pairs of two 40-Watt fluorescent bulbs that are positioned in a symmetrical row. There is no definitive

schedule for turning on lights in the nine packaging plants. Lights are turned on when there is a need for more lighting.

We noticed that coated fluorescent lights are present in rows at the boxing areas, where the bananas are being finally packaged. The brightly-colored coating on this type of light prevents the attraction of insects to the bananas. These lights were constantly on at all of the plants that we visited.

Three out of the nine packaging plants we visited use natural lighting. There are two types of natural lighting: black screen mesh and plastic roof windows. Both types allow natural light to enter the plant. This mode of lighting is practical and efficient because it provides natural sunlight without allowing the passage of heat into the plant.



	Finca 15	Cartejena	Finca 2	MP	La Paz	Los Rios	Boxito 1	Boxito 3	Porvenir
Artificial Lights	64	39	50	77	64	64	34	61	73
Natural Lights	12	0	1	0	0	0	17	0	0

Figure 4.1-1 ***Artificial and Natural Lighting Distribution in Packaging Plants***

4.1.3 Lights, Fans and Motors

The number of lights and ceiling fans throughout the packaging plants are not standardized. The number of these appliances changes from one farm to another. Among these nine plants, the number of fan range from zero to ten and the number of lights range from thirty-four to seventy-seven. The size of a packaging plant does not determine the number of fans and the number of lights.

All of the packaging plants that we visited are designed with two floors for two different operations. On the first floor, fans are placed linearly and directly above an assembly line of workers. There are other assembly lines that do not have any ventilation systems such as the lines for chemical application and the banana packaging lines. On the second floor, fans are placed above the workers who manually glue the shipping boxes together. However, these workers are not always provided with a ventilation system. The presence of fans varies from plant to plant. The fans in the second floor also provide a way of avoiding the dispersion of the dust that comes with the carton boxes, making it safer for the employees to work there.

In conclusion, there is no consistency between the plants. We observed that one of the packaging plants in Bananito has no fans due to its high ceiling. The high ceiling provides an abundance of air circulation in the plant. Since the workers do not complain about heat problems, there was no reason for the company to install fans.

Four of the motors at the boxitos run four conveyors and in some cases (Estrella and Bananito) the fifth runs a trash masher to disintegrate the bananas

that are disposed. These motorized conveyors have two purposes: to transport boxes of packed bananas to cargos, and to dispose of undesirable bananas. The four motors that drive the conveyors are essential and operate efficiently, even though they are old. We did not have a way of measuring their consumption efficiency. They are turned off during breaks to signal the break and to conserve energy.

4.1.4 Water Pumps

Each water pump uses a motor to pump water out of the well. We did not have the opportunity to look at the pumps in much detail; however, the TAISA study, as mentioned in the *Literature Review* Chapter, suggests that most of the pumps have some problems of maintenance and efficiency. It is also difficult to determine the operation of the pumps, because in most cases they also supplied water to nearby residences.

4.1.5 Quantitative Productivity and Electrical Consumption

Table 4.1.5.1 presents the electric appliances for the six plants in the three regions. The electric appliances in this table include lights, fans, and motors. The two Bananito packaging plants, collectively, have the highest number of lights, a total of 128. However, Figure 4.1.5.1 shows that this region evidently consumes a low amount of energy per box in comparison to the Estrella Valley and Perla-Porvenir regions. In contrast, although Perla has a smaller number of lights, it consumes more electricity than Bananito. Additionally, although Perla

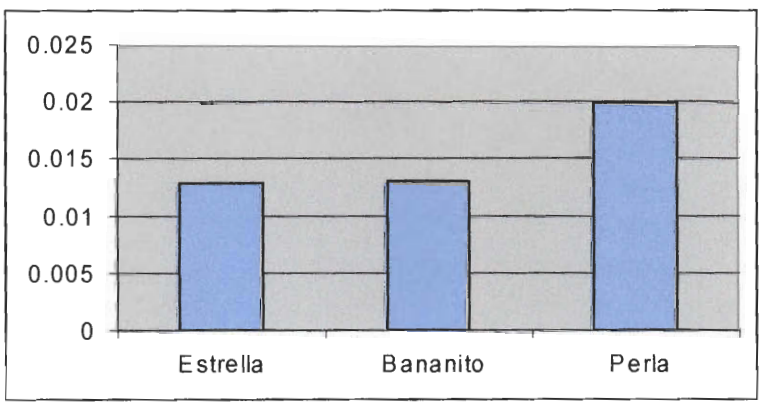
has approximately the same number of lights as Estrella, it consumes significantly more energy than Estrella.

Table 4.1.5-1 Electric Appliances

	Finca 15	Carta-gena	La Paz	Los Rios	Perla 1	Perla 3	Por-venir
Lights	64	39	64	64	34	61	73
Fans	10	2	2	0	6	5	2
Motors	5	5	5	5	4	4	4
Water Pumps	1	1	1	1	3	3	3

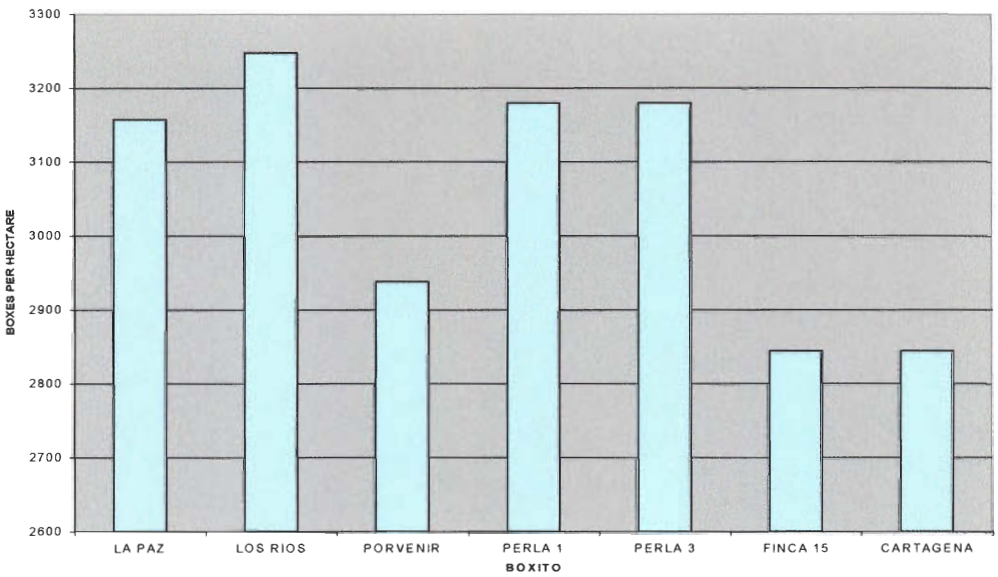
Finca 15 and Cartagena are boxitos in the Estrella valley. La Paz and Los Rios are boxitos in Bananito. Perla 1 and 3 and Porvenir belong to Perla-Porvenir. In Figure 4.1.5.2 we grouped them by region to compare the dollars per box that each region spends in electricity (see Appendix E for more detailed data).

Figure 4.1-2 Thirteen Period Average / $ per box spent in electricity, 1998



Productivity is measured in boxes per hectare. Figure 4.1.5.2 shows this productivity for the boxitos we visited. From this chart we can see that Bananito and Perla are the most productive fincas, and Estrella and Porvenir have a lower yield from their plantations.

Figure 4.1-3 ***Productivity – Boxes per hectare (yearly)***



There are many factors that account for high demand electric consumption at the boxitos. Some of these factors were the ones that we could observe and quantify, such as lights, fans, motors and water pumps. In order to quantify the factors that affect the usage of electricity, we created a theoretical model of consumption.

4.1.6 Theoretical Consumption and Uncertainties

We created a model that can calculate the theoretical consumption for each boxito. This model was designed to help us quantify the amount of money, that the Company could save. To create this model, we used the number of appliances that we counted at the boxitos and then estimated a theoretical consumption for each device. Our biggest sources of uncertainty are in the container usage and the exact number of hours that each appliance is functioning.

The pick-up schedule for the containers is very complex and there are transportation scheduling problems. For this reason, it is very common for containers to be plugged in at the fincas in order to start cooling the bananas. This time can range from a couple of hours to a whole day. The containers consume a considerable amount of energy, especially when they are first plugged in. This is because the refrigerating system in each container must reduce its temperature from environment temperature to 58° Fahrenheit. It is estimated that a container has a demand of 18 kW in this first phase.

Although we observed and inquired about the number of hours that each appliance is used, the exact hours of operation are not perfectly predictable. We observed that there was no schedule, and the usage varied from day to day and from farm to farm.

We had to make assumptions in order to create our model. We estimated that half of the lights are on during 6 hours a day, and that each pair consumes 80 Watts. We assumed that eighty percent of the fans are on during 9 hours since they are not turned off during the breaks and consume 250 Watts each. The motors are continuously running throughout the day and are turned off to announce the end of the work period. Motors were estimated at 1 horsepower and can consume approximately 800 Watts each. The water pumps' powers were taken from the study (TAISA – Appendix C), are 2 horsepower, and consume 1200 Watts. The consumption due to the operation of the water pumps is one of the biggest uncertainties. It is not obvious from our observations how many hours the pumps operate. We assumed that the pumps were working for 11 hours a day because they also supply the houses around the boxito and they are turned on continuously all through the day. After making these assumptions, we developed our model.

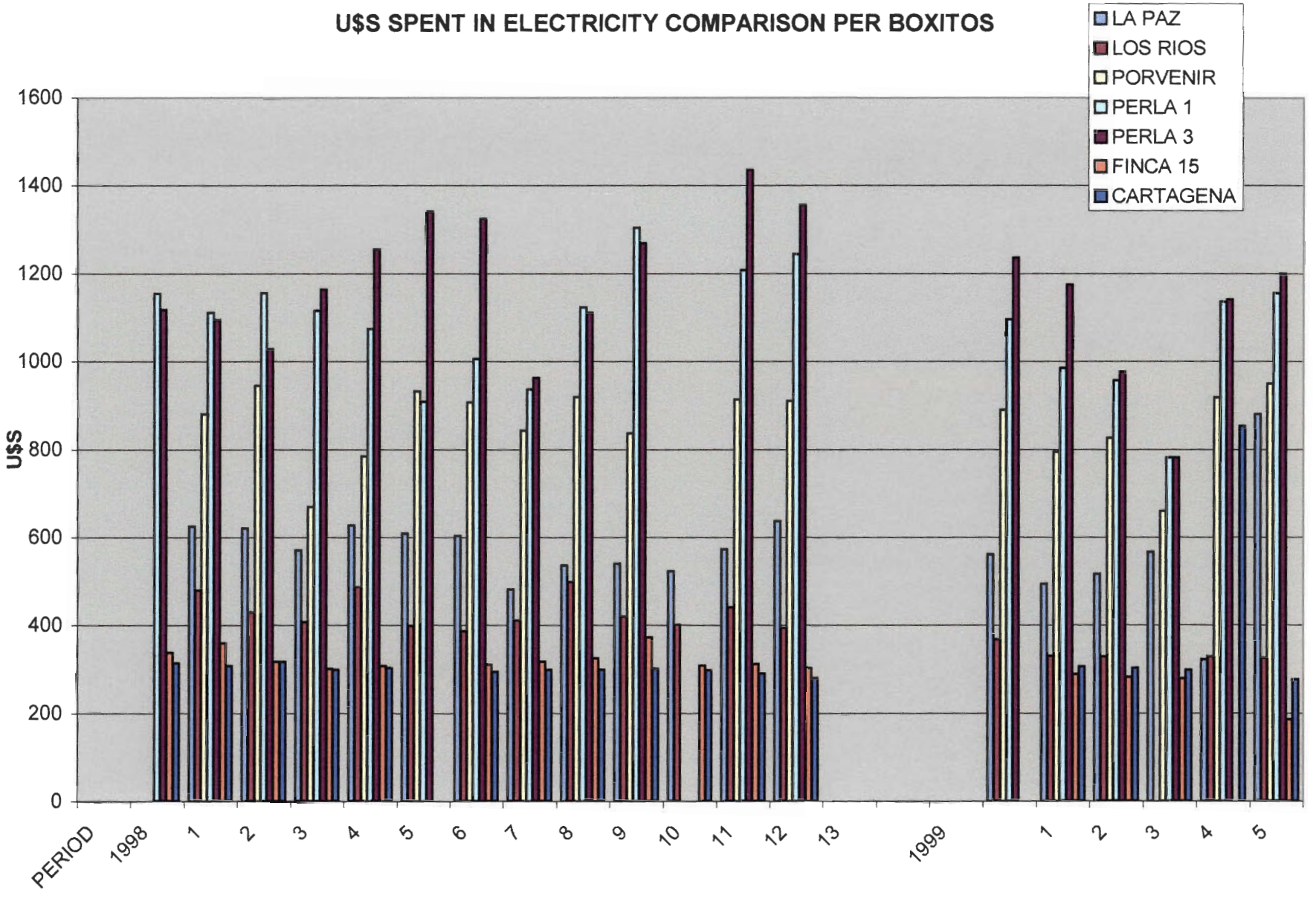
Figure 4.1-4 Theoretical Consumption, Boxitos

	Finca 15	Cartagena	La Paz	Los Rios	Perla 1	Porvenir
Lights	64	39	64	64	34	73
Fans	10	2	2	0	6	2
Motors	5	5	5	5	4	4
Water Pumps	1	1	1	1	3	3
Assumed electricity consumed by Lights	15.36	9.36	15.36	15.36	8.16	17.52
Assumed electricity consumed by Fans	18	3.6	3.6	0	10.8	3.6
Assumed electricity consumed by Motors	32	32	32	32	25.6	25.6
Assumed electricity consumed by Water Pumps	13.2	13.2	13.2	13.2	39.6	39.6

TOTAL (kWh) daily	78.56	58.16	64.16	60.56	84.16	86.32	**Average**	74.29
TOTAL MONTHLY 20 days	1571.2	1163.2	1283	1211.2	1683	1726.4	**Average**	1486

If we compare the results of our model to the actual data in Figure 4.1.6.2, we can observe that the model does a good qualitative job in predicting the real usage. As seen in Table 4.1.6.1 and Figure 4.1.6.2, more electric bill dollars are spent per period for Perla 1, Perla 3 and Porvenir. The least amount of money is spent on electrical usage for Finca 15 and Cartegena in Estrella Valley. La Paz and Los Rios fall in between this range of dollars spent. If we go back to our model, it is clear to see that there is a strong correlation between our theoretical and actual data.

Figure 4.1-5 Electric Bill Dollars Spent per Period, Boxitos


U$S SPENT IN ELECTRICITY COMPARISON PER BOXITOS
LA PAZ
LOS RIOS
PORVENIR
PERLA 1
PERLA 3
FINCA 15
CARTAGENA
U$S
1600
1400
1200
1000
800
600
400
200
0
PERIOD
1998
1
2
3
4
5
6
7
8
9
10
11
12
13
1999
1
2
3
4
5

After we had theoretical energy consumption, we used the model to quantify Company savings. We calculated savings for each plan in which SFCO can invest for energy conservation. We chose two plans that would represent the extremes, one with full investment of new, more energy-efficient equipment and the other with only a minor investment in security lights and the organizational changes that we recommend in this report. These recommendations included implementing schedules for the operations of electrical equipment, assigning a person the responsibility to turn it on and off, and establish rules and incentives for energy savings.

The first scheme determines that new modern lights, motors and water pumps could be 20% more energy efficient, yielding savings of 24% in the total consumption when combined with the housekeeping recommendations. Considering SFCO produces 17 million boxes a year, and high demand electricity represents approximately $0.03 of the total cost, 24% savings in electricity saves $122,400 yearly.

The second scenario determines the amount of money that the Company would save by applying the necessary organizational or housekeeping practices in order to conserve energy. Coupled with the necessary security lights to be left on at night, a yield of 9% savings in energy consumption would result, according to our model. This translates into a yearly saving of $45,900, with a very low cost investment.

Figure 4.1-6 Scenarios created with the model

	Finca 15	Cartagena	La Paz	Los Rios	Perla 1	Porvenir
Lights	64	39	64	64	34	73
Fans	10	2	2	0	6	2
Motors	5	5	5	5	4	4
Water Pumps	1	1	1	1	3	3

SCENARIO 1 with new motors and pumps

Cosnumption with our recommendations for conservation	**Lights**	**50% on during 3 hours**	60 Watts/Hour	6	4	6	6	3	7		
	10 Security Lights	**100% on during 12 hours**	40 Watts/Hour	5	5	5	5	5	5		
	Fans	**80% on during 8 hours**	250 Watts/Hour	16	3	3	0	10	3		
	Motors	**100% on during 8 hours**	600 Watts/Hour	24	24	24	24	19	19		
	Water Pumps	**100% on during 10 hours**	1000 Watts/Hour	10	10	10	10	30	30		
			NEW TOTAL (KW/H) daily	61	46	48	45	67	64	**Average**	57
			NEW TOTAL MONTHLY 20 days	1211	910	955	891	1333	1275	**Average**	1132
	Savings with SCENARIO 1		**SAVINGS per day**	18	13	16	16	18	23	**Average Savings**	18 **Reductio** **24%**
			SAVINGS per month	360	253	328	320	350	451	**Average Savings**	354 **Reductio** **24%**

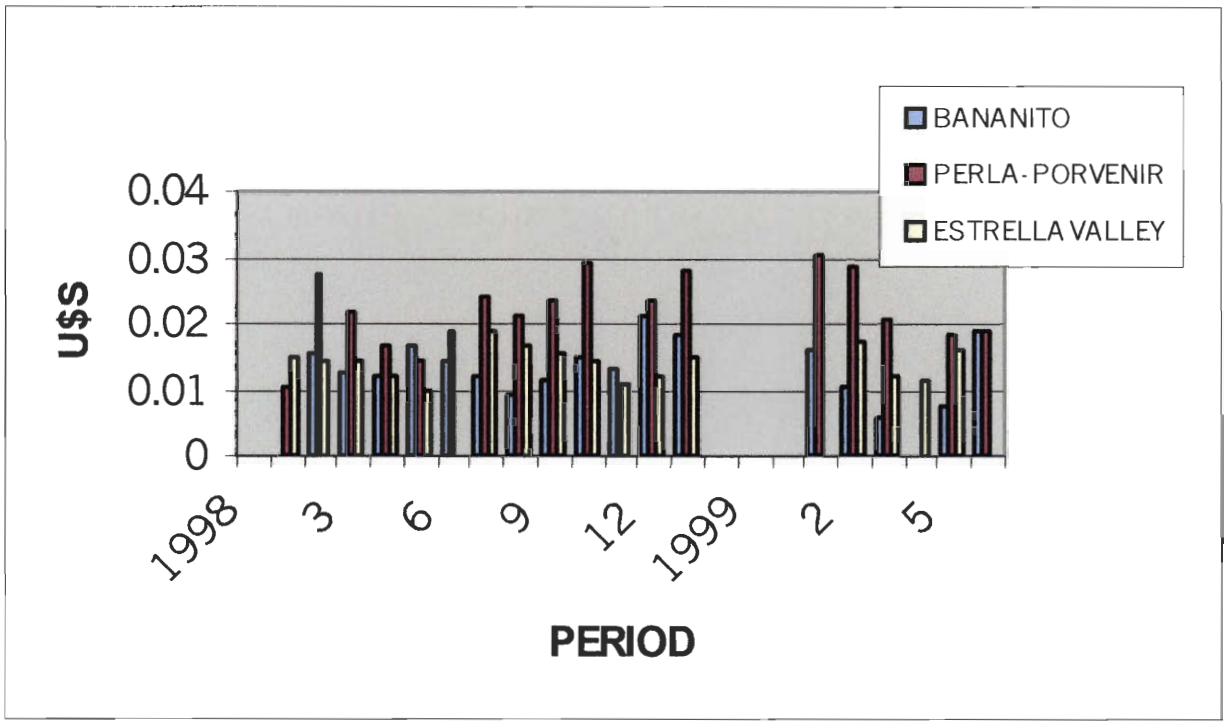
SCENARIO 2 without new motors and pumps

Cosnumption with our recommendations for conservation	**Lights**	**50% on during 3 hours**	80 Watts/Hour	6	4	6	6	3	7		
	10 Security Lights	**100% on during 12 hours**	40 Watts/Hour	5	5	5	5	5	5		0.0508
	Fans	**80% on during 8 hours**	250 Watts/Hour	16	3	3	0	10	3		0.0515
	Motors	**100% on during 8 hours**	800 Watts/Hour	32	32	32	32	26	26		
	Water Pumps	**100% on during 10 hours**	1200 Watts/Hour	12	12	12	12	36	36		
			NEW TOTAL (KW/H) daily	71	56	58	55	79	76	**Average**	67
			NEW TOTAL MONTHLY 20 days	1411	1110	1155	1091	1581	1523	**Average**	1348
	Savings with SCENARIO 2		**SAVINGS per day**	8	3	6	6	5	10	**Average Savings**	7 **Reductio** **9%**
			SAVINGS per month	160	53	128	120	102	203	**Average Savings**	138 **Reductio** **9%**

4.1.7 High Demand Costs ($ Per Box)

Figure 4.1.7.1 compares industrial usage, which is high demand, among 6 packaging plants in 3 regions-Bananito in green, Perla in gray, and Estrella in red. By dividing the dollar spent per period by the amount of boxes produced or received in that same period, one can derive a value that reflects a boxito's energy efficiency in comparison to the others. The x-axis labels are 1 to 13 because all packaging plants follow a thirteen period system with four weeks per period. From Figure 4.1.7.1, we can observe that Perla used the most energy $ per box for the majority of the thirteen periods. There are factors to explain this high-energy consumption per box in Perla. The Perla region has 6 water pumps instead of 2 water pumps like Bananito and Estrella. Water pumps, compared to lights, fans, and motors, use more energy to operate. Lights consume 80 watts per hour, fans consume 250 watts per hour, and motors consume 800 watts per hour, whereas water pumps use a total of 1200 watts per hour. Another additional factor that may explain why Perla has a high-energy consumption is our uncertainty of its refrigerator container usage, and the exact amount of hours that each electric appliance is in operation. Due to the complexity of the pick-up schedule in addition to occasional transportation problems, Perla may have to refrigerate its bananas for many hours when waiting for their transportation. A refrigerator container consumes more energy than a water pump with 18 kilowatts per hour versus 1.2 kilowatts per hour. We recommend further research on container refrigeration usage at each packaging plant to minimize the unnecessary usage of energy.

