

**Study tour to  
investigate production  
practices of Papayas  
in Brazil, April 2005**

Joe Zappala  
Australian Papaya Industry  
Association Ltd

Project Number: PP04003

## PP04003

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**STUDY TOUR TO INVESTIGATE PRODUCTION  
PRACTICES OF PAPAYAS IN BRAZIL, APRIL 2005**

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**Papaya Australia**

***FR04003 – Study tour to investigate production practices of Papayas in Brazil,  
April 2005***

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## **MEDIA SUMMARY**

The papaya industry currently suffers from limited consumer satisfaction. The industry struggles to produce papaya of a consistent quality all year round. This is primarily due to two things, lack of a commercially acceptable variety that also has good production characteristics and the impact of pest and diseases. In contrast Brazil is the world's largest producer of papaya producing in excess of 1.5 million tones annually. They produce papaya for both the domestic and export markets.

The Australian papaya industry invests heavily into the area of research and development however has never before visited another country to see first hand their industry. It was expected that two outcomes from the tour would be access to new varieties and better management practices for phytophthora. This study tour to Brazil was also the first time another country had visited the papaya industry in Brazil. The tour was 9 days and included visits to farms, packing sheds, research stations, a central market and also a chemical collection centre. The farms visited included some of the most advance and progressive producers in their industry.

In terms of production, Australian producers are not behind Brazilian producers. Disease problems are similar for both countries with the exception of two viruses that effect Brazil, Ring Spot Virus and Da Meleira. Australian producers are actually more advanced than the domestic producers in Brazil. The export producers in Brazil however are of a very high standard in terms of both quality and mechanization.

In terms of varieties there are three main varieties produced in Brazil, Sunrise Solo, Golden Solo and Tainung 1. These are currently grown in Australia however only consist of a small production area. In terms of phytophthora management Brazil's climate means that phytophthora is not a major problem. Australia producers actually incorporate better management practices for this disease, as it is such a problem. However Brazil has chemicals registered for the management of phytophthora that the Australian industry is still trying to either register or gather more data on.

The main areas that Australia producers can learn from the Brazilians is presentation of fruit post harvest and attention to detail in the paddock in terms of irrigation and nutrition practices. The consumption rate of papaw and papaya is also something that needs to be addressed at an industry level. Unfortunately the chemical treatments that they apply for pests and diseases cannot be replicated here in Australia, as we do not have all of these chemicals registered.

Tour participants gained a great deal of information during this tour and found it to be a very valuable experience. All information is currently being transferred back to the industry.

## **EXPECTED OUTCOMES AND HOW THEY WERE ACHIEVED**

Australia's main problems in terms of papaya production are limited consumer satisfaction with the varieties currently produced and inconsistent quality due mainly to pest and disease. Annual consumption rates of papaya in Brazil are over 8kg per person. This demonstrates consumer acceptance of the product. The scale at which the producers in Brazil successfully grow papaya demonstrates that they either manage pests and diseases well or they are not that great a problem.

The tour provided the opportunity to view production practices, post harvest practices and the industry as a whole.

It was important to visit a number of farms. While this may have meant that there was some repetition it also provided the opportunity to compare practices between Brazilian producers and benchmark the operations. Interaction with researchers was also an important aspect of the tour as they were able to provide the technical information during our visits give an overview of research. Translations were necessary due to the English/Portuguese barrier therefore it was essential that a translator traveled with tour participants.

To organize the tour and itinerary, AgTour Australia was contacted. Through their associates in Brazil an itinerary was developed. The Brazilian papaya researcher who was responsible for developing the itinerary and organizing the visits also took part in the tour and provided technical information. Throughout the tour there were a number of government officials who accompanied us. This provided participants with the opportunity to gain extensive information.

Tour participants were required to actively participate in all visits. Information collection was shared with participants taking responsibility for either note taking, photos, videoing or asking questions. During the tour the group fell into a system where everyone had set responsibilities and this worked well.



## RESULTS

Brazil is the world's largest producer of papaya producing in excess of 1.5 million tonne annually. In terms of volume, papaya is Brazil's second largest selling fruit with an annual consumption rate of over 8 kg per person. Papaya is often served at mealtimes and in retail stores occupies the most visible shelf space. In contrast, annual consumption rates of papaw and papaya in Australia are less than 1 kg per person and consumer knowledge of the product is limited.

There are two distinctly different markets that Brazilian producers supply, the domestic and export markets. Domestic consumers are familiar with papaya and are not focused on the appearance therefore domestic fruit generally has a poor appearance. Only 3% of Brazil's crop is exported and this is of a very superior standard in terms of appearance and presentation. Most exports are to Europe and the US.

Unlike Australia, the domestic market suppliers in Brazil do not have to meet strict quality assurance and there are little environmental regulations or work place health and safety standards. This is in contrast to the export producers who must meet the very high standards demanded of them by their overseas consumers. Therefore it is the export producers who Australia can learn the most from.

Ring Spot Virus and Da Meleira cause the main production losses for the Brazil papaya industry. Ring Spot Virus is present in Australia however it has been isolated to an area in South East Queensland and has not had a devastating impact. Da Meleira is a virus that is not found in Australia and the Brazilian authorities know very little about it. When initially identified in Brazil the Government undertook a large educational campaign and closely monitored producer compliance with the only known method of control being cutting out infected plants. Other pest and disease problems for the crop are similar in both Australia and Brazil.

There were two main areas that the tour wanted to gather information on these were varieties and phytophthora management. The tour found that although phytophthora is present in Brazil not a problem for these producers. Australia is more advanced with management practices for this disease. As for varieties there are three varieties that are commonly produced in Brazil, Sunrise Solo, Golden Solo and Tainung 1.

There are many differences to note between production in Brazil and Australia.

- Firstly the size of their industry - with such a large population and a high consumption rate, the papaya industry in Brazil is very big.
- As would be expected, Australian producers are more heavily regulated than Brazilian producers.
- Domestic fruit quality in Brazil is of a low standard however their export fruit is exceptional.
- Producers in Brazil have a high number of staff, due to the size of their businesses but also the low labour costs.
- The climate in which Brazil producers their papaya appears to be ideal

## Climate

Papaya production in Brazil is centred predominately along the coastline in the states of Bahia and Espirito Santo, which are in the central east coast region of Brazil.

Papayas are limited to the coastal regions as inland areas do not have a favourable climate with a higher altitude of about 850m (*pers.comm.*, Jose Altino Machado Filho, ADAB). The climate in these growing regions is:

- Temperature –26°C average, 16 °C minimum, 40 °C maximum
- Rainfall – 1800-2200mm annually, evenly distributed over the year
- Altitude – 100-450m above sea level

It is important to note that climatic extremes do not occur. Cyclones, floods or droughts do not occur in this area of Brazil. Although the above mentioned is the main growing region, papaya are produced in other areas. For example Caliman are expanding production with a new farm in the North East of Brazil. This area experiences a higher rainfall (*pers.comm.* Francisco Faleiro, Caliman).

## Soil Type

The soils are generally sodic soils with a water pH 6.5 and low fertility. The soil profile is generally sandy in the top 20cm and then 30-70cm of clay. Refer to photo 1. There is some organic matter in the profile from previous forests however after years of farming this will have been reduced.

The close proximity to the coastline means that it is fine sand in the soil profile. Although this soil has a low natural fertility, the producers have adapted their practices to suit. Fertilizers are applied regularly and close attention is paid to irrigation applications.

## Varieties

The varieties produced in Brazil are predominately Sunrise Solo, Golden Solo and Tainung 1, which is a member of the Formosa group. Sunrise solo is the main variety produced in Brazil accounting for 90% of production in the Bahia state. Golden solo is similar to Sunrise solo. Refer to photo 1. The main differences between Golden and Sunrise are:

golden has better consumer acceptance with a cleaner skin and more symmetrical shape

golden has less favourable production characteristics with a lower yield and smaller fruit

The leaves of the Golden Solo plant are paler and appear more yellow than the leaves of a Sunrise Solo plant. This is due to Golden Solo having 25% less chlorophyll than the Sunrise Solo (Geraldo, *pers. Comm.* Caliman Agricola). Golden Solo is produced primarily for the export market.

Tainung 1 are part of the Formosa group of papaya. They are long, red-fleshed fruit and high yielding. It is ideal for the hospitality industry due to its larger size. This is the 2<sup>nd</sup> most commonly produced variety after Sunrise Solo.

## Caliman 01

Caliman 01 is a variety that the Caliman family and University of Rio de Janeiro have been developing. It is a cross between a Formosa and a Solo. A characteristic of the Caliman 01 variety is the spots on the fruit. Caliman believe that these spots are due to photosynthetic reactions from light and temperature change rather than a nutrient deficiency. There is reportedly no resistance from consumers because of these marks. Refer to photo 2.