Figure 4.1-7 High Demand ($ per box), fincas

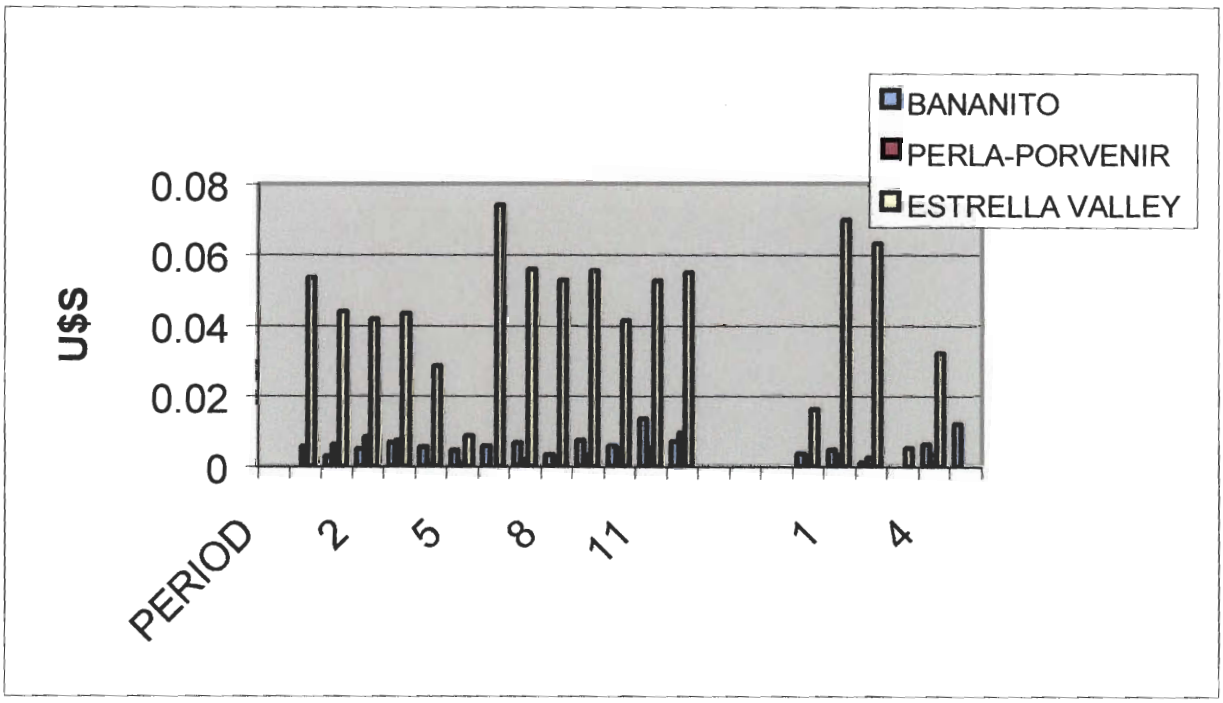


4.1.8 Low Demand Costs ($ Per Box)

This chart (Figure 4.1.8.1) shows the correlation between the residential housing and office usage, and the number of boxes produced by each of the 3 regions. Estrella consumes the most dollars per box, while Perla consumes the least dollars per box. There are possible factors to explain why Estrella consumes more dollars per box than the other two regions. The Estrella region does not consume higher dollars per box than the other two regions. However, it consumes far higher dollars per box in low demand. The number of workers' and

management houses and offices in Estrella (see Appendix D), and the high subsidy is much higher than that of any other region.

Figure 4.1-8 Low Demand ($ per box), fincas



4.1.9 Interviews with 'Capatazes'

Capatazes are the divisional managers for each boxito, or packaging plant. During our interviews, they offered many recommendations for improving the overall efficiency, including energy efficiency, of the boxitos. Each manager identified a lack of any organized schedule for operating electrical equipment, including lights. All managers agreed that fluorescent lights are not the most

energy-efficient light types and that the lights are allocated in an impractical manner about the work areas. Instead of more lights being allocated to areas of high worker concentration, and fewer to areas that need less lighting, all the lights are distributed evenly and symmetrically throughout the boxito.

Another major complaint was that there is no practical layout for the light switches. The switches themselves are often scattered from one end of the plant to another, causing unnecessary inconvenience and wasted time when turning lights on or off. Also, the switches are not clearly labeled and are not arranged in any order that corresponds to the light arrangement on the ceiling. Finally, many individual switches turn on entire *rows* of lights. This is unnecessary because, in many cases, only a cluster of lights needs to be turned on for a particular operation or work station.

The desire to add natural lighting to the packaging plants is not shared among all divisional managers. Some managers clearly supported the idea of increasing natural lighting in their boxito, supporting the goal of saving energy and the claim that natural lighting improves the work atmosphere. In contrast, other managers believed that any natural lighting (or additional natural lighting) would cause the plant to retain heat, creating a very unpleasant atmosphere for the workers.

The capatazes also complained about the waste of energy that leaving most of the lights on at night had. They suggested that a different set of lights should be installed to be loft exclusively at night for security reasons.

4.2 Residences

4.2.1 Qualitative Electrical Consumption

Residents of Estrella Valley, Bananito, and Perla banana plantations were interviewed in order to qualify the use of electricity in their homes. Chapter Three, the *Methodology*, includes the details of our survey. Residents were asked a series of questions about the types of electrical appliances they use in their homes, the frequency and duration of their usage, and if their families employ methods of conservation to save energy. The following tables outline the sources of electrical consumption in the homes, illustrating variance between farms and individual residences.

Table 4.2.1.1 Estrella Valley Residences

	Soda (Bar)	House 1	House 2
Electric Oven	Yes	No	Yes
Gas Oven	Yes	Yes	No
Lights	Yes	Yes	Yes
Refrigerator	Yes	Yes	Yes
Freezer	Yes	No	No
Microwave	No	No	No
Washer	No	Yes	Yes
Rice Cooker	No	No	No
Coffee Maker	No	No	No
Iron	Yes	Yes	Yes
Floor Cleaner/Buffer	No	No	No
Fans	Yes	Yes	Yes
Sewing Machine	No	No	No
Television	Yes	Yes	Yes
Stereo	No	Yes	Yes

Figure 4.2-1 Bananito Residences

	School Teacher	Banana Farm Worker
Electric Oven	Yes	Yes
Gas Oven	No	No
Lights	Yes	Yes
Refrigerator	Yes	Yes
Freezer	No	No
Microwave	Yes	No
Washer	No	Yes
Rice Cooker	No	No
Coffee Maker	No	Yes
Iron	Yes	No
Floor Cleaner/Buffer	No	No
Fans	Yes	Yes
Sewing Machine	No	No
Television	Yes	Yes
Stereo	No	Yes

Figure 4.2-2 Perla Residences

	Type 1	Type 1	Type 2	Type 2	Type 3	Type 3	Type 4	Type 4	Type 5, administrative	Type 5, farm worker
Electric Oven	No	No	Yes	Yes	No	No	Yes	No	Yes	No
Gas Oven	Yes	Yes	No	No	Yes	Yes	No	Yes	Yes	Yes
Lights	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Refrigerator	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Freezer	Yes	No	No	No	No	No	No	No	No	No
Micro-wave	No	No	No	No	No	No	No	No	No	No
Washer	No	Yes	Yes	Yes	No	Yes	Yes	Yes	No	Yes
Rice Cooker	No	No	No	No	No	Yes	No	No	Yes	No
Coffee Maker	No	No	No	No	No	Yes	No	No	No	No
Iron	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Floor Cleaner/Buffer	No	No	No	No	No	Yes	Yes	Yes	No	Yes
Fans	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes	Yes
Sewing Mach.	No	No	No	Yes	No	No	No	No	No	No
Tele-vision	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Stereo	Yes	No	No	Yes	Yes	Yes	No	Yes	Yes	Yes

KEY:

TYPE 1 = *4 years old*
TYPE 2 = *20 years old*
TYPE 3 = *20 years old, 2 stories*
TYPE 4 = *15 years old*
TYPE 5 = *2-5 years old*

The major difference between electrical usage in each farm lies solely in the use of minor household appliances such as rice cookers, coffee makers, microwaves, and sewing machines. All ten Perla residents reported using at least one minor appliance on a regular basis, whereas most Estrella and Bananito residents did not even report having minor appliances in their homes. Major household appliances like refrigerators, washers, and lights are standard in all farm residences. The last consideration is the type of oven used: gas or electric. There was no consistency between farms; one farm does not solely use gas or one solely electric. For every farm, some residents use gas ovens and some use electric ovens. Recommendations for the reduction of electrical usage in all farms are included in the *Conclusions and Recommendations* Chapter.

All residents pay a monthly electric bill. The amount paid by Standard Fruit Company (SFCO) varies between farms and these amounts are fixed. SFCO pays for approximately 2,200 colones of the electric bill in Estrella Valley, 650 colones in Bananito, and 315 colones in Perla. The average monthly electric bill for an Estrella Valley resident worker is for 2,500 colones. This value is the same for Perla residents. The average monthly electric bill for a Bananito resident worker is nearly twice the amount at 4,500 colones. SFCO is also financially responsible for residential maintenance at all farms, and this includes the inspection and renewal of electrical wiring. The general managers at each finca issued this data to us, and the residents verified this at the interviews.

Residents of Bananito and Perla reported that the electrical wiring and their home electrical appliances were functioning well. The residents also stated that the wiring was of average age (not old, not new) and adequately insulated. On average, the appliances were reported to be fairly new and energy efficient. Of the three homes visited in Estrella Valley, the owner of one home informed us of its old wiring, saying that it definitely contributed to an increase in her monthly electric bill.

All residents that we interview were evidently aware of energy conservation, its meaning and implications. Not all residents are practicing methods of energy conservation in their homes. Of the fifteen residents interviewed, only about 75% are attempting to reduce their daily electrical consumption. The remaining 25% do not see a need, asserting that the electric bill is not unreasonably high enough to warrant an extra effort to conserve energy in their homes. The most common energy-saving techniques that workers and their families use are:

- Using the washing machine only one day per week, particularly Saturday or Sunday
- Ironing only one day per week
- Allowing children to watch television only in the evenings
- Restricting the use of stereo throughout the day, particularly with children
- Keeping lights turned off when not in use
- Restricting excessive opening and closing of the refrigerator

4.2.2 Quantitative Electrical Consumption

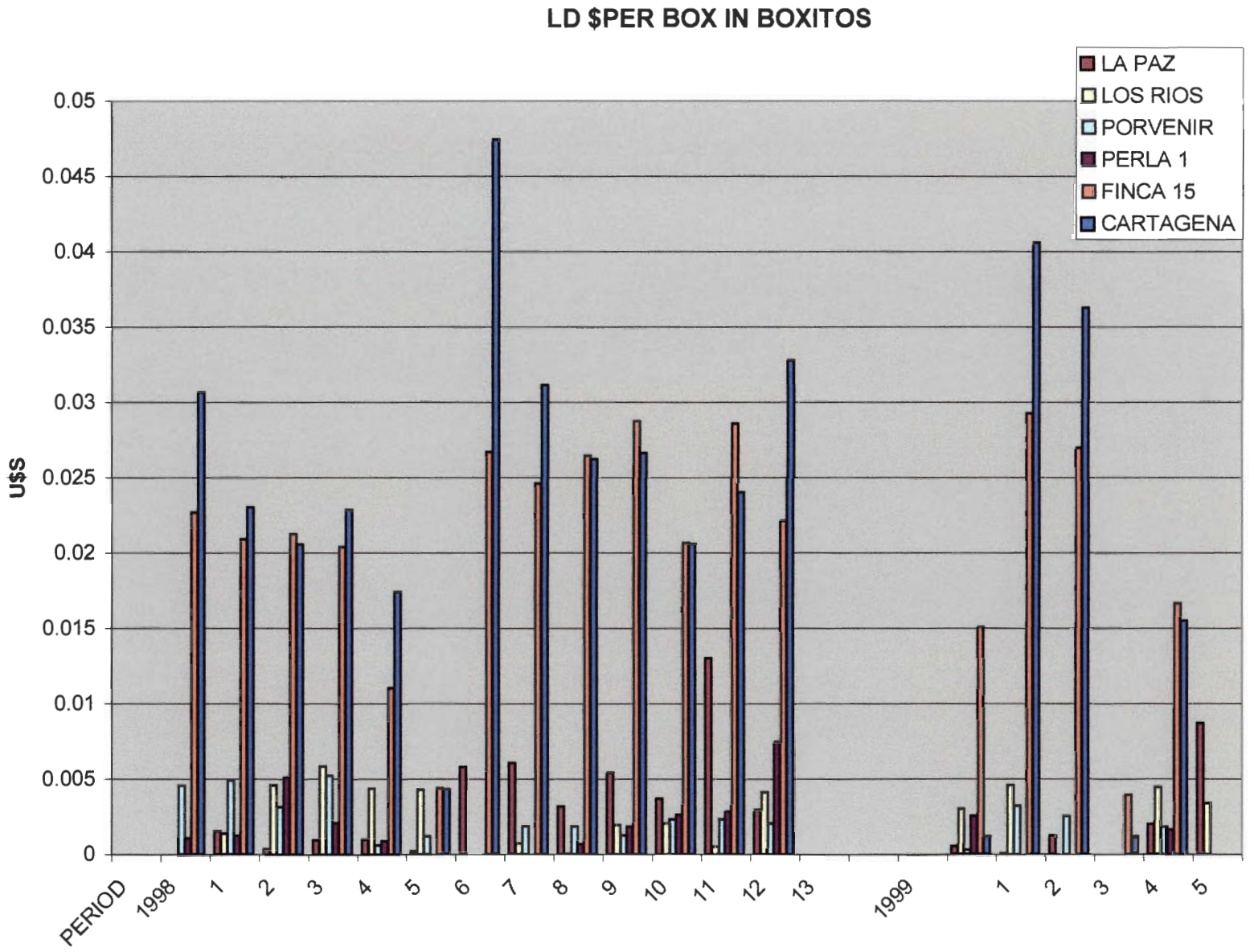
The number of homes in each farm varies. Cerere and Duruy, of the Estrella Valley, have 130 and 202 homes, respectively. Bananito has 185 residences, Perla has 134, and Porvenir has 83. Although Fortuna was not included in our study, it is important to note how much its residences contribute to Standard Fruit's electric costs. There are 299 homes in Fortuna. Please refer to *Appendix D* for a summary of this social infrastructure (homes, offices, hospitals, schools, etc.) owned by the company in each region.

The electric bill dollars spent per box produced for the homes at Finca 15 and Cartagena is significantly higher than that spent for any of the other residential sites included in this study. Otherwise, these values are relatively consistent among the Bananito and Perla-Porvenir residences. Perla 1 values are higher among this cluster of residential sites. Table 4.2.2.1 and Figure 4.2.2.1 illustrates the sharp contrast between residential electric bills in Estrella and the other two regions.

Table 4.2.2-1 Low Demand Electric Bill Dollars Spent Per Box Produced, Boxitos

	BANANITO		PERLA-PORVENIR		ESTRELLA VALLEY	
PERIOD	LA PAZ	LOS RIOS	PORVENIR	PERLA 1	FINCA 15	CARTAGENA
1998						
1	0.0000	0.00000	0.00454	0.00106	0.02267	0.03066
2	0.0015	0.00137	0.00489	0.00122	0.02088	0.02301
3	0.0003	0.00460	0.00315	0.00510	0.02124	0.02055
4	0.0010	0.00581	0.00519	0.00209	0.02038	0.02283
5	0.0010	0.00435	0.00060	0.00089	0.01103	0.01740
6	0.0002	0.00428	0.00119	0.00000	0.00439	0.00432
7	0.0058	0.00000	0.00000	0.00000	0.02667	0.04742
8	0.0061	0.00071	0.00184	0.00000	0.02460	0.03113
9	0.0032	0.00004	0.00184	0.00070	0.02644	0.02619
10	0.0054	0.00194	0.00128	0.00185	0.02874	0.02660
11	0.0037	0.00204	0.00232	0.00264	0.02067	0.02058
12	0.0130	0.00051	0.00234	0.00283	0.02855	0.02400
13	0.0029	0.00410	0.00206	0.00746	0.02212	0.03278
1999						
1	0.0005	0.00301	0.00027	0.00252	0.01507	0.00119
2	0.0001	0.00459	0.00322	0.00000	0.02925	0.04058
3	0.0012		0.00253	0.00000	0.02696	0.03628
4		0.00000			0.00395	0.00119
5	0.0020	0.00446	0.00180	0.00166	0.01665	0.01548
6	0.0087	0.00339	0.00000	0.00000		

Figure 0-1 Low Demand Electric Bill Dollars Spent Per Box Produced, Boxitos

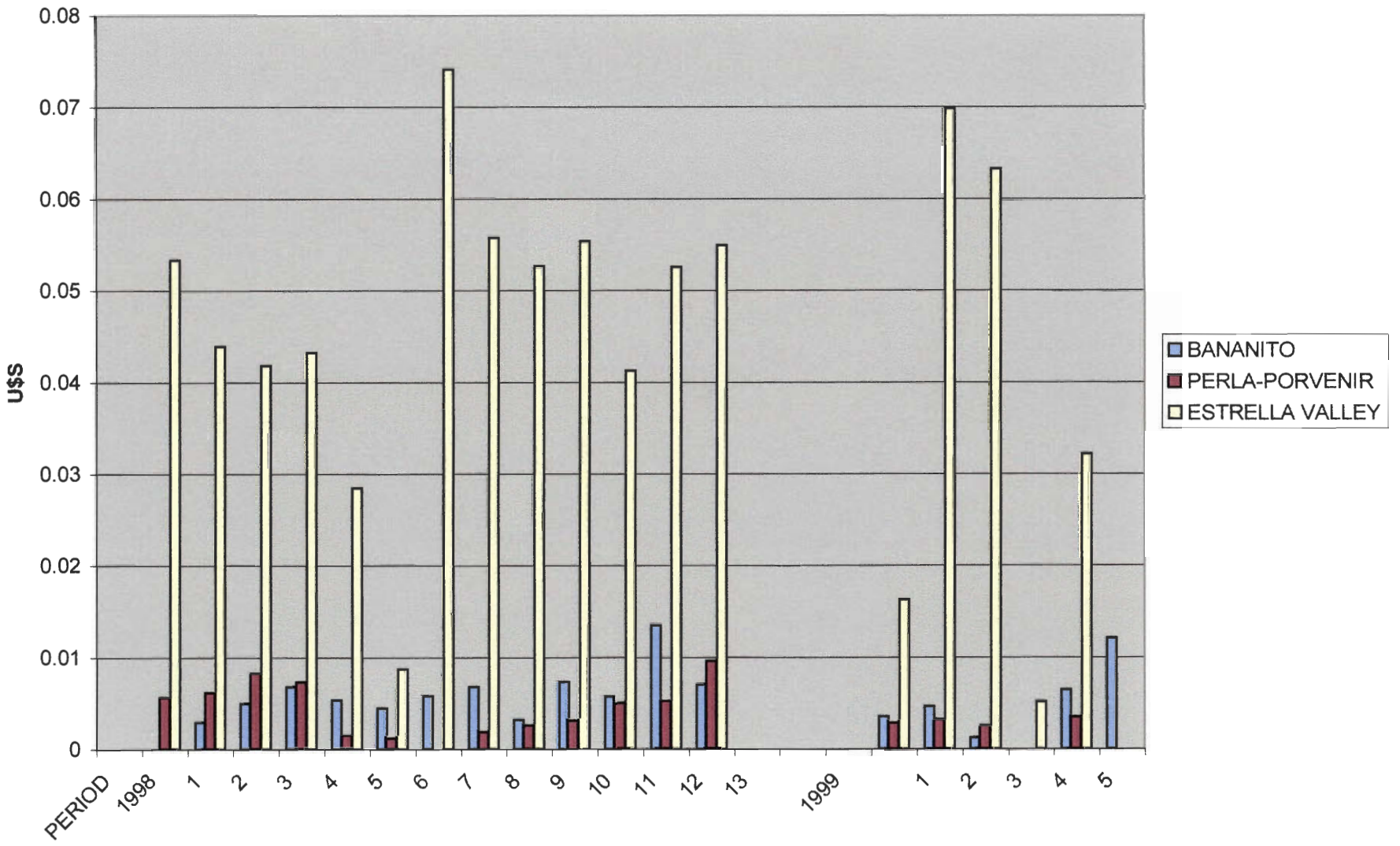

LD $PER BOX IN BOXITOS
LA PAZ
LOS RIOS
PORVENIR
PERLA 1
FINCA 15
CARTAGENA
U$S
0.05
0.045
0.04
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
PERIOD
1998
1
2
3
4
5
6
7
8
9
10
11
12
13
1999
1
2
3
4
5

It is not practical to make a direct correlation between electric usage in the home and SFCO electric bill costs. Finca managers at Estrella, Bananito, and Perla-Porvenir informed us of the exact amounts that the Company pays for per electric billing period. These values do not vary from period to period, but do vary between regions. These results simply show a cost distribution among fincas, so that the Company will know where their dollars are being spent. Again, even though the dollars spent in Estrella are high, one may not conclude that electrical usage in Estrella residences is also high. Factors that account for this sharp billing contrast, as well as recommendations for cost reduction, are presented in the Conclusions and Recommendations Chapter.

The following figure is a more general representation of cost distribution among farms. Again, it is clear to see that the amount of electric bill dollars spent per box produced is much larger for Estrella Valley. This amount is lowest for Perla-Porvenir.

Figure 0-2 Low Demand Electric Bill Dollars Spent Per Box Produced, Fincas

LD $ PER BOX IN FINCAS



4.3 High Demand vs. Low Demand

When we compared the money spent per box in high and low demand some very interesting things were observed. We can see that there are different cost structures among the farms. There are several factors that affect this structure.

Perla – Porvenir packaging plants each have three water pumps instead of one, like the Estrella and Bananito plants. This adds to high demand energy use at Perla. The water pump used for flood control in Bananito is electrical, causing an increase in this farm's high demand energy use as well.

For low demand the greatest impact comes from the amount of subsidy that the company pays and the amount of houses and offices that are using energy. In the case of Estrella, clearly a major user of low demand energy (see Figure 4.3.1), the high use is due to the amount of houses in the Valley (approximately 631). The Valley also has large quarters for management and office facilities (Pandora) for the region. Estrella Valley is SFCO's oldest finca and therefore the unions have demanded the benefit of a larger energy subsidy. Perla-Porvenir and Bananito on the contrary have a much larger proportion of their electric bill in high demand (see Figures 4.3.2 & 4.3.3), because they have fewer houses and the subsidy is smaller.

Figure 4.3-1 Low Demand vs. High Demand Estrella Valley, Dollars per Box

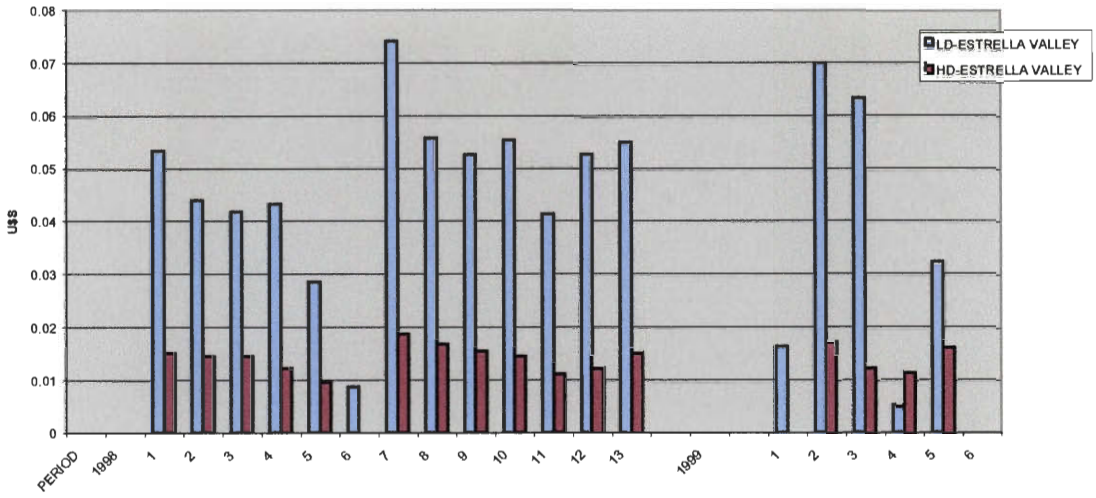


Figure 4.3-2 Low Demand vs. High Demand Perla-Porvenir, Dollars per Box

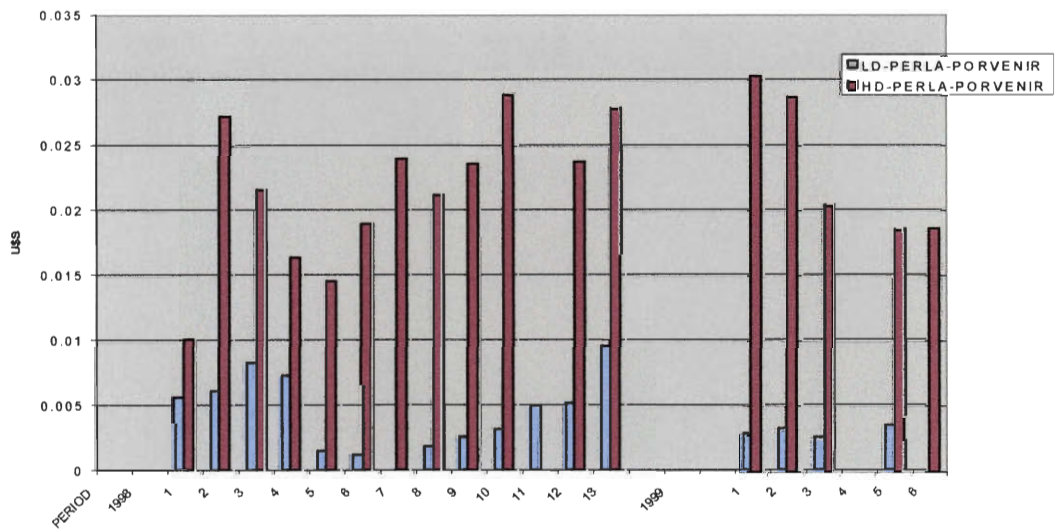
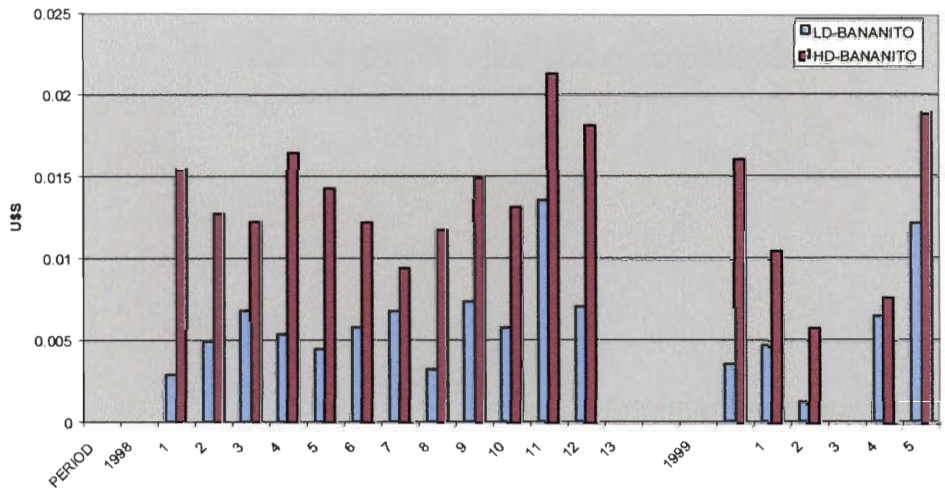


Figure 4.3-3 Low Demand vs. High Demand Bananito, Dollars per Box



5 Conclusions and Recommendations

Characterization of electricity demand and conservation at the banana farms is a very important project for SFCO. The Company needs to minimize the cost of electricity, which is small but significant. The Company also needs to account for the instability and varying profitability of the banana industry and also needs to maintain the ISO 14001 standards that are so important to them. Our project makes four types of recommendations to reduce electrical consumption: organizational, technical, container-related and residential.

5.1 Organizational

The recommendations in this section apply to the boxitos, or packaging plants, at which we observed many operational problems. Correcting these problems will cost little and will save a significant amount of money. Using the assumptions we made in our model, we determined that these changes could produce a 9% reduction in the electric bill. The only difficulty the Company might encounter in implementing these recommendations is human resistance to change. This resistance can be overcome with training and supervision.

We recommend that SFCO implement a schedule for operating electrical equipment. Presently the lights and fans are turned according to needs, but there is no appointed time for these appliances to be on.

We also recommend that the Company assign one person the responsibility of turning on and off the electrical equipment, following a schedule or according to need, but with a certain criteria, especially for turning the

equipment off when it is not in use. These energy-saving practices should be supervised in order to ensure their consistency and accuracy.

The schedule and the supervision should be supplemented with rules and incentives for energy saving. The rules should provide the procedures and understanding to operate within boundaries of energy conservation awareness. The incentives should promote this conservation, for example by giving bonuses to boxitos that produce at a lower electricity cost.

5.2 Technical

The equipment currently being used at the boxitos is effective from an operational point of view, but it is not the most energy efficient. Consequently, we recommend that SFCO invest in new equipment, which will result in additional savings. If SFCO chooses not to make an investment, it should consider replacing the actual equipment as it breaks with the most energy efficient devices. Although the investment cost is beyond the scope of our project, the savings could be calculated with our model. Our model yielded a 24% reduction in the cost of electricity when we assumed that all of the actual equipment was replaced with newer, more energy-efficient devices. A 24% reduction translates into annual savings of $122,000 per year. To achieve such a reduction in consumption, SFCO should invest in new motors and water pumps in addition to the organizational and lighting changes.

We recommend that SFCO installs more energy-efficient lights. As discussed in the literature review chapter there are new lights that can reduce

consumption by a significant amount. Natural lighting should be used when possible, paying careful attention to heating problems and direct sunlight on the workers. Some lights are left on at night in for security reasons. Therefore, the boxitos should be equipped with low energy consumption lights, such as sodium light, to be left on all night.

In order to provide the most efficient lighting, the lights should also be placed were they are needed. This is mainly at the cutting, selection and packaging areas of the boxito. Currently, the lighting layout consists of uniform symmetrical rows at 10-foot intervals.

The switches that control these lights should be rewired in order for the operators to be able to turn on cluster of lights according to their needs. The actual system turns on one or several rows of lights without considering the actual locations where lighting is required. Along with our operational recommendations, we suggest that these switches be centrally located so that person in charge has easy and simple control over all the electric equipment.

5.3 Container-related

Container usage is the greatest variable at the boxito. We recommend that SFCO study in greater detail the use of refrigeration while the containers are at the boxito. We recommend that the Company create a schedule that defines when the containers are to be plugged in at the packaging plants. This schedule should take into account the fact that the peak hours, 10:30-12:30 and 5:30-7:30, are times when refrigeration should be avoided. If avoiding these hours of

operation is impossible, usage during these hours should at least be minimized. The usage of refrigeration could be minimized during these hours through alternating two containers, plugging in one container for an hour and then a different one for the other hour.

5.4 Residential

We noted during our study that there is a difference in the subsidy that SFCO offers to its workers in the different regions. We recommend that SFCO review its subsidization policies and try to make the subsidy uniform in all the regions.

The recommendations at the workers' residences might not affect SFCO's electric bill, but is a way of benefiting its workers and complying with ISO 14001 standards. We recommend the Company encourage energy conservation practices at all levels; instructive pamphlets and regular information sessions could aid in accomplishing this task.

The education and practices should be applied to the managers, for whom the Company pays the full residential electric bill. Abuses in this benefit should be controlled. The managers should set an example for the workers.

We also recommend that SFCO extend its energy conservation policies to their offices. We observed that many air conditioners were left on all night. This can be avoided by installing timers and control devices to turn off air-conditioners and lights at night.

5.5 Summary of Conclusions

We recommend that SFCO implement the organizational changes mentioned above, providing significant savings at a low cost. The Company should conduct a feasibility and cost-benefit analysis of investing in new equipment for improving efficiency. Such an analysis would be a good continuation of this project. They should also revise their subsidies and the cost structure (low demand vs. high demand) of electricity at each region, especially in the Estrella Valley, where the amount paid for residential electric use is considerably larger than that paid for usage at the packaging plants.

6 GLOSSARY OF ELECTRICAL TERMS

Ampere (A) – the standard unit for measuring the strength of an electric current.

Electric current – the motion of an electrical charge from one region to another.

Electric potential – the electrical energy stored in an object.

Horsepower – a unit of power for the rate at which work is being done. It equals 33,000 foot pound (ft-lb.) per minute (Smith, 1979, p.210).

Kilowatt-hours (kWh) – one kW of power used continuously for one hour (Smith, 1979, p.210). It is a unit of energy consumption.

Load – amount of electricity per period time.

Meter-kilogram-second system (mks) – standard metric units for length, mass, and time.

Power factor – real power / apparent power = W (watts) / VA (volts x amperes)

Power surge – a high-magnitude increase in voltage or current that lasts for a short period of time, approximately a few milliseconds.

Volt (V) – the mks unit of electromotive force between two points in an electric field.

Volt-ampere – the apparent power; V times A.

Watt (W) – the mks unit of electrical power, equal to 1/746 of a horsepower.

Appendix A – Mission and Organization of the Agency

Dole Food Company, with 1998 revenues of $4.4 billion, is the world's largest producer and marketer of high-quality fresh fruit, dried fruit and nuts, vegetables and flowers, and markets a growing line of packaged foods (www.dole.com). Founded in Hawaii in 1851, Dole Food Company, Inc. does business in more than 990 countries and employs approximately 44,000 full-time people (www.dole.com).

Each year, one of Dole's objective is to responds to the victims of natural disasters around the world by providing relief – with donated food and cash, or through emergency medical treatment for residents of communities near Dole operations. In the Philippines in late 1995, Dole's Crisis Outreach team distributed goods to the T'boli flood survivors who were evacuated to another location in the Philippines. Dole contributed canned fish, rice, soup and noodles in addition to canned pineapple and juice. In the U.S., Dole provided relief to the 3,500 firefighters and deputies during the Malibu, California fires and to the victims of the floods in Northern California in 1995, to victims of floods in Kentucky and Arkansas in 1996, and to victims of the Sacramento floods in early 1997 (www.dole.com).

Dole reports that it has been one of the largest and most consistent donors to food banks in the nation (Press Release). In many parts of the world, Dole continues to provide support and services such as drinking water, electric power, flood control, higher education scholarships, housing, immunizations, medical clinics, schools, specialized or emergency medical care, transportation

and roads for our employees and their communities (www.dole.com). Dole encourages communities to care for the environment by providing training and education on recycling, composting, water conservation, erosion prevention and reforestation. Dole preserves and protects rainforest resources and areas of critical biodiversity.

Standard Fruit Company de Costa Rica S. A. (SFCO), a subsidiary of Dole Food Company, Inc. begin its operation in 1956 in Valle de la Estrella, in Limon. In 1959, the first shipment of 4902 banana stems was sent to the United States and in 1965, Europe received their first banana shipment in Antwerp, Belgium. In 1960 the first cooled fruit export was carried out. Standard Fruit was the first company exporting to the American market 100% of its products in refrigerated containers, which provide more flexibility and improve the fruit quality. Currently, the company has the most modern container terminal for the banana industry in America.

Between 1965 and 1966, the company promoted the rise of the independent producers. Presently, Standard Fruit buys fruit from 35 independent producers of 8200 hectares and in 1997, these producers exported sixteen million boxes. With an extension of 8.014 hectares, distributed in 13 farms, each one with its own packing plant, SFCO has the highest productivity and banana export volume in the country, with more than 34 million boxes (including independent producers). Productivity levels, banana quality, and volume of boxes exported demonstrate the constant leadership of SFCO in Costa Rica. The main

markets for SFCO are the East Coast of the United States, North Europe, South Europe, East Europe, and China.

SFCO has also developed a pineapple export program and establish a stable market for its production. In 1997, 1.7 million boxes were exported; 40% to the United States and 60% to Europe. The main assets for the company are the active participation of 5.500 (5,500) workers who through their suggestions and contributions integrate the best human team in Costa Rica. They are distributed in the areas of Valle de la Estrella, Bananito, Guapiles, Pacuare, Rio Frio, Limon, and San Jose. The company grants higher wages that those fixed by law, 4.449 (4,449) colones per day verses 2.208 (2,208) colones. The benefits and social guarantees are also higher than the legal minimums. Plus, the employees and their families have housing facilities, including maintenance. "Dole claims that it is among the highest paying agricultural employers in the countries where it operates and that it provides comprehensive medical, wellness, and retirement benefits to its employees (Press Release)."

Here is a list of social and community foundation contributed by Standard Fruit Company for its workers:

DETAIL	QUANTITY
Houses	1870
Banks	3
Health Centers	10
Solidarity Food Commissaries	19
Police Stations	2
Gymnasiums	15

Soccer Fields	42
Lighted Soccer Fields	25
Soccer Fields with changing rooms	26
Soccer Fields with grandstands	20
Playgrounds	26
Baseball Fields	2
Churches	16
Schools	28

Standard Fruit Company of Costa Rica has been especially active in Costa Rica's Estrella Valley where Dole has had production since the late 1950's. In addition to its vast social programs, which involve company personnel and financing, Standard Fruit has built classrooms, donated computers and upgraded educational facilities in various communities throughout the Valley (www.dole.com). In the past two years in Costa Rica, Dole has rebuilt the Estrella Valley's major bridge, which fell during the February 1996 flood, leaving many communities isolated at that time. Dole's Standard Fruit Company of Costa Rica provided both funds and engineering supervision for the reconstruction. In addition, the division provided flood relief services in the Estrella and Pacuare River Valleys. The division also arranged for helicopters and boats to rescue stranded residents as well as distributing food, water, clothing, blankets and other essentials to hundreds of victims of the floods (www.dole.com).

Another objective of Dole Food Company is in its environmental programs. Quoting from the company's website: "Environmental stewardship is an integral

part of Dole's concept of "quality," embodied in our label. We believe a quality product is produced in a quality way. We strive to integrate consideration for the environment into everything we do. We invest in environmental protection - in making real improvements in our people, our facilities and our operations" (www.dole.com). Their policies is that: "Every Dole employee is responsible for: complying with all applicable laws and regulations in force wherever Dole operates; striving to prevent accidents and illness, reduce adverse impacts of our operations on the environment, conserve resources and reduce waste; and producing safe, wholesome, high quality food products" (www.dole.com).

Dole has been developing and implementing successful integrated pest management (IPM) methods for decades. "We use conventional crop protection chemicals judiciously, only when and where necessary, and with the proper care" (www.dole.com). Dole uses only those crop protection chemicals accepted by all applicable governmental agencies, regardless of where the crop is grown. In addition, Dole will not use, anywhere, any pesticide banned for reasons of unacceptable health or environmental risk by the United States Environmental Protection Agency, the European Union or the World Health Organization (www.dole.com).

Each year, Corporate Conscience Awards Program (CEP) recognizes a few companies for outstanding accomplishments in social accountability and environmental responsibility. At the 1998 awards ceremony, Dole was designated a CEP Honor Roll Company in recognition of its overall social and environmental performance (www.dole.com). Honor Role companies receive the

highest scores in eight corporate responsibilities issue areas: Environmental programs, women's advancement, minority advancement, charitable giving, community outreach, family benefits, social disclosure and workplace issues. Quoting from Dole: "We are proud of this achievement: of 250 companies rated in 1998, only 22 others received Honor Roll designation" (www.dole.com).

The Organization for Tropical Studies (O.T.S.) has also awarded to Standard Fruit Company de Costa Rica, (a subsidiary of the Dole Food Company) the esteemed prize of "Company of the Year" for the 1997-8 season. The OTS honored Mr. Peter Gilmore, Standard Fruit's General Manager, with a special award at their annual gala and praised the company as a vanguard of enlightened companies that understand the importance of education, research, and training in responsible use of natural resources in the tropics (www.dole.com).

In July of 1998, Standard Fruit Company de Costa Rica became the first banana exporter and the first agricultural producer in the world to become certified to the environmental management system (EMS) requirements of ISO 14001 by the world renowned International Certification Service. Standard Fruit's extensive program of scientific and the corresponding development of environmentally friendly methods of banana production were objectively verified by the International Certification Service that it is functioning effectively. ISO 14000 requires that a company have an operating EMS based on the principles of management and employee commitment, continuous improvement in environmental performance, open communication on

environmental matters, and periodic review of the management system based on key performance measures. This means that Dole incorporates environmental considerations into all aspects of its banana operations, ensuring that it produces the highest quality fruit in the most environmentally responsible manner. Also, that Standard Fruit is acting correctly in such important matters as solid and liquid waste management; careful application and management of crop protection products; strict control over worker occupational and safety conditions; constant worker training reforestation projects, and environmental protection. It is the first certified EMS system in the world that is focused primarily on the management and monitoring of the environmental impacts and practices of its major suppliers. As they stated: "It is our goal to have Dole's other fresh fruit divisions in Latin American and Asia certified to the ISO 14001 by the end of 1999. Elements of Dole's program include management commitment; operating policies that go beyond compliance (stressing pollution prevention, waste minimization and risk reduction); a company-wide organization of professionals; specially developed technical guidance and training; regular self-assessment and goal-setting; and a dedication to continuous improvement" (www.dole.com).

Each one of its actions supports the Standard Fruit progressive character. The company has created a program addressed to workers occupational health and the environment. SFCO has elaborated different projects that embrace topics like reforestation, control and recycling of chemical containers and plastic, waste disposal, water monitoring, organic fertilizer production and seminars to near 3.000 (3,000) workers. These seminars cover topics from safe chemicals

handling to environmental conscience and occupational security and health. Currently, SFCO scientists are part of a multinational team researching invertebrate biodiversity in banana farms, and the use of reforested areas set aside from banana production to protect waterways as movement corridors by tropical birds, and as stopover and wintering habitats neotropical migrant birds (www.dole.com).

The entire Standard Fruit Company de Costa Rica organization has adopted the EMS as a top priority and transcendental importance for the future of its operations. To fully meet the goals of the EMS, their materials suppliers have been encouraged to actively participate and to comply with Company goals and objectives. Standard Fruit Company de Costa Rica, a producer and exporter of the DOLE brand bananas along with many other products, through its EMS demonstrates its permanent commitment to its workers, to the communities where it operates, and to Costa Rica.

Dole also has people with environmental and technical expertise in their operations worldwide that are responsible for the environmental protection efforts. Dole provides direction, technical guidance and training to independent growers and suppliers concerning safety, environmental protection and product quality. In many countries where Dole operates, Dole sets the standard and provides working examples of environmentally sound practices from which local growers and industry participants learn. Many of these programs are in active partnership with local communities and governments (www.dole.com).

Other objectives of Dole are:

- reduce its overall cost in its shipping program,
- to incorporate the latest technology in its operations to improve quality,
- focus on profitable growth of its core products and markets as well as opportunities to build earnings and expand the DOLE® brand name throughout Latin and South America. "The strategy is to integrate forward and open distribution centers from which DOLE® products will be delivered directly to retailers".

A Company as big as Dole always has a number of risks and uncertainties. The potential risks and uncertainties include weather-related phenomena; market responses to industry volume pressures; economic crises in developing countries; quotas, tariffs and other governmental actions; changes in currency exchange rates; product supply and pricing; and computer conversion and Year 2000 issues. Further information on the factors that could affect Dole's financial results is included in its Securities and Exchange Commission filings, including its Form 10-K (www.dole.com).