## **Production**

Brazil produces 1.5million tonne of papaya annually. Production is centred primarily on the south of Bahia that produces 800,000 tonne annually and Espirito Santo that produces 500,000 tonne annually. (*pers.comm.*, Jose Altino Machado Filho, ADAB)

To get an idea of the size of the papaya industry in Brazil, the south of Bahia that is the main production area has 12,500ha under papaya production. The whole of Australia has a production area of under 400ha. One of the farms visited on the tour, JTA Farms has 822ha of papaya meaning this farm is over double the size of the Australian industry.

In the south of Bahia, average industry production figures are just under 87 tonne/ha/year. The production at Caliman Bahia is higher than the industry average. Over a crop of about 16 months the yield is 150tonne/ha, which equates to 112tonne/ha/year and Bello's yield equates to 101tonne/ha/year. However it must be taken into consideration that the industry average would include primarily solos while Caliman's yield relates to Tainungs and it would be assumed Bello's does too.

The crop life varies however it is largely dependant on yield and disease. The farm manager at Gondo Farm claimed to have a crop that they have been picking off of for 2.5 years.

Caliman stated that they have a 26% variance in production between summer and winter. This does create some problems with the European market whose summer corresponds with Brazil's winter. Therefore when Europe's demand is at its highest, production is at its lowest.

## **Consumers**

Most of Brazil's papaya production is consumed on the domestic market. Domestic consumers are familiar with papaya and are not focused on the appearance therefore domestic fruit generally has a poor appearance. Brazil only exports about 35,000 tonnes/year of papaya, which is less than 3% of production. This was a major finding, as prior to the tour it was believed that a greater amount was exported. Brazil's consumption rate of papaya is 8kg/person/year. This only takes into account marketed fruit and does not include fruit that is consumed from back yard trees.

The main use for papaya is for fresh consumption with only a small amount used in processing. Processed papaya are cut into small pieces, dried and then used in ice cream and bread. The other processing use is for papain production.

## **Costs**

All figures in this section have been converted to Australian dollars. The exchange at the time of our visit was A\$1 equals 2 Real.

Government figures for total cost of production are A\$12,500/ha/cycle. This is a variable figure and is only a representative guide. Returns range from A\$22,500 to A\$25,000/ha/cycle.

## **Land**

Land around Caliman Bahia sells for around A\$2000/ha. Many producers lease land to grow papaya on so they are able to rotate land often. Leases are usually for 3 years and the rate is generally A\$500/ha for 3 years

## **Labour**

The minimum wage in Brazil rose on 1 May 2005 from 260Real/month to 300Real/month. This increased rate is equivalent to approximately A\$150/month.

## **Seed**

Of the farms we visited, seed was either imported from Taiwan or the farms bagged their own seed. Purchased seed was said to cost A\$500 for 100g of seed.

## **Carton**

A 3.5kg cardboard carton for export costs around A\$0.65. The wooden boxes used on the domestic market cost around A\$0.90. Refer to photos 3 & 4.

## **Freight**

### ***Domestic***

All domestic freight was transported by road in open aired trucks. The rate provided by one producer was A\$750/truck over about 1000km from Linhares to Sao Paulo. This equated to about A\$90 – A\$100/pallet.

### ***Export***

The cost of freight is paid by the grower up to the departure port. The overseas client pays the remainder of the freight costs. The fruit is transported in containers that travel by road from the farm to the port from where they are shipped. The costs provided by Bello fruit for a 17 tonne container were:

A\$1300 from farm to departure port (approx. A\$76/pallet)

A\$4290 from port to port (approx. A\$252/pallet)

A\$780 for wharf and quarantine fees

Caliman Agricola stated that freight costs equated to a quarter of their total cost. Airfreight costs Caliman Agricola US\$1.2/kg plus an additional 10c/kg to get it to the airport. This is approximately equivalent to A\$1700/pallet for airfreight. Shipping costs Caliman Agricola US\$0.4/kg, which is approximately A\$520/pallet.

## **Returns**

At the time of our visit both the domestic and export markets were considered oversupplied however the domestic market was slightly stronger. In the months prior to our visit the domestic market had been quite strong due to reduced plantings in previous years. The export markets were oversupplied at the time of the tour, especially in the US with fruit from Mexico.

### ***Domestic***

During our visit to the Ceagesp markets in Sao Paulo, 8kg boxes of papaya were selling for A\$2.50. This is equivalent to A\$0.31/kg. The average price provided by the government officials accompanying us on the tour were, Tainungs A\$0.17- A\$0.20/kg and Solo A\$0.23/kg.