Our project investigation of energy conservation and the nature of electrical demand are related to the agency's mission because we have the same goals. Standard Fruit and our team are committed to quality, safety, environmental protection and the principle of continuous improvement. Our conservation of energy study might help with the decision of installing new lights to save their energy and can increase Dole's revenue. With our investigation, we will bring the company a step closer to its goal of satisfying current and future

energy needs with a diverse portfolio of clean, renewable, and environmentally sound energy sources.

Appendix B – Manager Interviews

Jack Delgado – Accounting Manager at Pandora

We were initially introduced to Uriel Quesada, but he was being promoted so we ended up talking to Jack that was assuming the position. This was a strategic meeting because he would be able to direct us to the fincas of that zone. Pandora is the central administration for the zone that is composed of the whole Estrella Valley and Bananito (another finca near Limon). He conducted us to the people at the fincas and arranged for our transportation, which is a critical subject around such extensive plantations.

Mainor Mora – Human Resources at Pandora

Kevin Ludeke mainly introduced Mr. Mora as a back up or support in Estrella in case we had some difficulties finding people or getting around the organization. He also provided us with some previous study done on energy conservation by a private company that will aid in our research on conservation of energy.

Rafael Herrera – Administration Assistant at Finca Duruy-Cerere

He was the first person that we met at the finca, he directed us to Elias Gomez (introduced below) who we worked together to retrieve the information from the computer system and to analyze which data would be relevant. We determined that we were going to analyze the boxitos' monthly electricity consumption with box production and number of employees. This gave us the

best and most relevant factors for which we could collect data. The other factors were to be analyzed at the boxitos themselves, such as the exact uses of electricity. SFCO uses centralized software for accounting that is connected on-line with DOLE in the entire world, its called ST400 and is very useful, but takes some skill to be able to use it. Rafael is an avid user and was able to produce a report at our request.

Elias Gomez – Human Resources at Finca Duruy-Cerere

Mr. Gomez was in charge of taking us around the fincas and boxitos in the Estrella Valley. He took us to some of the workers' residences in order to interview them. He was very helpful because it's not easy to get around such a large place with many employees. He also gave us many insights into the problems with energy supply to the houses and other relevant information on the operations of the boxitos. He has lived in the Valley for the past 25 years, therefore he has an exceptional knowledge of the workers houses and the operations.

Augusto Bolanoz – Superintendente Ingenieria (Manager Engineering Department)

Mr. Bolanoz provided us with the report on the water pumps (TAISA) and some other useful information on the maintenance of the electrical equipment at the boxitos. He also gave us some insights of the Company's policies on energy conservation, which are not many.

Carlos Gimenez – Administrator Assistant (Finca Perla-Porvenir)

Mr. Gimenez gave us all the information about Perla-Porvenir that we requested, such as cost structure, number of hectares, subsidies and number of workers' houses.

Felipe Vargas – General Manager (Finca Perla-Porvenir)

Mr. Vargas received us at the finca and provided us with the contacts to be able to get around the finca and get all the information, interviews and visits to the boxitos that we needed. We also had a long informal conversation about the banana industry in which he revealed the management of the fincas and the current situation of the banana markets.

Guillermo Roldan – Information Systems

Mr. Roldan was the person that provided us the quantitative data. He extracted the electric bills and production for each boxito using the same report that Rafael Herrera had created in the global accounting system. Mr. Roldan is an expert of this accounting system, AS/400.

Rolando Quesada – Manager of Moin (Container Yard)

We interviewed personally with Mr. Quesada when thought that we were going to try to study the demand at the container yard. Even though we didn't

include this section in our investigation, we got all the information related to container consumption from him.

Appendix C – Water Pump Study TAISA

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IQP/MQP SCANNING PROJECT

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Appendix D – Social and Communal Infraestructure

STANDARD FRUIT COMPANY DE COSTA RICA S.A.
SOCIAL AND COMMUNAL INFRASTRUCTURE

DESCRIPTION	RIO FRIO				GUAPILES					PACUARE				PANDORA				
	CHIRRIPO	SAN JOSE	ZURQUI II	ADMIN.	CARIARI	CEDRAL	BOSQUE	ST. CLARA	ADMIN.	PORVENIR	NAIRI	PERLA	ADMIN.	FORTUNA	CERERE	DURUY	BANANITO	ADMIN.
HOMES	147	94	58	67	53	118	12		20	83	110	134	16	299	130	202	185	142
BANKS		1												1			1	
Health Centers	1	1								1	1	1		2	1	1	1	
Comisiarries	3	1			2	3		1		1	3	2			1	1	1	
Police				1														1
Shops	2	11			30	3		5		4	15	10		25	2	19	5	
Multi-Use Facility		1								1	2	2		4	2	2	1	
Total soccer Fields	4	3			4	3	1	2		1	3	2		8	4	5	2	
Soccer Fields with Illuminatio	3	2				2		1		1	2	2		4	3	3	2	
Soccker Fileds with Changing Rooms	3	3				2		1		1	3	2		5	3	1	2	
Bleachers	3	2								1	2	1		3	3	3	2	
Childrens Parks	3	2			2	2		1			3	1		3	4	3	2	
Baseball Fields												1					1	
Catholic Churches	3	2			3	3					1	1		1		1	1	

Appendix E – Data and More Data Analysis

Standard Fruit Company de Costa Rica S.A.
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Año 1998 y 1999

Boxito	# Docto.	Fecha	Centro Costo	Cta Obj.	ta Sub	Importe	Unidades	U/M	Pdo.	Año
Finca 15	324039	06/09/98	33000946	701020	7004	309.04	2,891.00	KW	6	98
Finca 15	422711	06/02/99	33000946	701020	7004	329.31	2,957.00	KW	6	99
Finca 15	330040	06/29/98	33000946	701020	7004	991.57	12,886.00	KW	7	98
Finca 15	332575	07/08/98	33000946	701020	7004	272.64	2,608.00	KW	7	98
Finca 15	338044	07/29/98	33000946	701020	7004	942.48	12,815.00	KW	8	98
Finca 15	340252	08/04/98	33000946	701020	7004	319.65	2,984.00	KW	8	98
Finca 15	346107	08/27/98	33000946	701020	7004	1,027.39	12,989.00	KW	9	98
Finca 15	348088	09/02/98	33000946	701020	7004	460.21	4,012.00	KW	9	98
Finca 15	354895	09/28/98	33000946	701020	7004	1,098.34	12,367.00	KW	10	98
Finca 15	355100	09/28/98	33000946	701020	7004	1,098.34	12,367.00	KW	10	98
Finca 15	354895	09/28/98	33000946	701020	7004	(1,098.34)	(12,367.00)	KW	10	98
Finca 15	356927	10/06/98	33000946	701020	7004	586.88	4,770.00	KW	10	98
Finca 15	363380	11/02/98	33000946	701020	7004	1,080.72	12,890.00	KW	11	98
Finca 15	364779	11/06/98	33000946	701020	7004	424.23	3,591.00	KW	11	98
Finca 15	372018	11/26/98	33000946	701020	7004	1,158.73	13,967.00	KW	12	98
Finca 15	374338	12/02/98	33000946	701020	7004	435.95	3,706.00	KW	12	98
Finca 15	382469	12/30/98	33000946	701020	7004	1,126.64	13,719.00	KW	13	98
Finca 15	287475	02/05/98	33000946	701025	7004	336.86	33.42	KW	2	98
Finca 15	293346	02/25/98	33000946	701025	7004	359.57	35.87	KW	2	98
Finca 15	301703	03/24/98	33000946	701025	7004	317.01	31.86	KW	3	98
Finca 15	400942	03/08/99	33000946	701025	7004	288.75	32.17	KW	3	99
Finca 15	406005	03/25/99	33000946	701025	7004	281.67	31.56	KW	3	99
Finca 15	311346	04/25/98	33000946	701025	7004	300.92	30.49	KW	4	98
Finca 15	318970	05/23/98	33000946	701025	7004	307.12	31.35	KW	5	98
Finca 15	415740	05/04/99	33000946	701025	7004	278.71	31.58	KW	5	99
Finca 15	422711	06/02/99	33000946	701025	7004	1,189.27	15,224.00	KW	6	99
Finca 15	422711	06/02/99	33000946	701025	7004	185.05	32.86	KW	6	99
Finca 15	330040	06/29/98	33000946	701025	7004	310.40	32.05	KW	7	98
Finca 15	338044	07/29/98	33000946	701025	7004	316.68	33.01	KW	8	98
Finca 15	346107	08/27/98	33000946	701025	7004	324.43	34.11	KW	9	98
Finca 15	354895	09/28/98	33000946	701025	7004	372.16	39.49	KW	10	98
Finca 15	355100	09/28/98	33000946	701025	7004	372.16	39.49	KW	10	98
Finca 15	354895	09/28/98	33000946	701025	7004	(372.16)	(39.49)	KW	10	98
Finca 15	363380	11/02/98	33000946	701025	7004	308.25	33.06	KW	11	98
Finca 15	372018	11/26/98	33000946	701025	7004	311.52	33.69	KW	12	98
Finca 15	382469	12/30/98	33000946	701025	7004	303.06	33.11	KW	13	98
Finca 21	41711	01/31/98	33000947	607016	4010	0.00	27,949.00	Cajas	1	98
Finca 21	41781	01/31/98	33000947	607016	4010	(891.21)	0.00	Cajas	1	98
Finca 21	59121	01/30/99	33000947	607016	4010	4.94	0.00	Cajas	1	99
Finca 21	43111	02/28/98	33000947	607016	4010	0.00	25,473.00	Cajas	2	98
Finca 21	43220	02/28/98	33000947	607016	4010	419.12	0.00	Cajas	2	98
Finca 21	43256	02/28/98	33000947	607016	4010	(2.89)	0.00	Cajas	2	98
Finca 21	60569	02/27/99	33000947	607016	4010	1,381.94	0.00	Cajas	2	99
Finca 21	60575	02/27/99	33000947	607016	4010	19.51	0.00	Cajas	2	99
Finca 21	44478	03/28/98	33000947	607016	4010	0.00	22,770.00	Cajas	3	98
Finca 21	44528	03/28/98	33000947	607016	4010	(101.61)	0.00	Cajas	3	98
Finca 21	62038	03/27/99	33000947	607016	4010	56.53	0.00	Cajas	3	99
Finca 21	45837	04/25/98	33000947	607016	4010	175.82	0.00	Cajas	4	98
Finca 21	45786	04/25/98	33000947	607016	4010	0.00	26,765.00	Cajas	4	98
Finca 21	45854	04/25/98	33000947	607016	4010	175.82	0.00	Cajas	4	98
Finca 21	45837	04/25/98	33000947	607016	4010	(175.82)	0.00	Cajas	4	98
Finca 21	47309	05/23/98	33000947	607016	4010	199.73	0.00	Cajas	5	98
Finca 21	48629	06/20/98	33000947	607016	4010	236.84	0.00	Cajas	6	98
Finca 21	66289	06/19/99	33000947	607016	4010	(352.07)	0.00	Cajas	6	99
Finca 21	49881	07/18/98	33000947	607016	4010	1,092.60	0.00	Cajas	7	98
Finca 21	51115	08/15/98	33000947	607016	4010	315.22	0.00	Cajas	8	98

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Boxito	# Docto.	Fecha	Centro Costo	Cta Obj.	ta Sub	Importe	Unidades	U/M	Pdo.	Año
	399903	03/03/99	33001118	701020	2513	1,586.49	14,843.00	KW	3	99
	409100	04/08/99	33001118	701020	2513	1,602.15	14,455.00	KW	4	99
	312498	04/29/98	33001118	701020	2513	1,397.01	11,557.00	KW	5	98
	417671	05/11/99	33001118	701020	2513	1,650.06	15,529.00	KW	5	99
	324009	06/09/98	33001118	701020	2513	1,362.25	11,327.00	KW	6	98
	422710	06/02/99	33001118	701020	2513	1,224.70	12,816.00	KW	6	99
	332975	07/09/98	33001118	701020	2513	1,377.88	11,591.00	KW	7	98
	340335	08/05/98	33001118	701020	2513	1,698.93	13,393.00	KW	8	98
	349609	09/09/98	33001118	701020	2513	1,708.77	13,898.00	KW	9	98
	359394	10/14/98	33001118	701020	2513	2,145.29	16,704.00	KW	11	98
	366379	11/10/98	33001118	701020	2513	1,724.88	13,982.00	KW	12	98
	377150	12/10/98	33001118	701020	2513	1,999.07	16,261.00	KW	13	98
Finca 20	41711	01/31/98	33001146	607016	4010	0.00	34,332.00	Cajas	1	98
Finca 20	41781	01/31/98	33001146	607016	4010	(1,094.74)	0.00	Cajas	1	98
Finca 20	59121	01/30/99	33001146	607016	4010	3.10	0.00	Cajas	1	99
Finca 20	43111	02/28/98	33001146	607016	4010	0.00	35,245.00	Cajas	2	98
Finca 20	43220	02/28/98	33001146	607016	4010	579.90	0.00	Cajas	2	98
Finca 20	43256	02/28/98	33001146	607016	4010	(4.00)	0.00	Cajas	2	98
Finca 20	1999	02/27/99	33001146	607016	4010	0.00	80,903.00	Cajas	2	99
Finca 20	60569	02/27/99	33001146	607016	4010	778.92	0.00	Cajas	2	99
Finca 20	60575	02/27/99	33001146	607016	4010	11.00	0.00	Cajas	2	99
Finca 20	44478	03/28/98	33001146	607016	4010	0.00	30,439.00	Cajas	3	98
Finca 20	44528	03/28/98	33001146	607016	4010	(135.84)	0.00	Cajas	3	98
Finca 20	62038	03/27/99	33001146	607016	4010	54.65	0.00	Cajas	3	99
Finca 20	45837	04/25/98	33001146	607016	4010	208.20	0.00	Cajas	4	98
Finca 20	45786	04/25/98	33001146	607016	4010	0.00	31,694.00	Cajas	4	98
Finca 20	45854	04/25/98	33001146	607016	4010	208.20	0.00	Cajas	4	98
Finca 20	45837	04/25/98	33001146	607016	4010	(208.20)	0.00	Cajas	4	98
Finca 20	2113	04/24/99	33001146	607016	4010	0.00	81,293.00	Cajas	4	99
Finca 20	47309	05/23/98	33001146	607016	4010	303.39	0.00	Cajas	5	98
Finca 20	2196	05/22/99	33001146	607016	4010	0.00	91,767.00	Cajas	5	99
Finca 20	48629	06/20/98	33001146	607016	4010	282.17	0.00	Cajas	6	98
Finca 20	48684	06/20/98	33001146	607016	4010	0.00	48,630.00	Cajas	6	98
Finca 20	2262	06/19/99	33001146	607016	4010	0.00	114,082.00	Cajas	6	99
Finca 20	66289	06/19/99	33001146	607016	4010	(329.78)	0.00	Cajas	6	99
Finca 20	49881	07/18/98	33001146	607016	4010	1,637.38	0.00	Cajas	7	98
Finca 20	1566	07/18/98	33001146	607016	4010	0.00	44,223.00	Cajas	7	98
Finca 20	51115	08/15/98	33001146	607016	4010	349.84	0.00	Cajas	8	98
Finca 20	1612	08/15/98	33001146	607016	4010	0.00	48,708.00	Cajas	8	98
Finca 20	52450	09/12/98	33001146	607016	4010	338.87	0.00	Cajas	9	98
Finca 20	1673	09/12/98	33001146	607016	4010	0.00	56,332.00	Cajas	9	98
Finca 20	53637	10/10/98	33001146	607016	4010	5.07	0.00	Cajas	10	98
Finca 20	1717	10/10/98	33001146	607016	4010	0.00	46,228.00	Cajas	10	98
Finca 20	1760	11/07/98	33001146	607016	4010	0.00	69,848.00	Cajas	11	98
Finca 20	55132	11/07/98	33001146	607016	4010	590.01	0.00	Cajas	11	98
Finca 20	55134	11/07/98	33001146	607016	4010	1,790.72	0.00	Cajas	11	98
Finca 20	55145	11/07/98	33001146	607016	4010	28.42	0.00	Cajas	11	98
Finca 20	55677	11/25/98	33001146	607016	4010	(1,780.06)	0.00	Cajas	12	98
Finca 20	56395	12/05/98	33001146	607016	4010	1,810.48	0.00	Cajas	12	98
Finca 20	1835	12/05/98	33001146	607016	4010	0.00	96,903.00	Cajas	12	98
Finca 20	1892	12/31/98	33001146	607016	4010	0.00	84,655.00	Cajas	13	98
Finca 20	57712	12/31/98	33001146	607016	4010	1,210.25	0.00	Cajas	13	98
Finca 20	384106	01/07/99	33001146	701020	7004	3,304.81	39,921.00	KW	1	99
Finca 20	286668	02/03/98	33001146	701020	7004	1,939.29	25,016.00	KW	2	98
Finca 20	391425	02/02/99	33001146	701020	7004	2,655.21	35,185.00	KW	2	99
Finca 20	295279	03/02/98	33001146	701020	7004	2,164.39	28,210.00	KW	3	98

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Finca 20	301749	03/24/98	33001146	701020	7004	2,157.94	28,296.00	KW	3	98
Finca 20	399904	03/03/99	33001146	701020	7004	2,438.24	35,778.00	KW	3	99
Finca 20	405140	03/22/99	33001146	701020	7004	2,311.98	32,562.00	KW	3	99
Finca 20	46278	05/11/98	33001146	701020	7001	(4,256.60)	56,506.00	KW	5	98
Finca 20	46652	05/19/98	33001146	701020	7001	4,245.69	56,506.00	KW	5	98
Finca 20	46652	05/19/98	33001146	701020	7004	(4,245.69)	56,506.00	KW	5	98
Finca 20	415738	05/04/99	33001146	701020	7004	2,472.62	34,546.00	KW	5	99
Finca 20	422710	06/02/99	33001146	701020	7004	1,464.12	34,230.00	KW	6	99
Finca 20	55837	11/30/98	33001146	701020	7001	5,453.76	65,233.00	KW	12	98
Finca 20	374165	12/02/98	33001146	701020	7004	1,901.71	22,842.00	KW	12	98
Finca 20	384106	01/07/99	33001146	701025	7004	608.11	67.00	KW	1	99
Finca 20	286668	02/03/98	33001146	701025	7004	687.69	68.00	KW	2	98
Finca 20	391425	02/02/99	33001146	701025	7004	586.70	65.00	KW	2	99
Finca 20	295279	03/02/98	33001146	701025	7004	719.73	72.00	KW	3	98
Finca 20	301749	03/24/98	33001146	701025	7004	721.97	73.00	KW	3	98
Finca 20	399904	03/03/99	33001146	701025	7004	624.82	70.00	KW	3	99
Finca 20	405140	03/22/99	33001146	701025	7004	582.78	65.00	KW	3	99
Finca 20	415738	05/04/99	33001146	701025	7004	567.14	64.00	KW	5	99
Finca 20	422710	06/02/99	33001146	701025	7004	1,661.37	76.00	KW	6	99
Finca 20	55837	11/30/98	33001146	701025	7001	1,244.17	118.00	KW	12	98
Finca 20	374165	12/02/98	33001146	701025	7004	585.84	63.00	KW	12	98
Finca 17	41711	01/31/98	33001147	607016	4010	0.00	23,644.00	Cajas	1	98
Finca 17	41781	01/31/98	33001147	607016	4010	(753.93)	0.00	Cajas	1	98
Finca 17	59121	01/30/99	33001147	607016	4010	1.70	0.00	Cajas	1	99
Finca 17	43111	02/28/98	33001147	607016	4010	0.00	15,627.00	Cajas	2	98
Finca 17	43220	02/28/98	33001147	607016	4010	257.12	0.00	Cajas	2	98
Finca 17	43256	02/28/98	33001147	607016	4010	(1.77)	0.00	Cajas	2	98
Finca 17	60569	02/27/99	33001147	607016	4010	556.27	0.00	Cajas	2	99
Finca 17	60575	02/27/99	33001147	607016	4010	7.85	0.00	Cajas	2	99
Finca 17	44478	03/28/98	33001147	607016	4010	0.00	21,363.00	Cajas	3	98
Finca 17	44528	03/28/98	33001147	607016	4010	(95.34)	0.00	Cajas	3	98
Finca 17	62038	03/27/99	33001147	607016	4010	29.57	0.00	Cajas	3	99
Finca 17	45837	04/25/98	33001147	607016	4010	106.50	0.00	Cajas	4	98
Finca 17	45786	04/25/98	33001147	607016	4010	0.00	16,213.00	Cajas	4	98
Finca 17	45854	04/25/98	33001147	607016	4010	106.50	0.00	Cajas	4	98
Finca 17	45837	04/25/98	33001147	607016	4010	(106.50)	0.00	Cajas	4	98
Finca 17	47309	05/23/98	33001147	607016	4010	181.34	0.00	Cajas	5	98
Finca 17	48629	06/20/98	33001147	607016	4010	161.33	0.00	Cajas	6	98
Finca 17	66289	06/19/99	33001147	607016	4010	(174.54)	0.00	Cajas	6	99
Finca 17	49881	07/18/98	33001147	607016	4010	643.60	0.00	Cajas	7	98
Finca 17	51115	08/15/98	33001147	607016	4010	193.96	0.00	Cajas	8	98
Finca 17	52450	09/12/98	33001147	607016	4010	186.50	0.00	Cajas	9	98
Finca 17	53637	10/10/98	33001147	607016	4010	2.99	0.00	Cajas	10	98
Finca 17	55132	11/07/98	33001147	607016	4010	264.06	0.00	Cajas	11	98
Finca 17	55134	11/07/98	33001147	607016	4010	801.44	0.00	Cajas	11	98
Finca 17	55145	11/07/98	33001147	607016	4010	12.72	0.00	Cajas	11	98
Finca 17	55677	11/25/98	33001147	607016	4010	(796.67)	0.00	Cajas	12	98
Finca 17	56395	12/05/98	33001147	607016	4010	806.57	0.00	Cajas	12	98
Finca 17	57712	12/31/98	33001147	607016	4010	574.16	0.00	Cajas	13	98
Finca 17	384106	01/07/99	33001147	701020	7004	597.50	7,022.00	KW	1	99
Finca 17	286668	02/03/98	33001147	701020	7004	712.74	8,722.00	KW	2	98
Finca 17	391425	02/02/99	33001147	701020	7004	444.49	5,812.00	KW	2	99
Finca 17	295279	03/02/98	33001147	701020	7004	623.10	6,936.00	KW	3	98
Finca 17	301749	03/24/98	33001147	701020	7004	523.71	5,125.00	KW	3	98
Finca 17	399904	03/03/99	33001147	701020	7004	303.25	4,320.00	KW	3	99
Finca 17	405140	03/22/99	33001147	701020	7004	256.70	3,419.00	KW	3	99

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Finca 17	405140	03/22/99	33001147	701020	7004	315.60	4,137.00	KW	3	99
Finca 17	312507	04/29/98	33001147	701020	7004	617.46	6,805.00	KW	5	98
Finca 17	415738	05/04/99	33001147	701020	7004	582.66	8,226.00	KW	5	99
Finca 17	320826	05/27/98	33001147	701020	7004	831.93	10,585.00	KW	6	98
Finca 17	422710	06/02/99	33001147	701020	7004	281.18	9,519.00	KW	6	99
Finca 17	330061	06/30/98	33001147	701020	7004	771.32	10,222.00	KW	7	98
Finca 17	337440	07/25/98	33001147	701020	7004	119.80	1.00	KW	8	98
Finca 17	340334	08/05/98	33001147	701020	7004	576.79	7,613.00	KW	8	98
Finca 17	347697	09/01/98	33001147	701020	7004	105.15	3,146.00	KW	9	98
Finca 17	356894	10/06/98	33001147	701020	7004	566.37	6,696.00	KW	10	98
Finca 17	363334	11/02/98	33001147	701020	7004	545.71	6,502.00	KW	11	98
Finca 17	374165	12/02/98	33001147	701020	7004	635.76	7,699.00	KW	12	98
Finca 17	384106	01/07/99	33001147	701025	7004	155.87	17,051.00	KW	1	99
Finca 17	286668	02/03/98	33001147	701025	7004	376.73	37.00	KW	2	98
Finca 17	391425	02/02/99	33001147	701025	7004	141.28	15.58	KW	2	99
Finca 17	295279	03/02/98	33001147	701025	7004	356.26	36.00	KW	3	98
Finca 17	301749	03/24/98	33001147	701025	7004	325.96	33.00	KW	3	98
Finca 17	399904	03/03/99	33001147	701025	7004	142.43	15,851.00	KW	3	99
Finca 17	405140	03/22/99	33001147	701025	7004	138.97	15.55	KW	3	99
Finca 17	312507	04/29/98	33001147	701025	7004	334.67	34.00	KW	5	98
Finca 17	415738	05/04/99	33001147	701025	7004	140.15	15.88	KW	5	99
Finca 17	320826	05/27/98	33001147	701025	7004	351.37	36.00	KW	6	98
Finca 17	422710	06/02/99	33001147	701025	7004	539.45	16.70	KW	6	99
Finca 17	330061	06/30/98	33001147	701025	7004	328.65	34.00	KW	7	98
Finca 17	340334	08/05/98	33001147	701025	7004	325.53	34.00	KW	8	98
Finca 17	347697	09/01/98	33001147	701025	7004	165.92	17,471.00	KW	9	98
Finca 17	356894	10/06/98	33001147	701025	7004	164.47	17,501.00	KW	10	98
Finca 17	363334	11/02/98	33001147	701025	7004	159.16	17,071.00	KW	11	98
Finca 17	374165	12/02/98	33001147	701025	7004	156.92	17,001.00	KW	12	98
Finca 10	41711	01/31/98	33001148	607016	4010	0.00	10,385.00	Cajas	1	98
Finca 10	41781	01/31/98	33001148	607016	4010	(331.15)	0.00	Cajas	1	98
Finca 10	59121	01/30/99	33001148	607016	4010	9.95	0.00	Cajas	1	99
Finca 10	43111	02/28/98	33001148	607016	4010	0.00	13,462.00	Cajas	2	98
Finca 10	43220	02/28/98	33001148	607016	4010	221.50	0.00	Cajas	2	98
Finca 10	43256	02/28/98	33001148	607016	4010	(1.53)	0.00	Cajas	2	98
Finca 10	60569	02/27/99	33001148	607016	4010	2,575.50	0.00	Cajas	2	99
Finca 10	60575	02/27/99	33001148	607016	4010	36.36	0.00	Cajas	2	99
Finca 10	44478	03/28/98	33001148	607016	4010	0.00	4,689.00	Cajas	3	98
Finca 10	44528	03/28/98	33001148	607016	4010	(20.93)	0.00	Cajas	3	98
Finca 10	62038	03/27/99	33001148	607016	4010	87.70	0.00	Cajas	3	99
Finca 10	45837	04/25/98	33001148	607016	4010	0.00	0.00	Cajas	4	98
Finca 10	45786	04/25/98	33001148	607016	4010	0.00	0.00	Cajas	4	98
Finca 10	45854	04/25/98	33001148	607016	4010	0.00	0.00	Cajas	4	98
Finca 10	45837	04/25/98	33001148	607016	4010	0.00	0.00	Cajas	4	98
Finca 10	47309	05/23/98	33001148	607016	4010	0.00	0.00	Cajas	5	98
Finca 10	48629	06/20/98	33001148	607016	4010	0.00	0.00	Cajas	6	98
Finca 10	66289	06/19/99	33001148	607016	4010	(212.77)	0.00	Cajas	6	99
Finca 10	49881	07/18/98	33001148	607016	4010	0.00	0.00	Cajas	7	98
Finca 10	51115	08/15/98	33001148	607016	4010	0.00	0.00	Cajas	8	98
Finca 10	52450	09/12/98	33001148	607016	4010	0.00	0.00	Cajas	9	98
Finca 10	53637	10/10/98	33001148	607016	4010	0.00	0.00	Cajas	10	98
Finca 10	55132	11/07/98	33001148	607016	4010	66.48	0.00	Cajas	11	98
Finca 10	55134	11/07/98	33001148	607016	4010	201.76	0.00	Cajas	11	98
Finca 10	55145	11/07/98	33001148	607016	4010	3.20	0.00	Cajas	11	98
Finca 10	55677	11/25/98	33001148	607016	4010	(200.56)	0.00	Cajas	12	98
Finca 10	56395	12/05/98	33001148	607016	4010	1,904.40	0.00	Cajas	12	98

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Finca 10	57712	12/31/98	33001148	607016	4010	1,769.43	0.00	Cajas	13	98
Finca 10	384106	01/07/99	33001148	701020	7004	391.44	4,356.00	KW	1	99
Finca 10	286668	02/03/98	33001148	701020	7004	428.50	5,329.00	KW	2	98
Finca 10	391425	02/02/99	33001148	701020	7004	321.28	3,996.00	KW	2	99
Finca 10	295279	03/02/98	33001148	701020	7004	562.22	7,200.00	KW	3	98
Finca 10	301749	03/24/98	33001148	701020	7004	357.05	4,457.00	KW	3	98
Finca 10	399904	03/03/99	33001148	701020	7004	326.22	4,559.00	KW	3	99
Finca 10	312507	04/29/98	33001148	701020	7004	455.24	5,843.00	KW	5	98
Finca 10	415738	05/04/99	33001148	701020	7004	347.22	4,533.00	KW	5	99
Finca 10	320826	05/27/98	33001148	701020	7004	619.72	8,213.00	KW	6	98
Finca 10	422710	06/02/99	33001148	701020	7004	331.56	6,812.00	KW	6	99
Finca 10	330061	06/30/98	33001148	701020	7004	613.35	8,160.00	KW	7	98
Finca 10	337440	07/25/98	33001148	701020	7004	506.59	6,750.00	KW	8	98
Finca 10	347697	09/01/98	33001148	701020	7004	400.99	4,892.00	KW	9	98
Finca 10	356894	10/06/98	33001148	701020	7004	482.76	5,537.00	KW	10	98
Finca 10	363334	11/02/98	33001148	701020	7004	275.79	3,077.00	KW	11	98
Finca 10	374165	12/02/98	33001148	701020	7004	450.52	5,300.00	KW	12	98
Finca 10	384106	01/07/99	33001148	701025	7004	194.08	21.00	KW	1	99
Finca 10	286668	02/03/98	33001148	701025	7004	263.96	26.00	KW	2	98
Finca 10	391425	02/02/99	33001148	701025	7004	217.36	24.00	KW	2	99
Finca 10	295279	03/02/98	33001148	701025	7004	258.43	26.00	KW	3	98
Finca 10	301749	03/24/98	33001148	701025	7004	244.57	25.00	KW	3	98
Finca 10	399904	03/03/99	33001148	701025	7004	197.97	22.00	KW	3	99
Finca 10	405140	03/22/99	33001148	701025	7004	210.20	24.00	KW	3	99
Finca 10	312507	04/29/98	33001148	701025	7004	252.75	26.00	KW	5	98
Finca 10	415738	05/04/99	33001148	701025	7004	207.58	24.00	KW	5	99
Finca 10	320826	05/27/98	33001148	701025	7004	236.95	24.00	KW	6	98
Finca 10	422710	06/02/99	33001148	701025	7004	386.08	25.00	KW	6	99
Finca 10	330061	06/30/98	33001148	701025	7004	262.73	27.00	KW	7	98
Finca 10	337440	07/25/98	33001148	701025	7004	239.48	25.00	KW	8	98
Finca 10	347697	09/01/98	33001148	701025	7004	233.45	25.00	KW	9	98
Finca 10	356894	10/06/98	33001148	701025	7004	246.71	26.00	KW	10	98
Finca 10	363334	11/02/98	33001148	701025	7004	209.51	22.00	KW	11	98
Finca 10	374165	12/02/98	33001148	701025	7004	206.48	22.00	KW	12	98
La Paz	1950	01/30/99	33111240	607016	4010	0.00	43,208.00	Cajas	1	99
La Paz	1368	02/28/98	33111240	607016	4010	0.00	65,579.00	Cajas	2	98
La Paz	1369	02/28/98	33111240	607016	4010	0.00	60,524.00	Cajas	2	98
La Paz	1999	02/27/99	33111240	607016	4010	0.00	67,782.00	Cajas	2	99
La Paz	1409	03/28/98	33111240	607016	4010	0.00	73,358.00	Cajas	3	98
La Paz	1444	04/25/98	33111240	607016	4010	0.00	78,495.00	Cajas	4	98
La Paz	2113	04/24/99	33111240	607016	4010	0.00	89,325.00	Cajas	4	99
La Paz	1485	05/23/98	33111240	607016	4010	0.00	67,285.00	Cajas	5	98
La Paz	2196	05/22/99	33111240	607016	4010	0.00	68,867.00	Cajas	5	99
La Paz	1527	06/20/98	33111240	607016	4010	0.00	65,763.00	Cajas	6	98
La Paz	2262	06/19/99	33111240	607016	4010	0.00	60,107.00	Cajas	6	99
La Paz	1566	07/18/98	33111240	607016	4010	0.00	69,052.00	Cajas	7	98
La Paz	1612	08/15/98	33111240	607016	4010	0.00	74,922.00	Cajas	8	98
La Paz	1673	09/12/98	33111240	607016	4010	0.00	69,539.00	Cajas	9	98
La Paz	1717	10/10/98	33111240	607016	4010	0.00	56,183.00	Cajas	10	98
La Paz	1760	11/07/98	33111240	607016	4010	0.00	64,404.00	Cajas	11	98
La Paz	1835	12/05/98	33111240	607016	4010	0.00	35,232.00	Cajas	12	98
La Paz	1892	12/31/98	33111240	607016	4010	0.00	51,609.00	Cajas	13	98
La Paz	11424	01/30/99	33111240	701020	7001	22.16	28.00	KW	1	99
La Paz	8979	02/06/98	33111240	701020	7001	92.58	658.00	KW	2	98
La Paz	9121	03/05/98	33111240	701020	7001	24.70	135.00	KW	3	98
La Paz	11644	03/03/99	33111240	701020	7001	3.77	1.00	KW	3	99

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La Paz	11802	03/25/99	33111240	701020	7001	110.34	880.00	KW	3	99
La Paz	9383	04/08/98	33111240	701020	7001	76.48	533.00	KW	4	98
La Paz	9589	05/07/98	33111240	701020	7001	67.36	485.00	KW	5	98
La Paz	12037	04/29/99	33111240	701020	7001	135.90	1,087.00	KW	5	99
La Paz	9827	06/09/98	33111240	701020	7001	13.28	81.00	KW	6	98
La Paz	12206	05/25/99	33111240	701020	7001	523.66	4,166.00	KW	6	99
La Paz	10193	07/09/98	33111240	701020	7001	396.57	2,942.00	KW	7	98
La Paz	10333	08/12/98	33111240	701020	7001	453.41	3,395.00	KW	8	98
La Paz	10458	08/27/98	33111240	701020	7001	220.32	1,570.00	KW	9	98
La Paz	10715	10/06/98	33111240	701020	7001	303.89	1,987.00	KW	10	98
La Paz	10872	11/04/98	33111240	701020	7001	238.99	1,678.00	KW	11	98
La Paz	11037	11/30/98	33111240	701020	7001	458.59	3,183.00	KW	12	98
La Paz	11229	12/29/98	33111240	701020	7001	151.32	1,030.00	KW	13	98
La Paz	11425	01/30/99	33111240	701025	7001	561.26	5,896.00	KW	1	99
La Paz	8980	02/06/98	33111240	701025	7001	624.70	6,453.00	KW	2	98
La Paz	9121	03/05/98	33111240	701025	7001	620.45	6,202.00	KW	3	98
La Paz	11644	03/03/99	33111240	701025	7001	494.00	5,493.00	KW	3	99
La Paz	11802	03/25/99	33111240	701025	7001	516.36	5,823.00	KW	3	99
La Paz	9383	04/08/98	33111240	701025	7001	570.54	5,596.00	KW	4	98
La Paz	9592	05/07/98	33111240	701025	7001	626.58	6,447.00	KW	5	98
La Paz	12037	04/29/99	33111240	701025	7001	566.45	6,489.00	KW	5	99
La Paz	12142	05/14/99	33111240	701025	7001	322.48	1,020.00	KW	5	99
La Paz	9828	06/09/98	33111240	701025	7001	608.47	6,253.00	KW	6	98
La Paz	12207	05/25/99	33111240	701025	7001	880.01	6,435.00	KW	6	99
La Paz	10094	07/06/98	33111240	701025	7001	602.76	6,246.00	KW	7	98
La Paz	10334	08/12/98	33111240	701025	7001	481.86	4,618.00	KW	8	98
La Paz	10419	08/26/98	33111240	701025	7001	535.94	5,127.00	KW	9	98
La Paz	10716	10/06/98	33111240	701025	7001	540.24	4,766.00	KW	10	98
La Paz	10873	11/04/98	33111240	701025	7001	523.28	4,791.00	KW	11	98
La Paz	11032	11/29/98	33111240	701025	7001	573.11	5,270.00	KW	12	98
La Paz	11230	12/29/98	33111240	701025	7001	636.27	6,111.00	KW	13	98
Los Rios	1950	01/30/99	33121240	607016	4010	0.00	117,842.00	Cajas	1	99
Los Rios	1368	02/28/98	33121240	607016	4010	0.00	113,139.00	Cajas	2	98
Los Rios	1369	02/28/98	33121240	607016	4010	0.00	93,098.00	Cajas	2	98
Los Rios	1999	02/27/99	33121240	607016	4010	0.00	102,927.00	Cajas	2	99
Los Rios	1409	03/28/98	33121240	607016	4010	0.00	100,493.00	Cajas	3	98
Los Rios	1444	04/25/98	33121240	607016	4010	0.00	81,922.00	Cajas	4	98
Los Rios	2113	04/24/99	33121240	607016	4010	0.00	136,389.00	Cajas	4	99
Los Rios	1485	05/23/98	33121240	607016	4010	0.00	67,525.00	Cajas	5	98
Los Rios	2196	05/22/99	33121240	607016	4010	0.00	112,232.00	Cajas	5	99
Los Rios	1527	06/20/98	33121240	607016	4010	0.00	78,926.00	Cajas	6	98
Los Rios	2262	06/19/99	33121240	607016	4010	0.00	77,089.00	Cajas	6	99
Los Rios	1566	07/18/98	33121240	607016	4010	0.00	111,480.00	Cajas	7	98
Los Rios	1612	08/15/98	33121240	607016	4010	0.00	140,703.00	Cajas	8	98
Los Rios	1673	09/12/98	33121240	607016	4010	0.00	124,706.00	Cajas	9	98
Los Rios	1717	10/10/98	33121240	607016	4010	0.00	79,095.00	Cajas	10	98
Los Rios	1760	11/07/98	33121240	607016	4010	0.00	80,427.00	Cajas	11	98
Los Rios	1835	12/05/98	33121240	607016	4010	0.00	87,594.00	Cajas	12	98
Los Rios	1892	12/31/98	33121240	607016	4010	0.00	67,546.00	Cajas	13	98
Los Rios	10872	01/30/99	33121240	701020	7001	354.31	2,484.00	KW	1	99
Los Rios	8440	02/06/98	33121240	701020	7001	127.18	904.00	KW	2	98
Los Rios	8588	03/05/98	33121240	701020	7001	462.24	3,251.00	KW	3	98
Los Rios	11064	03/03/99	33121240	701020	7001	472.00	3,714.00	KW	3	99
Los Rios	11220	03/25/99	33121240	701020	7001	527.96	4,152.00	KW	3	99
Los Rios	8904	04/08/98	33121240	701020	7001	476.10	3,414.00	KW	4	98
Los Rios	9021	05/07/98	33121240	701020	7001	293.62	2,038.00	KW	5	98

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Los Rios	11482	04/29/99	33121240	70102	7001	500.72	3,896.00	KW	5	99
Los Rios	9245	06/09/98	33121240	70102	7001	337.46	2,377.00	KW	6	98
Los Rios	11637	05/25/99	33121240	70102	7001	260.96	1,953.00	KW	6	99
Los Rios	9725	08/12/98	33121240	701020	7001	99.60	672.00	KW	8	98
Los Rios	9826	08/26/98	33121240	701020	7001	5.02	19.00	KW	9	98
Los Rios	10152	10/06/98	33121240	701020	7001	153.30	1,051.00	KW	10	98
Los Rios	10309	11/04/98	33121240	701020	7001	164.21	1,153.00	KW	11	98
Los Rios	10477	11/30/98	33121240	701020	7001	44.64	284.00	KW	12	98
Los Rios	10691	12/29/98	33121240	701020	7001	276.69	1,941.00	KW	13	98
Los Rios	10873	01/30/99	33121240	701020	7001	367.92	1,754.00	KW	1	99
Los Rios	8441	02/06/98	33121240	701020	7001	479.14	3,876.00	KW	2	98
Los Rios	8588	03/05/98	33121240	701020	7001	430.08	3,162.00	KW	3	98
Los Rios	11064	03/03/99	33121240	701025	7001	329.67	1,927.00	KW	3	99
Los Rios	11220	03/25/99	33121240	701025	7001	328.54	1,632.00	KW	3	99
Los Rios	8904	04/08/98	33121240	701025	7001	406.79	3,049.00	KW	4	98
Los Rios	9022	05/07/98	33121240	701020	7001	487.06	3,345.00	KW	5	98
Los Rios	11482	04/29/99	33121240	701020	7001	328.92	1,897.00	KW	5	99
Los Rios	9246	06/09/98	33121240	701020	7001	398.35	2,305.00	KW	6	98
Los Rios	11639	05/25/99	33121240	701020	7001	325.29	1,468.00	KW	6	99
Los Rios	9467	07/06/98	33121240	701020	7001	385.73	2,641.00	KW	7	98
Los Rios	9726	08/12/98	33121240	701020	7001	411.10	3,345.00	KW	8	98
Los Rios	9827	08/26/98	33121240	701020	7001	497.55	4,069.00	KW	9	98
Los Rios	10155	10/06/98	33121240	701025	7001	419.55	2,580.00	KW	10	98
Los Rios	10310	11/04/98	33121240	701025	7001	401.16	2,947.00	KW	11	98
Los Rios	10473	11/29/98	33121240	701025	7001	440.83	3,162.00	KW	12	98
Los Rios	10692	12/29/98	33121240	701025	7001	393.65	2,907.00	KW	13	98
Porvenir	1950	01/30/99	33351740	60701	4010	0.00	44,556.00	Cajas	1	99
Porvenir	1368	02/28/98	33351740	60701	4010	0.00	64,247.00	Cajas	2	98
Porvenir	1369	02/28/98	33351740	60701	4010	0.00	46,836.00	Cajas	2	98
Porvenir	1999	02/27/99	33351740	60701	4010	0.00	43,843.00	Cajas	2	99
Porvenir	1409	03/28/98	33351740	607016	4010	0.00	68,039.00	Cajas	3	98
Porvenir	1444	04/25/98	33351740	607016	4010	0.00	74,778.00	Cajas	4	98
Porvenir	2113	04/24/99	33351740	607016	4010	0.00	51,480.00	Cajas	4	99
Porvenir	1485	05/23/98	33351740	607016	4010	0.00	91,288.00	Cajas	5	98
Porvenir	2196	05/22/99	33351740	607016	4010	0.00	67,295.00	Cajas	5	99
Porvenir	1527	06/20/98	33351740	607016	4010	0.00	72,940.00	Cajas	6	98
Porvenir	2262	06/19/99	33351740	607016	4010	0.00	69,216.00	Cajas	6	99
Porvenir	1566	07/18/98	33351740	607016	4010	0.00	61,121.00	Cajas	7	98
Porvenir	1612	08/15/98	33351740	607016	4010	0.00	58,623.00	Cajas	8	98
Porvenir	1673	09/12/98	33351740	607016	4010	0.00	50,928.00	Cajas	9	98
Porvenir	1717	10/10/98	33351740	607016	4010	0.00	40,098.00	Cajas	10	98
Porvenir	1760	11/07/98	33351740	607016	4010	0.00	64,188.00	Cajas	11	98
Porvenir	1835	12/05/98	33351740	607016	4010	0.00	59,354.00	Cajas	12	98
Porvenir	2288	11/20/98	33351740	607016	9591	0.00	33,531.00	Cajas	12	98
Porvenir	1892	12/31/98	33351740	607016	4010	0.00	53,888.00	Cajas	13	98
Porvenir	8543	01/16/98	33351740	701020	7001	247.44	1,753.00	KW	1	98
Porvenir	8543	01/16/98	33351740	701020	7001	45.27	7,551.00	KW	1	98
Porvenir	1716	01/16/98	33351740	701020	7001	0.00	1.00	KW	1	98
Porvenir	1716	01/16/98	33351740	701020	7001	0.00	1.00	KW	1	98
Porvenir	1717	01/16/98	33351740	701020	7001	0.00	1.00	KW	1	98
Porvenir	1717	01/16/98	33351740	701020	7001	0.00	1.00	KW	1	98
Porvenir	1729	01/26/98	33351740	701020	7001	(45.17)	(7,551.00)	KW	1	98
Porvenir	1729	01/26/98	33351740	701020	7001	45.17	755.00	KW	1	98
Porvenir	10505	01/21/99	33351740	701020	7001	110.09	2,023.00	KW	1	99
Porvenir	10505	01/21/99	33351740	701020	7001	34.97	602.00	KW	1	99
Porvenir	269	01/30/99	33351740	701020	7001	12.26	0.00	KW	1	99