### ***Export***

Most exports were Golden Solos in a 3.5kg carton. On average, these sold for A\$4.55 per carton. Golden Solos have the best return on the European market due to their “clean” appearance.

### ***Organic papaya***

There is a 30% premium on organic papaya over normal papaya (Geraldo, *pers. comm.* Caliman Agricola). Caliman Agricola produces 3 or 4 pallets of organic papaya

per week. This is sent to either Canada or Germany. Bello fruit also saw potential for organic papaya and will try and produce 20 ha of organic papaya in the future. Organic papaya is very labour intensive therefore it is difficult to produce large areas. According to Caliman Agricola there is also limited scope due to the margins being too fine.

## **Planting**

### **Land preparation**

Land preparation was similar to Australian practices except for mounding. Pre plant practices included disking, deep ripping and liming. Planting was done by hand into the deep ripped rows and a compost/charcoal mix was placed around the seedlings. Some farms then watered by hand. After desexing soil is then mounded up around the plants. This is to stop re-growth of cut out plants and also to increase the amount of plant base below the surface to prevent fall out from wind.

### **Planting densities**

Row spacings were either 3.5 or 3.8 m. Spacings between trees ranged from 1.6 to 2m. Solos were grown at a higher plant density than Tainungs. Tainungs were planted at a density of between 1300-1500 plants/ha. Solo varieties were planted at densities of between 1400-1700 plants/ha. Most of the blocks we visited were single rows, however some farms had both single and double rows.

Most of the farms planted 3 seedlings per site, however Caliman Bahia was going to increase this to 4 as they were still getting too many females. Only 1 farm that we visited direct seeded the others all had their own nurseries. Most nurseries were very basic with seeding pots sitting on the ground. Lembrance had a well set up shade house with all seedling trays suspended on racks under plastic. Refer to photo 5.

All planting was done by hand. Lembrance didn't plant all three seedlings in the one spot rather they planted them 25 cm apart so that there were 3 plants in a 50cm line. Bello fruit plants the seedlings out when they have 5 leaves.

## **Fallow and Rotation**

Finding suitable land to produce papaya on is not a problem. There are vast amounts of land and water. During our tour we rarely saw any cropping, rather it was all grazing and eucalypt forests. These two industries were dominant largely because these industries utilized large areas with minimal labour input. The Brazilian government is able to purchase land back from farmers if the land is not being used. This is then divided up into small lots for homeless people to live.

The length of time blocks were fallowed varied amongst the farms we visited however all recognized that fallowing was important. Unlike in Australia where fallowing is necessary for phytophthora, the Brazilians fallow for reasons such as nematodes and viruses.

We did not get a usual fallow period length off of Caliman Bahia but the block they were getting ready to plant while we were there was fallowed for 4 years. Lembrance fallowed for 3 years, Bello 2 years and Gondo fallowed for either 1 or 2 years. We visited a replant block at JTA farms that was not successful. However the tour

members felt this was largely due to nematodes initially and once the plants became sick they were then susceptible to phytophthora.

Blocks were generally rotated with grazing however one farm rotated with watermelons and pumpkins, while another that we visited planted beans and corn in the fallow. The government officials with us said that a large number of farms are leased therefore they are able to rotate blocks regularly.

## **Pests & Diseases**

The majority of pests and diseases that effect papaya producers in Brazil are also a problem here in Australia. Reports of black spot, brown spot, anthracnose, dieback, red spider mites, oriental scale, fruit fly, nematodes and phytophthora were common during our visits to farms in Brazil. The most commonly mentioned problems by producers in Brazil were black spot and brown spot which are controllable and Ring Spot Virus and Da Meleira, neither of which there is a control for.

### **Ring Spot Virus**

Plants infected by ring spot virus become unproductive. The only know method of treatment, other than genetic modification, is cutting the plant out. This is termed “rogueing” in Brazil. Without rogueing, the virus will spread through the entire crop in severe cases. Genetic modification is not an option as Brazil will not allow the production of genetically modified crops.

The researchers at Incaper believe that aphids transmit Ring Spot Virus. Caliman Agricola has planted corn in their paddocks to act as a trap crop. This is technology that they discovered from Australia. The aphids are believed to find the corn more attractive than the papaya and therefore land in the corn. Since the introduction of the corn as a trap crop, the production manager at Caliman Agricola claims that the incidence of Ring Spot Virus has reduced.