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Porvenir	8625	02/11/98	33351740	701020	7001	158.53	1,101.00	KW	2	98
Porvenir	8625	02/11/98	33351740	701020	7001	70.25	1,055.00	KW	2	98
Porvenir	10652	02/18/99	33351740	701020	7001	109.66	2,075.00	KW	2	99
Porvenir	10652	02/18/99	33351740	701020	7001	32.10	560.00	KW	2	99
Porvenir	8803	03/17/98	33351740	701020	7001	162.75	1,142.00	KW	3	98
Porvenir	8803	03/17/98	33351740	701020	7001	51.22	8,711.00	KW	3	98
Porvenir	10761	03/17/99	33351740	701020	7001	98.51	196.00	KW	3	99
Porvenir	10761	03/17/99	33351740	701020	7001	30.98	563.00	KW	3	99
Porvenir	9032	04/17/98	33351740	701020	7001	352.94	2,529.00	KW	4	98
Porvenir	9032	04/17/98	33351740	701020	7001	35.16	647.00	KW	4	98
Porvenir	10906	04/19/99	33351740	701020	7001	86.06	1,443.00	KW	4	99
Porvenir	10906	04/19/99	33351740	701020	7001	26.30	462.00	KW	4	99
Porvenir	9179	05/19/98	33351740	701020	7001	55.42	733.00	KW	5	98
Porvenir	11034	05/14/99	33351740	701020	7001	29.89	532.00	KW	5	99
Porvenir	11034	05/14/99	33351740	701020	7001	91.67	1,765.00	KW	5	99
Porvenir	9340	06/18/98	33351740	701020	7001	86.68	455.00	KW	6	98
Porvenir	9464	07/20/98	33351740	701020	7001	108.11	2,030.00	KW	8	98
Porvenir	9595	08/18/98	33351740	701020	7001	93.70	1,821.00	KW	9	98
Porvenir	9721	09/16/98	33351740	701020	7001	51.44	720.00	KW	10	98
Porvenir	9969	10/20/98	33351740	701020	7001	49.18	651.00	KW	11	98
Porvenir	9969	10/20/98	33351740	701020	7001	99.50	1,084.00	KW	11	98
Porvenir	10082	11/23/98	33351740	701020	7001	107.51	1,867.00	KW	12	98
Porvenir	10082	11/23/98	33351740	701020	7001	31.73	557.00	KW	12	98
Porvenir	10392	12/21/98	33351740	701020	7001	70.41	1,707.00	KW	13	98
Porvenir	10392	12/21/98	33351740	701020	7001	40.85	625.00	KW	13	98
Porvenir	8479	01/06/98	33351740	701025	7001	570.32	4,959.00	KW	1	98
Porvenir	8479	01/06/98	33351740	701025	7001	998.71	8,180.00	KW	1	98
Porvenir	8479	01/06/98	33351740	701025	7001	721.02	6,093.00	KW	1	98
Porvenir	10452	01/06/99	33351740	701025	7001	364.42	2,372.00	KW	1	99
Porvenir	10452	01/06/99	33351740	701025	7001	(364.42)	(2,372.00)	KW	1	99
Porvenir	10475	01/12/99	33351740	701025	7001	889.90	7,726.00	KW	1	99
Porvenir	8623	02/07/98	33351740	701025	7001	493.27	3,998.00	KW	2	98
Porvenir	8623	02/07/98	33351740	701025	7001	880.18	7,027.00	KW	2	98
Porvenir	8623	02/07/98	33351740	701025	7001	688.91	5,616.00	KW	2	98
Porvenir	10589	02/03/99	33351740	701025	7001	794.20	7,454.00	KW	2	99
Porvenir	8747	03/05/98	33351740	701025	7001	504.51	4,213.00	KW	3	98
Porvenir	8747	03/05/98	33351740	701025	7001	944.86	7,731.00	KW	3	98
Porvenir	8747	03/05/98	33351740	701025	7001	612.39	4,630.00	KW	3	98
Porvenir	10711	03/11/99	33351740	701025	7001	825.78	8,635.00	KW	3	99
Porvenir	8922	04/01/98	33351740	701025	7001	470.75	3,808.00	KW	4	98
Porvenir	8922	04/01/98	33351740	701025	7001	822.99	6,670.00	KW	4	98
Porvenir	8922	04/01/98	33351740	701025	7001	669.53	5,646.00	KW	4	98
Porvenir	10910	04/20/99	33351740	701025	7001	659.46	7,013.50	KW	4	99
Porvenir	9099	05/04/98	33351740	701025	7001	588.21	3,475.00	KW	5	98
Porvenir	9099	05/04/98	33351740	701025	7001	784.72	6,660.00	KW	5	98
Porvenir	9099	05/04/98	33351740	701025	7001	761.96	7,060.00	KW	5	98
Porvenir	1936	05/12/98	33351740	701025	7001	0.00	2,000.00	KW	5	98
Porvenir	10992	05/09/99	33351740	701025	7001	917.78	9,904.00	KW	5	99
Porvenir	9273	06/08/98	33351740	701025	7001	931.26	9,426.00	KW	6	98
Porvenir	11089	06/02/99	33351740	701025	7001	948.68	10,473.00	KW	6	99
Porvenir	9424	07/08/98	33351740	701025	7001	906.62	9,055.00	KW	7	98
Porvenir	9424	07/08/98	33351740	701025	7001	27.20	1.00	KW	7	98
Porvenir	9424	07/08/98	33351740	701025	7001	(906.62)	9,055.00	KW	7	98
Porvenir	9424	07/08/98	33351740	701025	7001	(27.20)	1.00	KW	7	98
Porvenir	9424	07/08/98	33351740	701025	7001	906.62	9,056.00	KW	7	98
Porvenir	2047	07/16/98	33351740	701025	7001	0.00	(18,112.00)	KW	7	98

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Porvenir	9565	08/06/98	33351740	701025	7001	843.01	7,946.00	KW	8	98
Porvenir	9705	09/09/98	33351740	701025	7001	918.33	8,392.00	KW	9	98
Porvenir	9821	09/28/98	33351740	701025	7001	836.27	6,821.00	KW	10	98
Porvenir	9991	11/09/98	33351740	701025	7001	913.09	8,049.00	KW	12	98
Porvenir	10328	12/08/98	33351740	701025	7001	909.69	8,373.00	KW	13	98
Perla 1	1950	01/30/99	33361740	607016	4010	0.00	105,794.00	Cajas	1	99
Perla 1	1368	02/28/98	33361740	607016	4010	0.00	114,535.00	Cajas	2	98
Perla 1	1369	02/28/98	33361740	607016	4010	0.00	131,381.00	Cajas	2	98
Perla 1	1999	02/27/99	33361740	607016	4010	0.00	92,900.00	Cajas	2	99
Perla 1	1409	03/28/98	33361740	607016	4010	0.00	151,263.00	Cajas	3	98
Perla 1	1444	04/25/98	33361740	607016	4010	0.00	150,533.00	Cajas	4	98
Perla 1	2113	04/24/99	33361740	607016	4010	0.00	221,848.00	Cajas	4	99
Perla 1	1485	05/23/98	33361740	607016	4010	0.00	181,595.00	Cajas	5	98
Perla 1	2196	05/22/99	33361740	607016	4010	0.00	234,477.00	Cajas	5	99
Perla 1	1527	06/20/98	33361740	607016	4010	0.00	146,786.00	Cajas	6	98
Perla 1	2262	06/19/99	33361740	607016	4010	0.00	234,828.00	Cajas	6	99
Perla 1	1566	07/18/98	33361740	607016	4010	0.00	110,446.00	Cajas	7	98
Perla 1	1612	08/15/98	33361740	607016	4010	0.00	138,548.00	Cajas	8	98
Perla 1	1673	09/12/98	33361740	607016	4010	0.00	202,973.00	Cajas	9	98
Perla 1	1717	10/10/98	33361740	607016	4010	0.00	162,314.00	Cajas	10	98
Perla 1	1760	11/07/98	33361740	607016	4010	0.00	194,435.00	Cajas	11	98
Perla 1	1835	12/05/98	33361740	607016	4010	0.00	145,111.00	Cajas	12	98
Perla 1	1892	12/31/98	33361740	607016	4010	0.00	113,662.00	Cajas	13	98
Perla 1	14644	01/19/98	33361740	701020	7001	121.08	856.00	KW	1	98
Perla 1	18646	01/21/99	33361740	701020	7001	266.86	1,917.00	KW	1	99
Perla 1	15039	02/19/98	33361740	701020	7001	160.12	1,142.00	KW	2	98
Perla 1	15241	03/18/98	33361740	701020	7001	772.44	1,550.00	KW	3	98
Perla 1	15241	03/18/98	33361740	701020	7001	(772.19)	(1,550.00)	KW	3	98
Perla 1	15241	03/18/98	33361740	701020	7001	772.19	5,992.00	KW	3	98
Perla 1	15557	04/20/98	33361740	701020	7001	315.25	2,284.00	KW	4	98
Perla 1	19572	04/19/99	33361740	701020	7001	237.61	3,100.00	KW	4	99
Perla 1	15797	05/18/98	33361740	701020	7001	162.09	1,183.00	KW	5	98
Perla 1	19857	05/14/99	33361740	701020	7001	388.39	3,100.00	KW	5	99
Perla 1	16096	06/18/98	33361740	701020	7001	27.68	204.00	KW	6	98
Perla 1	16412	07/20/98	33361740	701020	7001	43.81	326.00	KW	8	98
Perla 1	16733	08/18/98	33361740	701020	7001	141.20	1,060.00	KW	9	98
Perla 1	16735	08/18/98	33361740	701020	7001	141.20	1,060.00	KW	9	98
Perla 1	16733	08/18/98	33361740	701020	7001	(141.20)	(1,060.00)	KW	9	98
Perla 1	16976	09/17/98	33361740	701020	7001	299.97	2,121.00	KW	10	98
Perla 1	17379	10/20/98	33361740	701020	7001	513.95	3,590.00	KW	11	98
Perla 1	17585	11/17/98	33361740	701020	7001	410.92	2,896.00	KW	12	98
Perla 1	18346	12/21/98	33361740	701020	7001	847.46	6,038.00	KW	13	98
Perla 1	14503	01/06/98	33361740	701025	7001	1,153.94	10,742.00	KW	1	98
Perla 1	18503	01/07/99	33361740	701025	7001	1,096.13	9,559.00	KW	1	99
Perla 1	15083	02/25/98	33361740	701025	7001	1,111.19	10,410.00	KW	2	98
Perla 1	18761	02/02/99	33361740	701025	7001	984.96	9,806.00	KW	2	99
Perla 1	15170	03/10/98	33361740	701025	7001	1,154.85	11,443.00	KW	3	98
Perla 1	19117	03/09/99	33361740	701025	7001	956.50	10,045.00	KW	3	99
Perla 1	15390	03/30/98	33361740	701025	7001	1,114.83	10,326.00	KW	4	98
Perla 1	19584	04/20/99	33361740	701025	7001	781.43	7,677.75	KW	4	99
Perla 1	15635	04/30/98	33361740	701025	7001	1,073.48	10,173.00	KW	5	98
Perla 1	19745	05/05/99	33361740	701025	7001	1,135.23	12,530.00	KW	5	99
Perla 1	15916	06/01/98	33361740	701025	7001	907.88	8,647.00	KW	6	98
Perla 1	19965	06/01/99	33361740	701025	7001	1,155.19	12,876.00	KW	6	99
Perla 1	16237	07/01/98	33361740	701025	7001	1,005.85	9,963.00	KW	7	98
Perla 1	16608	08/06/98	33361740	701025	7001	936.26	9,211.00	KW	8	98

Standard Fruit Company de Costa Rica S.A.
Reporte Consumo Eléctrico, Costos Cartón
Año 1998 y 1999

Boxito	# Docto.	Fecha	Centro Costo	Cta Obj.	ta Sub	Importe	Unidades	U/M	Pdo.	Año
Perla 1	16608	08/06/98	33361740	701025	7001	(936.25)	(9,211.00)	KW	8	98
Perla 1	16636	08/06/98	33361740	701025	7001	936.25	9,211.00	KW	8	98
Perla 1	16916	09/08/98	33361740	701025	7001	1,122.47	10,711.00	KW	9	98
Perla 1	17124	09/29/98	33361740	701025	7001	1,303.36	11,723.00	KW	10	98
Perla 1	17540	11/10/98	33361740	701025	7001	1,207.41	11,161.00	KW	12	98
Perla 1	18189	12/10/98	33361740	701025	7001	1,244.29	11,598.00	KW	13	98
Perla 2	15557	04/20/98	33361741	701020	7001	225.11	1,814.00	KW	4	98
Perla 2	15797	05/18/98	33361741	701020	7001	253.15	2,055.00	KW	5	98
Perla 2	16096	06/18/98	33361741	701020	7001	323.73	2,654.00	KW	6	98
Perla 2	16412	07/20/98	33361741	701020	7001	265.70	2,199.00	KW	8	98
Perla 2	16733	08/18/98	33361741	701020	7001	216.78	1,810.00	KW	9	98
Perla 2	16735	08/18/98	33361741	701020	7001	216.78	1,810.00	KW	9	98
Perla 2	16733	08/18/98	33361741	701020	7001	(216.78)	(1,810.00)	KW	9	98
Perla 2	16976	09/17/98	33361741	701020	7001	287.34	2,243.00	KW	10	98
Perla 2	17379	10/20/98	33361741	701020	7001	261.76	2,014.00	KW	11	98
Perla 2	17585	11/17/98	33361741	701020	7001	263.75	2,048.00	KW	12	98
Perla 2	18375	12/22/98	33361741	701020	7001	213.99	1,680.00	KW	13	98
Perla 2	18375	12/22/98	33361741	701020	7001	(213.99)	(1,680.00)	KW	13	98
Perla 2	18386	12/22/98	33361741	701020	7001	213.99	1,680.00	KW	13	98
Perla 2	14503	01/06/98	33361741	701025	7001	384.01	2,590.00	KW	1	98
Perla 2	14503	01/06/98	33361741	701025	7001	1,382.58	13,989.00	KW	1	98
Perla 2	18503	01/07/99	33361741	701025	7001	1,163.07	11,494.00	KW	1	99
Perla 2	18503	01/07/99	33361741	701025	7001	364.20	2,372.00	KW	1	99
Perla 2	18647	01/21/99	33361741	701025	7001	212.31	1,680.00	KW	1	99
Perla 2	15083	02/25/98	33361741	701025	7001	1,382.96	14,291.00	KW	2	98
Perla 2	15083	02/25/98	33361741	701025	7001	11.37	1.00	KW	2	98
Perla 2	18761	02/02/99	33361741	701025	7001	340.74	2,012.00	KW	2	99
Perla 2	18761	02/02/99	33361741	701025	7001	992.49	10,981.00	KW	2	99
Perla 2	15170	03/10/98	33361741	701025	7001	1,347.80	14,437.00	KW	3	98
Perla 2	19117	03/09/99	33361741	701025	7001	329.15	2,005.00	KW	3	99
Perla 2	19117	03/09/99	33361741	701025	7001	918.73	10,744.00	KW	3	99
Perla 2	15390	03/30/98	33361741	701025	7001	1,321.68	13,071.00	KW	4	98
Perla 2	19584	04/20/99	33361741	701025	7001	781.42	7,677.75	KW	4	99
Perla 2	19584	04/20/99	33361741	701025	7001	781.43	7,677.75	KW	4	99
Perla 2	15635	04/30/98	33361741	701025	7001	1,350.53	14,203.00	KW	5	98
Perla 2	19745	05/05/99	33361741	701025	7001	995.59	11,736.00	KW	5	99
Perla 2	19745	05/05/99	33361741	701025	7001	329.30	2,267.00	KW	5	99
Perla 2	15916	06/01/98	33361741	701025	7001	1,274.49	13,850.00	KW	6	98
Perla 2	19965	06/01/99	33361741	701025	7001	974.99	11,401.00	KW	6	99
Perla 2	19965	06/01/99	33361741	701025	7001	328.11	2,848.00	KW	6	99
Perla 2	16237	07/01/98	33361741	701025	7001	1,293.83	14,240.00	KW	7	98
Perla 2	16608	08/06/98	33361741	701025	7001	1,220.74	13,281.00	KW	8	98
Perla 2	16608	08/06/98	33361741	701025	7001	(1,220.74)	(13,281.00)	KW	8	98
Perla 2	16636	08/06/98	33361741	701025	7001	1,220.74	13,281.00	KW	8	98
Perla 2	16916	09/08/98	33361741	701025	7001	1,335.73	13,499.00	KW	9	98
Perla 2	17124	09/29/98	33361741	701025	7001	1,433.32	13,544.00	KW	10	98
Perla 2	17540	11/10/98	33361741	701025	7001	1,246.58	12,166.00	KW	12	98
Perla 2	18189	12/10/98	33361741	701025	7001	1,138.84	11,178.00	KW	13	98
Perla 3	14503	01/06/98	33361742	701025	7001	1,117.59	8,477.00	KW	1	98
Perla 3	1696	01/13/98	33361742	701025	7001	1,115.81	8,497.00	KW	1	98
Perla 3	1696	01/13/98	33361742	701025	7001	(1,115.81)	(8,477.00)	KW	1	98
Perla 3	18503	01/07/99	33361742	701025	7001	1,235.41	9,700.00	KW	1	99
Perla 3	15083	02/25/98	33361742	701025	7001	1,094.49	8,389.00	KW	2	98
Perla 3	18761	02/02/99	33361742	701025	7001	1,174.48	10,461.00	KW	2	99
Perla 3	15170	03/10/98	33361742	701025	7001	1,027.91	7,989.00	KW	3	98
Perla 3	19117	03/09/99	33361742	701025	7001	976.23	8,495.00	KW	3	99

Standard Fruit Company de Costa Rica S.A.
Reporte Consumo Eléctrico, Costos Cartón
Año 1998 y 1999

Boxito	# Docto.	Fecha	Centro Costo	Cta Obj.	ta Sub	Importe	Unidades	U/M	Pdo.	Año
Perla 3	15390	03/30/98	33361742	701025	7001	1,163.57	8,746.00	KW	4	98
Perla 3	19584	04/20/99	33361742	701025	7001	781.43	7,677.75	KW	4	99
Perla 3	15635	04/30/98	33361742	701025	7001	1,254.52	10,597.00	KW	5	98
Perla 3	19745	05/05/99	33361742	701025	7001	1,140.72	10,741.00	KW	5	99
Perla 3	15916	06/01/98	33361742	701025	7001	1,340.92	12,465.00	KW	6	98
Perla 3	19965	06/01/99	33361742	701025	7001	1,199.60	11,087.00	KW	6	99
Perla 3	16237	07/01/98	33361742	701025	7001	1,324.07	11,640.00	KW	7	98
Perla 3	16608	08/06/98	33361742	701025	7001	962.23	7,101.00	KW	8	98
Perla 3	16608	08/06/98	33361742	701025	7001	(962.23)	(7,101.00)	KW	8	98
Perla 3	16636	08/06/98	33361742	701025	7001	962.23	7,101.00	KW	8	98
Perla 3	16916	09/08/98	33361742	701025	7001	1,111.20	8,716.00	KW	9	98
Perla 3	17124	09/29/98	33361742	701025	7001	1,269.68	9,766.00	KW	10	98
Perla 3	17540	11/10/98	33361742	701025	7001	1,436.58	12,544.00	KW	12	98
Perla 3	18189	12/10/98	33361742	701025	7001	1,355.99	11,427.00	KW	13	98
Totales						303,459.38	12,602,334.92			

High Demand1998-99 DOLLAR ELECTRIC BILL

BANANITO

PERIOD	BOXITO	$	PRODUCTION BOXES	$ per BOX	BOXITO	$	PRODUCTION BOXES	$ per BOX	BOXITO	$	PRODUCTION BOXES	$ per BOX
1998												
1	La Paz		65,579	0.000	Los Rios		113,139	0.000				
2	La Paz	624.70	60,524	0.010	Los Rios	479.14	93,098	0.005				
3	La Paz	620.45	73,358	0.008	Los Rios	430.08	100,493	0.004				
4	La Paz	570.54	78,495	0.007	Los Rios	406.79	81,922	0.005				
5	La Paz	626.58	67,285	0.009	Los Rios	487.06	67,525	0.007				
6	La Paz	608.47	65,763	0.009	Los Rios	398.35	78,926	0.005				
7	La Paz	602.76	69,052	0.009	Los Rios	385.73	111,480	0.003				
8	La Paz	481.86	74,922	0.006	Los Rios	411.10	140,703	0.003				
9	La Paz	535.94	69,539	0.008	Los Rios	497.55	124,706	0.004				
10	La Paz	540.24	56,183	0.010	Los Rios	419.55	79,095	0.005				
11	La Paz	523.28	64,404	0.008	Los Rios	401.16	80,427	0.005				
12	La Paz	573.11	35,232	0.016	Los Rios	440.83	87,594	0.005				
13	La Paz	636.27	51,609	0.012	Los Rios	393.65	67,546	0.006				
1999												
1	La Paz	561.26	43,208	0.013	Los Rios	367.92	117,842	0.003				
2	La Paz	494.00	67,782	0.007	Los Rios	329.67	102,927	0.003				
3	La Paz	516.36	89,325	0.006	Los Rios	328.54						
4	La Paz	566.45			Los Rios		136,389	0.000				
5	La Paz	322.48	68,867	0.005	Los Rios	328.92	112,232	0.003				
6	La Paz	880.01	60,107	0.015	Los Rios	325.29	77,089	0.004				