Ring Spot Virus was only viewed at one farm visited. Refer to photo 6.

### **Da Meleira**

Da Meleira is responsible for the largest crop losses in Brazil and in 1990 it was responsible for destroying 30,000ha of papaya, which was 2/3 of the production area at the time. Researchers however know very little about this virus. Symptoms have been present in the field for 20 years however the virus was only confirmed 10 years ago. What is known about the disease is that it is transferred by cicadas (Hem:Cicadelidae, Cigarrinha) and the grass *Bracieria Decumbens* (signal grass) is the only other known host. The grass does not display symptoms therefore the virus can only be found in the grass through molecular analysis. There is no evidence to suggest that seed can transfer this virus.

Visible symptoms of Da Meleira only appear after flowering. Symptoms include spots on fruit and leaves and the fruit weeps a clear liquid rather than sappy colour. Refer to photo 7.

There is no chemical control method for Da Meleira. Like Ring Spot Virus the control method is rogueing. If this is preformed correctly crop losses are minimal at 2-3%, if not cut out, crop losses of 100% are possible.

When the virus was initially identified the Brazilian Government undertook a national approach to manage it. This process included the following steps.

- all plantations were recorded by GPS
- all plantations were visited by government officials
- infected plants were cut out
- if rogueing was not carried out correctly the producer could not sell their fruit
- in extreme cases of non-compliance all plants were destroyed

Growers were forced by law to comply with these practices. The government believed that education was an important part of managing this virus therefore there were extensive meetings with farmers and their employees. These days all farms have a person dedicated to monitoring the crops for disease to ensure early detection and rogueing of infected plants.

Incaper does a lot of research with Da Meleira. They successfully inoculated plants in a laboratory and found that from the time of inoculation symptoms are visible within 35 days. Incaper is currently researching to see if there are any varieties resistant to Da Meleira.

### **Phytophthora**

Phytophthora is not usually a problem for producers in Brazil. The soils are sandy allowing good drainage and rainfall is evenly distributed throughout the year. Irrigation is also well managed to ensure plants are not over watered. According to the government officials most of the farms are leased so the paddocks are rotated often.

During one presentation by a government official it was stated that one of the management practices for phytophthora control was to retain mulch, which contradicts Australian research.

Some farms mound for phytophthora however the majority of farms we visited actually mound after desexing and not for phytophthora at all. These farms mound so there is more base below the surface in the event of strong winds. This would increase the amount of moisture around the roots and therefore the incidence of phytophthora if this were a problem.

7m<sup>2</sup> is considered the ideal plant spacing to stop phytophthora spread however this is not often followed as it is not productive enough. Lembrance was the only farm we visited over this however some of the other farms were close to this figure. The smallest spacing we saw was just over 5.5m<sup>2</sup>.

Grafting with phytophthora resistant rootstock was used in Brazil in the past however it was not successful in managing phytophthora without other production practices. Some producers use the chemicals Ridomil and Phosonic Acid for phytophthora management. Brazil is in the process of registering Aliette as well.

### **Chocolate Spot**

Some farms reported having a problem with chocolate spot. This is called “fruit rot” in Australia. The chemical management program that Caliman Bahia provided was a combination of copper for prevention and Score (30ml/100L) and Bravo to manage once present. To apply Score they recommend mixing 5kg sugar for every 2000L mixture in tank. This will act as a wetter. Applying Score early morning before light, is claimed to sicken the disease. Applying Bravo in the afternoon will then kill the disease. This treatment of Score and Bravo is recommended every 3-7 days. The With Holding Period (WHP) for this is 14 days.

### **Black and Brown Spot**

Most farms reported having major black and minor brown spot problems. In Brazil Mancozeb, Sulfur, Copper, Amistar, Bravo and Score are registered for papaya. Producers rotate the use of these chemicals to avoid resistance. Caliman Agricola treated black spot in their organic papaya with copper and the beneficial fungi Trichoderma.

### **Anthracnose**

Score and Copper were reportedly used to treat Anthracnose. Copper was used at one farm weekly when Anthracnose was a problem.

### **Dieback**

Dieback is called “turn head” in Brazil. ADAB believes dieback is passed on by legs the of insects. The treatment for dieback in Brazil is the same as Australia with infected plants being cut out.

### **Red Spider Mite**

The main insect pest that causes a problem to Brazilian papaya producers is red spider mite. Gondo reported using a product similar to Vertimec for control and another farm had an interesting solution of misting cattle urine mixed at a rate of 2L/100L water. Gondo reported that Tainungs were worse affected by red spider mites than the solo varieties.