PERLA-PORVENIR

1998											
1	Porvenir		64,247	0.000	Perla 1	1,153.84	114,535	0.010	Perla 3	1,117.59	No info
2	Porvenir	880.18	46,836	0.019	Perla 1	1,111.19	131,381	0.008	Perla 3	1,094.49	No info
3	Porvenir	944.86	68,039	0.014	Perla 1	1,154.85	151,263	0.008	Perla 3	1,027.91	No info
4	Porvenir	669.53	74,778	0.009	Perla 1	1,114.83	150,533	0.007	Perla 3	1,163.57	No info
5	Porvenir	784.72	91,288	0.009	Perla 1	1,073.48	181,595	0.006	Perla 3	1,254.52	No info
6	Porvenir	931.26	72,940	0.013	Perla 1	907.88	146,786	0.006	Perla 3	1,340.92	No info
7	Porvenir	906.62	61,121	0.015	Perla 1	1,005.85	110,446	0.009	Perla 3	1,324.07	No info
8	Porvenir	843.01	58,623	0.014	Perla 1	936.25	138,548	0.007	Perla 3	962.23	No info
9	Porvenir	918.33	50,928	0.018	Perla 1	1,122.47	202,973	0.006	Perla 3	1,111.20	No info
10	Porvenir	836.27	40,098	0.021	Perla 1	1,303.36	162,314	0.008	Perla 3	1,269.68	No info
11	Porvenir		64,188	0.000	Perla 1		194,435	0.000	Perla 3		No info
12	Porvenir	913.09	59,354	0.015	Perla 1	1,207.41	145,111	0.008	Perla 3	1,436.58	No info
13	Porvenir	909.69	53,888	0.017	Perla 1	1,244.29	113,662	0.011	Perla 3	1,355.99	No info
1999											
1	Porvenir	889.90	44,556	0.020	Perla 1	1,096.13	105,794	0.010	Perla 3	1,235.41	No info
2	Porvenir	794.20	43,843	0.018	Perla 1	984.96	92,900	0.011	Perla 3	1,174.48	No info
3	Porvenir	825.78	51,480	0.016	Perla 1	956.50	221,848	0.004	Perla 3	976.23	No info
4	Porvenir	659.46			Perla 1	781.43			Perla 3	781.43	No info
5	Porvenir	917.78	67,295	0.014	Perla 1	1,135.23	234,477	0.005	Perla 3	1,140.72	No info
6	Porvenir	948.68	69,216	0.014	Perla 1	1,155.19	234,828	0.005	Perla 3	1,199.60	No info

ESTRELLA VALLEY

1998

1	FINCA 1	336.86	57071	0.006	CARTAGE	313.78	34098	0.009
2	FINCA 1	359.57	58439	0.006	CARTAGE	307.14	36933	0.008
3	FINCA 1	317.01	52255	0.006	CARTAGE	316.41	37858	0.008
4	FINCA 1	300.92	63110	0.005	CARTAGE	298.65	40845	0.007
5	FINCA 1	307.12	82994	0.004	CARTAGE	302.61	52080	0.006
6	FINCA 15		70370	0.000	CARTAGENA		35738	0.000
7	FINCA 1	310.40	47389	0.007	CARTAGE	293.74	24295	0.012
8	FINCA 1	316.68	51293	0.006	CARTAGE	297.88	28235	0.011
9	FINCA 1	324.43	56230	0.006	CARTAGE	297.80	31194	0.010
10	FINCA 1	372.16	58619	0.006	CARTAGE	301.30	37139	0.008
11	FINCA 1	308.25	72776	0.004	CARTAGE	296.70	43193	0.007
12	FINCA 1	311.52	55825	0.006	CARTAGE	289.23	43209	0.007
13	FINCA 1	303.06	50940	0.006	CARTAGE	280.36	30576	0.009

1999

1	FINCA 15		53945	0.000	CARTAGENA		35465	0.000
2	FINCA 1	288.75	44879	0.006	CARTAGE	305.63	28589	0.011
3	FINCA 1	281.67	64385	0.004	CARTAGE	302.92	38728	0.008
4	FINCA 1	278.71	65065	0.004	CARTAGE	298.66	41689	0.007
5	FINCA 15		80476	0.000	CARTAGE	852.83	52896	0.016
6	FINCA 1	185.05			CARTAGE	276.22		

HIGH DEMAND U$S SPENT IN ELECTRIC BILLS COMPARISON

	BANANITO		PERLA-PORVENIR			ESTRELLA VALLEY	
PERIOD	LA PAZ	LOS RIOS	PORVENIR	PERLA 1	PERLA 3	FINCA 15	CARTAGENA
1998							
1				1,153.84	1,117.59	336.86	313.78
2	624.70	479.14	880.18	1,111.19	1,094.49	359.57	307.14
3	620.45	430.08	944.86	1,154.85	1,027.91	317.01	316.41
4	570.54	406.79	669.53	1,114.83	1,163.57	300.92	298.65
5	626.58	487.06	784.72	1,073.48	1,254.52	307.12	302.61
6	608.47	398.35	931.26	907.88	1,340.92		
7	602.76	385.73	906.62	1,005.85	1,324.07	310.40	293.74
8	481.86	411.10	843.01	936.25	962.23	316.68	297.88
9	535.94	497.55	918.33	1,122.47	1,111.20	324.43	297.80
10	540.24	419.55	836.27	1,303.36	1,269.68	372.16	301.30
11	523.28	401.16				308.25	296.70
12	573.11	440.83	913.09	1,207.41	1,436.58	311.52	289.23
13	636.27	393.65	909.69	1,244.29	1,355.99	303.06	280.36
1999							
1	561.26	367.92	889.90	1,096.13	1,235.41		
2	494.00	329.67	794.20	984.96	1,174.48	288.75	305.63
3	516.36	328.54	825.78	956.50	976.23	281.67	302.92
4	566.45		659.46	781.43	781.43	278.71	298.66
5	322.48	328.92	917.78	1,135.23	1,140.72		852.83
6	880.01	325.29	948.68	1,155.19	1,199.60	185.05	276.22

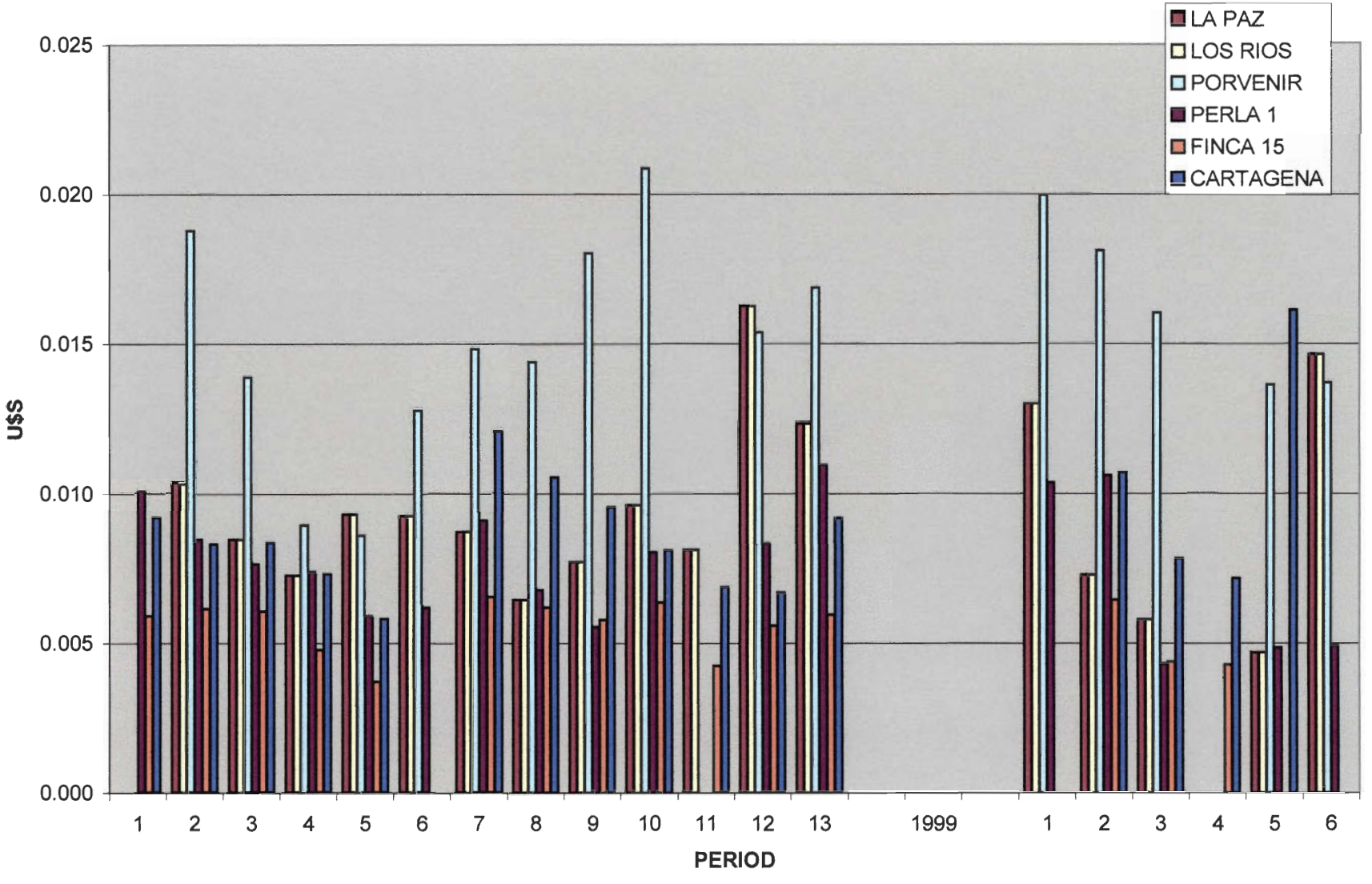
BANANITO	PERLA-PORVENIR	ESTRELLA VALLEY
0.000	1153.840	650.640
1103.840	1991.370	666.710
1050.530	2099.710	633.420
977.330	1784.360	599.570
1113.640	1858.200	609.730
1006.820	1839.140	0.000
988.490	1912.470	604.140
892.960	1779.260	614.560
1033.490	2040.800	622.230
959.790	2139.630	673.460
924.440	0.000	604.950
1013.940	2120.500	600.750
1029.920	2153.980	583.420
929.180	1986.030	0.000
823.670	1779.160	594.380
844.900	1782.280	584.590
566.450	1440.890	577.370
651.400	2053.010	852.830
1205.300	2103.870	461.270

HIGH DEMAND COMPARISON

$ per Box

	BANANITO		RLA-PORVENIR		ESTRELLA VALLEY	
PERIOD	LA PAZ	LOS RIOS	PORVENIR	PERLA 1	FINCA	CARTAGENA
1998						
1	0.000	0.000	0.000	0.010	0.006	0.009
2	0.010	0.005	0.019	0.008	0.006	0.008
3	0.008	0.004	0.014	0.008	0.006	0.008
4	0.007	0.005	0.009	0.007	0.005	0.007
5	0.009	0.007	0.009	0.006	0.004	0.006
6	0.009	0.005	0.013	0.006	0.000	0.000
7	0.009	0.003	0.015	0.009	0.007	0.012
8	0.006	0.003	0.014	0.007	0.006	0.011
9	0.008	0.004	0.018	0.006	0.006	0.010
10	0.010	0.005	0.021	0.008	0.006	0.008
11	0.008	0.005	0.000	0.000	0.004	0.007
12	0.016	0.005	0.015	0.008	0.006	0.007
13	0.012	0.006	0.017	0.011	0.006	0.009
1999						
1	0.013	0.003	0.020	0.010	0.000	0.000
2	0.007	0.003	0.018	0.011	0.006	0.011
3	0.006		0.016	0.004	0.004	0.008
4		0.000			0.004	0.007
5	0.005	0.003	0.014	0.005	0.000	0.016
6	0.015	0.004	0.014	0.005		

BANANITO	PERLA-PORVENIR	ESTRELLA VALLEY
0.000	0.010	0.015
0.015	0.027	0.014
0.013	0.022	0.014
0.012	0.016	0.012
0.017	0.015	0.010
0.014	0.019	0.000
0.012	0.024	0.019
0.009	0.021	0.017
0.012	0.024	0.015
0.015	0.029	0.014
0.013	0.000	0.011
0.021	0.024	0.012
0.018	0.028	0.015
0.016	0.030	0.000
0.010	0.029	0.017
0.006	0.020	0.012
0.000	0.000	0.011
0.008	0.018	0.016
0.019	0.019	0.000


HIGH DEMAND $ PER BOX IN BOXITOS
LA PAZ
LOS RIOS
PORVENIR
PERLA 1
FINCA 15
CARTAGENA
0.025
0.020
0.015
0.010
0.005
0.000
U$S
1
2
3
4
5
6
7
8
9
10
11
12
13
1999
1
2
3
4
5
6
PERIOD

FINCA	BOXITO	AILY PRODUCTI		HECTAR	PRODUCI	BOXES
		MIN	*MAX*		(yearly)	per stem
BANANITO	LA PAZ	**3000**	**4000**	**262**	**3157**	**1.4**
	LOS RIOS	**5000**	**6000**	**385**	**3247**	**1.4**
PERLA-PO	PORVENIR			**228**	**2938**	**1.4**
	PERLA 1			**322**	**3179**	**1.5**
	PERLA 3			**322**	**3179**	**1.5**
ESTRELLA	FINCA 15	**4000**	**5000**	**279**	**2844**	**1.4**
	CARTAGENA	**2000**	**3000**	**187**	**2844**	**1.4**

The bananas are shipped in containers and the production is regulated in terms of the number of containers scheduled for that day. The containers each carry approximately one thousand boxes, but it varies according to the box used in the packaging which is determined by the destination of the product.

Low Demand1998-99 DOLLAR ELECTRIC BILL

BANANITO

PERIOD	BOXITO	$	PRODUCTION BOXES	per BO	BOXITO	$	PRODUCTION BOXES	per BO	BOXIT	$	PRODUCTION BOXES	$ per BOX
1998												
1	La Paz		65,579	0.0000	Los Rios		113,139	0.00000				
2	La Paz	92.58	60,524	0.0015	Los Rios	127.18	93,098	0.00137				
3	La Paz	24.70	73,358	0.0003	Los Rios	462.24	100,493	0.00460				
4	La Paz	76.48	78,495	0.0010	Los Rios	476.10	81,922	0.00581				
5	La Paz	67.36	67,285	0.0010	Los Rios	293.62	67,525	0.00435				
6	La Paz	13.28	65,763	0.0002	Los Rios	337.46	78,926	0.00428				
7	La Paz	398.57	69,052	0.0058	Los Rios		111,480	0.00000				
8	La Paz	453.41	74,922	0.0061	Los Rios	99.60	140,703	0.00071				
9	La Paz	220.32	69,539	0.0032	Los Rios	5.02	124,706	0.00004				
10	La Paz	303.89	56,183	0.0054	Los Rios	153.30	79,095	0.00194				
11	La Paz	238.99	64,404	0.0037	Los Rios	164.21	80,427	0.00204				
12	La Paz	458.59	35,232	0.0130	Los Rios	44.64	87,594	0.00051				
13	La Paz	151.32	51,609	0.0029	Los Rios	276.69	67,546	0.00410				
1999												
1	La Paz	22.16	43,208	0.0005	Los Rios	354.31	117,842	0.00301				
2	La Paz	3.77	67,782	0.0001	Los Rios	472.00	102,927	0.00459				
3	La Paz	110.34	89,325	0.0012	Los Rios	527.96						
4	La Paz				Los Rios		136,389	0.00000				
5	La Paz	135.90	68,867	0.0020	Los Rios	500.72	112,232	0.00446				
6	La Paz	523.66	60,107	0.0087	Los Rios	260.96	77,089	0.00339				

PERLA-PORVENIR

1998											
1	Porvenir	292	64,247	0.0045	Perla 1	121	114,535	0.00106	Perla 3	No info	No info
2	Porvenir	229	46,836	0.0049	Perla 1	160	131,381	0.00122	Perla 3	No info	No info
3	Porvenir	214	68,039	0.0031	Perla 1	772	151,263	0.00510	Perla 3	No info	No info
4	Porvenir	388	74,778	0.0052	Perla 1	315	150,533	0.00209	Perla 3	No info	No info
5	Porvenir	55	91,288	0.0006	Perla 1	162	181,595	0.00089	Perla 3	No info	No info
6	Porvenir	87	72,940	0.0012	Perla 1		146,786	0.00000	Perla 3	No info	No info
7	Porvenir		61,121	0.0000	Perla 1		110,446	0.00000	Perla 3	No info	No info
8	Porvenir	108.11	58,623	0.0018	Perla 1		138,548	0.00000	Perla 3	No info	No info
9	Porvenir	93.70	50,928	0.0018	Perla 1	141	202,973	0.00070	Perla 3	No info	No info
10	Porvenir	51.44	40,098	0.0013	Perla 1	300	162,314	0.00185	Perla 3	No info	No info
11	Porvenir	149	64,188	0.0023	Perla 1	514	194,435	0.00264	Perla 3	No info	No info
12	Porvenir	139	59,354	0.0023	Perla 1	411	145,111	0.00283	Perla 3	No info	No info
13	Porvenir	111	53,888	0.0021	Perla 1	847	113,662	0.00746	Perla 3	No info	No info
1999											
1	Porvenir	12	44,556	0.0003	Perla 1	266.86	105,794	0.00252	Perla 3	No info	No info
2	Porvenir	141	43,843	0.0032	Perla 1		92,900	0.00000	Perla 3	No info	No info
3	Porvenir	130	51,480	0.0025	Perla 1		221,848	0.00000	Perla 3	No info	No info
4	Porvenir	112			Perla 1	237.61			Perla 3	No info	No info
5	Porvenir	121	67,295	0.0018	Perla 1	388.39	234,477	0.00166	Perla 3	No info	No info
6	Porvenir		69,216	0.0000	Perla 1		234,828	0.00000	Perla 3	No info	No info

ESTRELLA VALLEY

1998								
1	FINCA 1	1,294.00	57071	0.0227	CARTAGENA	1,045.36	34098	0.03066
2	FINCA 1	1,220.00	58439	0.0209	CARTAGENA	850.00	36933	0.02301
3	FINCA 1	1,110.00	52255	0.0212	CARTAGENA	778.00	37858	0.02055
4	FINCA 1	1,285.95	63110	0.0204	CARTAGENA	932.39	40845	0.02283
5	FINCA 1	915.43	82994	0.0110	CARTAGENA	906.28	52080	0.01740
6	FINCA 1	309.04	70370	0.0044	CARTAGENA	154.51	35738	0.00432
7	FINCA 1	1,264.00	47389	0.0267	CARTAGENA	1,152.00	24295	0.04742

8	FINCA 1	1,262.00	51293	0.0246	CARTAGENA	879.00	28235	0.03113
9	FINCA 1	1,487.00	56230	0.0264	CARTAGENA	817.00	31194	0.02619
10	FINCA 1	1,685.00	58619	0.0287	CARTAGENA	988.00	37139	0.02660
11	FINCA 1	1,504.00	72776	0.0207	CARTAGENA	889.00	43193	0.02058
12	FINCA 1	1,594.00	55825	0.0286	CARTAGENA	1,037.00	43209	0.02400
13	FINCA 1	1,126.64	50940	0.0221	CARTAGENA	1,002.16	30576	0.03278

1999

1	FINCA 1	813	53945	0.01507	CARTAGENA	42.23	35465	0.00119
2	FINCA 1	1,312.67	44879	0.02925	CARTAGENA	1,160.00	28589	0.04058
3	FINCA 1	1,736.00	64385	0.02696	CARTAGENA	1,405.00	38728	0.03628
4	FINCA 1	256.77	65065	0.00395	CARTAGENA	49.66	41689	0.00119
5	FINCA 1	1,340.00	80476	0.01665	CARTAGENA	819.00	52896	0.01548
6	FINCA 1	329.31			CARTAGENA	36.00		

LOW DEMAND COMPARISON

$ per Box

	BANANITO		PERLA-PORVENIR		ESTRELLA VALLEY	
PERIOD	LA PAZ	LOS RIOS	PORVENIR	PERLA 1	FINCA 15	CARTAGENA
1998						
1	0.0000	0.00000	0.00454	0.00106	0.02267	0.03066
2	0.0015	0.00137	0.00489	0.00122	0.02088	0.02301
3	0.0003	0.00460	0.00315	0.00510	0.02124	0.02055
4	0.0010	0.00581	0.00519	0.00209	0.02038	0.02283
5	0.0010	0.00435	0.00060	0.00089	0.01103	0.01740
6	0.0002	0.00428	0.00119	0.00000	0.00439	0.00432
7	0.0058	0.00000	0.00000	0.00000	0.02667	0.04742
8	0.0061	0.00071	0.00184	0.00000	0.02460	0.03113
9	0.0032	0.00004	0.00184	0.00070	0.02644	0.02619
10	0.0054	0.00194	0.00128	0.00185	0.02874	0.02660
11	0.0037	0.00204	0.00232	0.00264	0.02067	0.02058
12	0.0130	0.00051	0.00234	0.00283	0.02855	0.02400
13	0.0029	0.00410	0.00206	0.00746	0.02212	0.03278
1999						
1	0.0005	0.00301	0.00027	0.00252	0.01507	0.00119
2	0.0001	0.00459	0.00322	0.00000	0.02925	0.04058
3	0.0012		0.00253	0.00000	0.02696	0.03628
4		0.00000			0.00395	0.00119
5	0.0020	0.00446	0.00180	0.00166	0.01665	0.01548
6	0.0087	0.00339	0.00000	0.00000		

BANANITO	PERLA-PORVENIR	ESTRELLA VALLEY
0.000	0.006	0.053
0.003	0.006	0.044
0.005	0.008	0.042
0.007	0.007	0.043
0.005	0.001	0.028
0.004	0.001	0.009
0.006	0.000	0.074
0.007	0.002	0.056
0.003	0.003	0.053
0.007	0.003	0.055
0.006	0.005	0.041
0.014	0.005	0.053
0.007	0.010	0.055
0.004	0.003	0.016
0.005	0.003	0.070
0.001	0.003	0.063
0.000	0.000	0.005
0.006	0.003	0.032
0.012	0.000	0.000

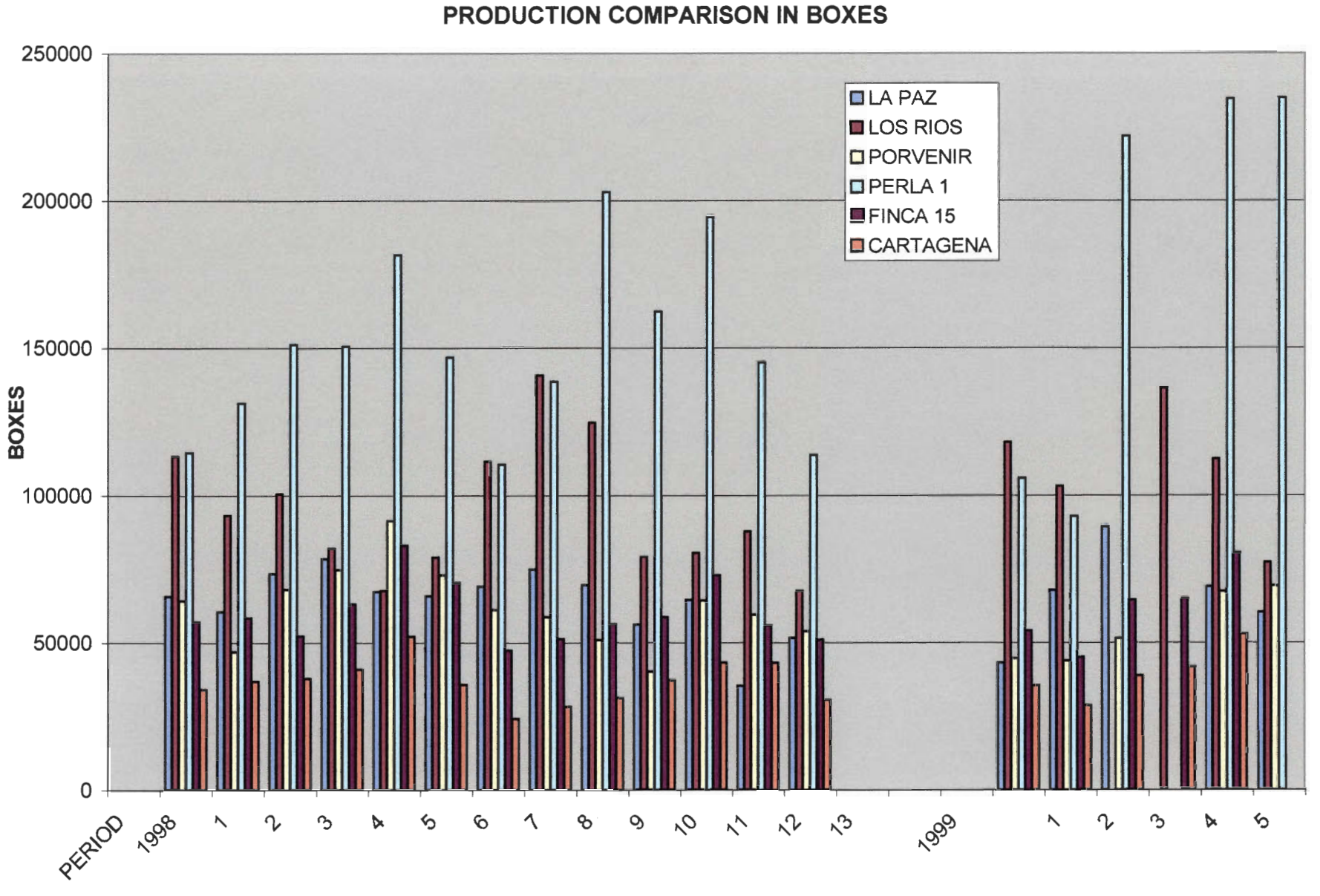
LOW DEMAND

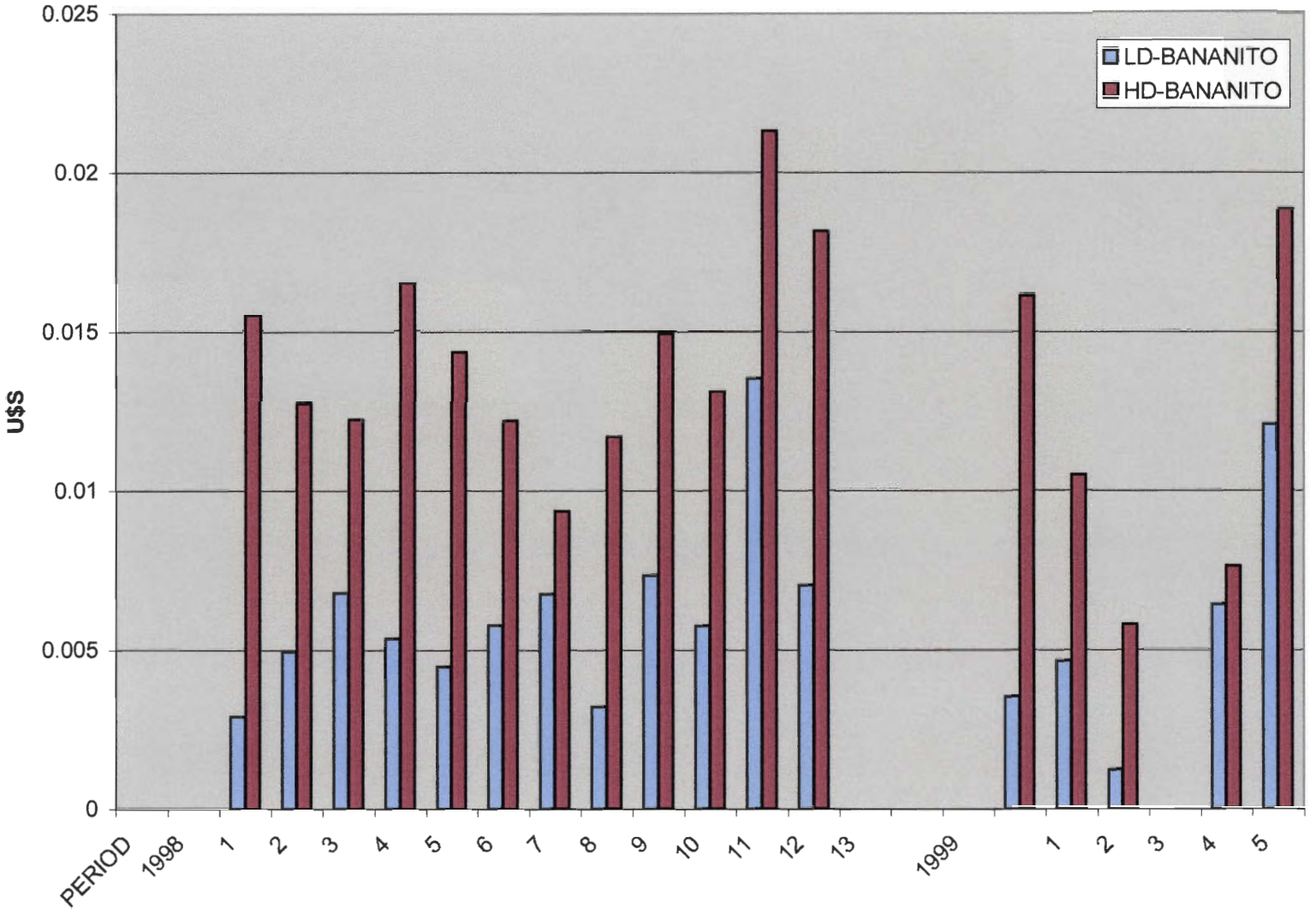
	BANANITO		PERLA-PORVENI		ESTRELLA VALLEY	
PERIOD	LA PAZ	LOS RIOS	PORVENI	PERLA	FINCA 15	CARTAGENA
1998						
1	0.0000	0.00000	0.00454	0.00106	0.02267	0.03066
2	0.0015	0.00137	0.00489	0.00122	0.02088	0.02301
3	0.0003	0.00460	0.00315	0.00510	0.02124	0.02055
4	0.0010	0.00581	0.00519	0.00209	0.02038	0.02283
5	0.0010	0.00435	0.00060	0.00089	0.01103	0.01740
6	0.0002	0.00428	0.00119	0.00000	0.00439	0.00432
7	0.0058	0.00000	0.00000	0.00000	0.02667	0.04742
8	0.0061	0.00071	0.00184	0.00000	0.02460	0.03113
9	0.0032	0.00004	0.00184	0.00070	0.02644	0.02619
10	0.0054	0.00194	0.00128	0.00185	0.02874	0.02660
11	0.0037	0.00204	0.00232	0.00264	0.02067	0.02058
12	0.0130	0.00051	0.00234	0.00283	0.02855	0.02400
13	0.0029	0.00410	0.00206	0.00746	0.02212	0.03278
1999						
1	0.0005	0.00301	0.00027	0.00252	0.01507	0.00119
2	0.0001	0.00459	0.00322	0.00000	0.02925	0.04058
3	0.0012		0.00253	0.00000	0.02696	0.03628
4		0.00000			0.00395	0.00119
5	0.0020	0.00446	0.00180	0.00166	0.01665	0.01548
6	0.0087	0.00339	0.00000	0.00000		

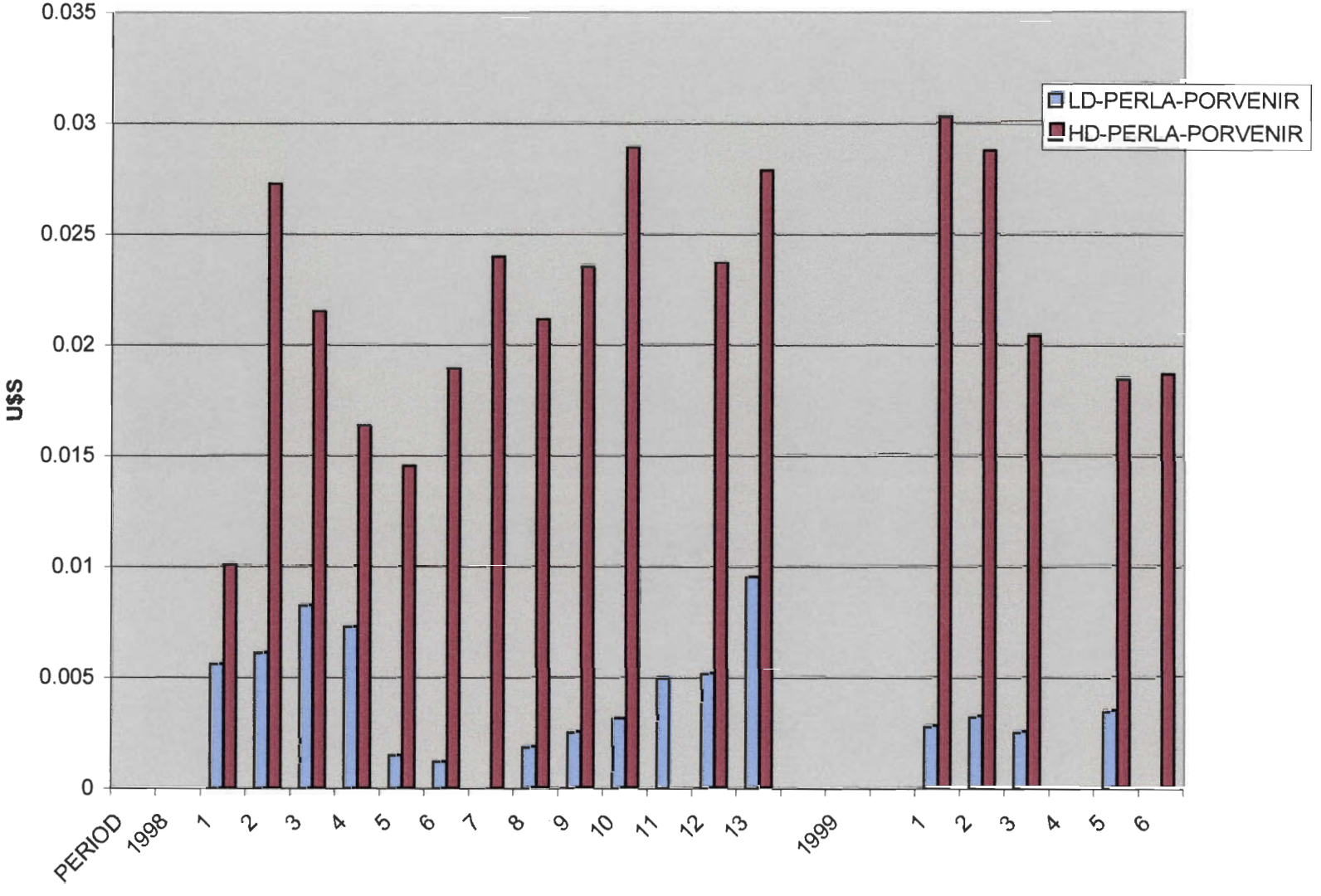
LD-BANANITO	HD-BANANITO	LD-PERLA-PORVENIR	HD-PERLA-PORVENIR	LD-ESTRELLA VALLEY	HD-ESTRELLA VALLEY
0.000	0.000	0.006	0.010	0.053	0.015
0.003	0.015	0.006	0.027	0.044	0.014
0.005	0.013	0.008	0.022	0.042	0.014
0.007	0.012	0.007	0.016	0.043	0.012
0.005	0.017	0.001	0.015	0.028	0.010
0.004	0.014	0.001	0.019	0.009	0.000
0.006	0.012	0.000	0.024	0.074	0.019
0.007	0.009	0.002	0.021	0.056	0.017
0.003	0.012	0.003	0.024	0.053	0.015
0.007	0.015	0.003	0.029	0.055	0.014
0.006	0.013	0.005	0.000	0.041	0.011
0.014	0.021	0.005	0.024	0.053	0.012
0.007	0.018	0.010	0.028	0.055	0.015
0.004	0.016	0.003	0.030	0.016	0.000
0.005	0.010	0.003	0.029	0.070	0.017
0.001	0.006	0.003	0.020	0.063	0.012
0.000	0.000	0.000	0.000	0.005	0.011
0.006	0.008	0.003	0.018	0.032	0.016
0.012	0.019	0.000	0.019	0.000	0.000

HIGH DEMAND

	BANANITO		PERLA-PORVENI		ESTRELLA VALLEY	
PERIOD	LA PAZ	LOS RIOS	PORVENI	PERLA	FINCA 15	CARTAGENA
1998						
1	0.000	0.000	0.000	0.010	0.006	0.009
2	0.010	0.005	0.019	0.008	0.006	0.008
3	0.008	0.004	0.014	0.008	0.006	0.008
4	0.007	0.005	0.009	0.007	0.005	0.007
5	0.009	0.007	0.009	0.006	0.004	0.006
6	0.009	0.005	0.013	0.006	0.000	0.000
7	0.009	0.003	0.015	0.009	0.007	0.012
8	0.006	0.003	0.014	0.007	0.006	0.011
9	0.008	0.004	0.018	0.006	0.006	0.010
10	0.010	0.005	0.021	0.008	0.006	0.008
11	0.008	0.005	0.000	0.000	0.004	0.007
12	0.016	0.005	0.015	0.008	0.006	0.007
13	0.012	0.006	0.017	0.011	0.006	0.009
1999						
1	0.013	0.003	0.020	0.010	0.000	0.000
2	0.007	0.003	0.018	0.011	0.006	0.011
3	0.006		0.016	0.004	0.004	0.008
4		0.000			0.004	0.007
5	0.005	0.003	0.014	0.005	0.000	0.016
6	0.015	0.004	0.014	0.005		


PRODUCTION COMPARISON IN BOXES
BOXES
250000
200000
150000
100000
50000
0
LA PAZ
LOS RIOS
PORVENIR
PERLA 1
FINCA 15
CARTAGENA
PERIOD
1998
1
2
3
4
5
6
7
8
9
10
11
12
13
1999
1
2
3
4
5


LD vs. HD BANANITO
LD-BANANITO
HD-BANANITO
U$S
0.025
0.02
0.015
0.01
0.005
0
PERIOD
1998
1
2
3
4
5
6
7
8
9
10
11
12
13
1999
1
2
3
4
5


LD vs. HD PERLA-PORVENIR
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
U$S
LD-PERLA-PORVENIR
HD-PERLA-PORVENIR
PERIOD
1998
1
2
3
4
5
6
7
8
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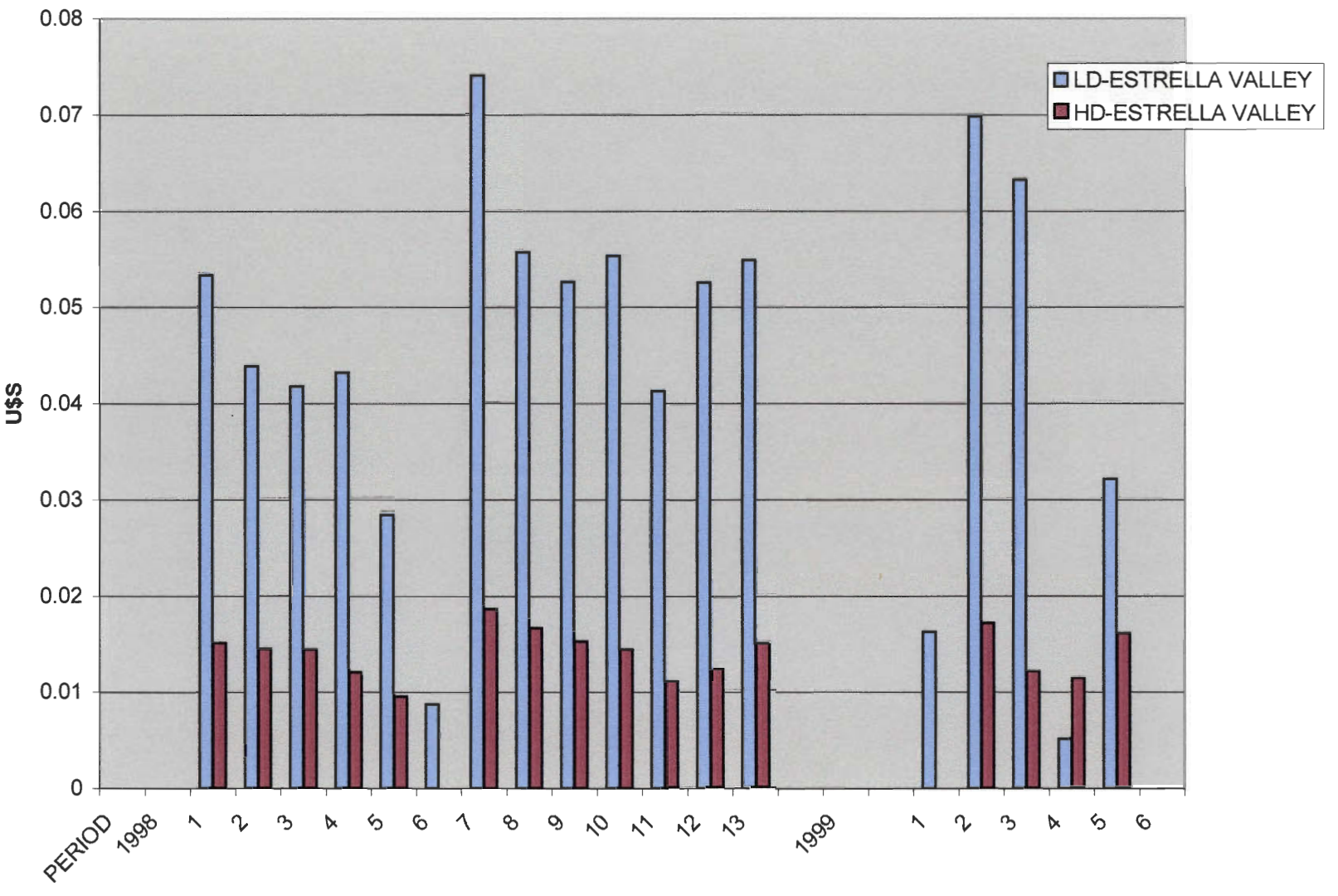
10
11
12
13
1999
1
2
3
4
5
6


LD vs. HD ESTRELLA VALLEY
U$S
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
LD-ESTRELLA VALLEY
HD-ESTRELLA VALLEY
PERIOD
1998
1
2
3
4
5
6
7
8
9
10
11
12
13
1999
1
2
3
4
5
6

TYPICAL BUDGET of a FINCA - COSTS OF PRODUCTION PER BOX		Prices U$S	% of Finca	% of FOB
Electricity	Finca (Workers Homes+Offices) *Low Demand*	0.02	0.53%	0.33%
	Packaging+Container Refrigeration *High Demand*	0.03	0.79%	0.50%
	Non Variable			
Carton		0.75	19.74%	12.50%
Fertilizing		0.32	8.42%	5.33%
Salaries	Field Workers	0.39	10.26%	6.50%
	Packaging	0.58	15.26%	9.67%
	Administration	0.25	6.58%	4.17%
		v		
Transportation		0.16	4.21%	2.67%
Total Cost out of finca		**3.80**		63.33%
Total Cost FOB		**6.00**		

Savings of 24% = $ 0.0072 per Box @ **17,000,000 Boxes produced per Year** **Saves $** **122,400** 0.18% of Total Cost

Savings of 9% = $ 0.0027 per Box @ **17,000,000 Boxes produced per Year** **Saves $** **45,900** 0.07% of Total Cost

TOTAL COST **$ 68,000,000**

Appendix F – ISO 14001 Standards for Conservation of Electric Energy

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IQP/MQP SCANNING PROJECT

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