### **Nematode**

One of the farms we visited appeared to have a severe nematode problem in one of their blocks. The farm manager did not identify the problem as nematodes. The Brazilian government officials stated that nematodes are found in papaya however they are not a common and only a problem if the plant is already stressed.

### **Fruit Flies**

Producers are required to follow certain management practices for fruit flies to allow market access into some countries. There is a program administered on a state-by-state basis called the “Systems Approach”. There is a section in this report outlining this program.

*It is important to note that the information contained in this section is intended to represent practices in Brazil, not to encourage the adoption of these practices. Chemicals registered for the papaya industry in Brazil are not necessarily registered here in Australia.*

### **Spraying systems**

While misters were seen during our the tour, a typical system viewed at most farms consisted of a tractor pulling a trailer-mounted spray tank, with two hand lances at the back, that were operated by staff members. Operators were elevated to the level of the tree canopy and would spray as the tractor drove up the rows.

### **Irrigation**

Of the farms visited there was a mixture of irrigation devices. Most of the farms visited used drip and under tree sprinklers however we also saw central pivot and overhead at one farm. According to the government officials that accompanied our tour travelling irrigators are also used.

All of the farms we visited paid close attention to their irrigation practices and irrigated daily. This is especially important considering their sandy soils. Farms with drip irrigation pulsed and the government officials stated that the industry standard is



to have 2/3 drippers per tree. Caliman Bahia appeared to have the most intense management of their irrigation with 8 pulses of 10 minutes daily. Lembrance pulsed 3 to 5 times daily for 25 minutes each with an output of 6L/hour/plant.

Gondo used under tree sprinklers that they placed in every 2<sup>nd</sup> inter row space. These sprinklers would then water two rows at once. These blocks are watered once a day, for 1 to 3 hours depending on the weather.

We only visited one farm that had overhead irrigation and this was Bello Fruits. Centre pivots and overheads were initially installed as they grew large acreages of pumpkins and watermelons. The owners of this farm have changed to under tree sprinklers in new plantings of papaya and will continue to install under tree in future.

During our visit to JTA Farms we visited their new plant crop of 150 ha. While it is planned to install under tree sprinklers in this block, there is currently no irrigation system in place. Therefore this plant crop was being water daily, by hand, from tankers.

Access to water is not a problem for the producers we visited as there are plentiful supplies from rivers and dams. One of the farms we visited had dammed a gully that acted as a natural watercourse, to pump out of for irrigation water. This is a practice that would not be allowed in Australia. The lack of regulation in Brazil also means that there is no restriction to the amount of water these producers use.

During the tour soil moisture monitoring devices were not seen, however this is not to say that they do not use such devices.

## **Nutrition**

As mentioned previously, these farms are located near the coast and the top of the soil profile is predominately sand. Therefore the soils have low fertility levels. According to the government officials, phosphorus is most lacking from the soils and this is applied through applications of super. They stated that on average 150g of an NPK mix was applied per tree/month, however the analysis was not provided.

A great deal of importance is placed in nutrient management. Some of the farms that we visited employed a full time agronomist to manage the production side of the business. Soil and leaf tests are taken regularly, every 60 days at Lembrance, and the fertilizer program is changed accordingly. At Caliman Bahia the tree age is also taken into consideration for fertilizer applications.

Most of the farms visited use fertigation to apply their nutrients. Caliman Bahia actually apply all of their nutrients through fertigation this includes their calcium and magnesium applications. Caliman fertigates three times per day which is possible due to their previously mentioned regular pulsing. Lembrance also fertigates three times daily.

*An important point to note is that Caliman Bahia believes that soft fruit is due to an imbalance of nutrients.*

Bello was the only farm to broadcast their fertilizer but this was due to the centre pivots and overhead irrigation system. The owners of Bello plan to apply nutrients through fertigation in the future when under tree sprinklers are installed in the new

plantations. The first farm we visited on the tour broadcast their fertilizers by hand. This was the only farm we visited that did this however we did see a neighbouring farm at another of our visits practicing this method.

Some of the farms visited used compost that they either applied pre-plant or place around the seedlings at planting. Caliman Agricola compost their own and it is a mixture of cow manure, chook manure, mulched pasture grass and eucalyptus charcoal.

## **Weed control**

The cheap labour costs mean many producers in Brazil use staff to chip weeds when the plants are at a young age. After this Glyphosate is used to control weeds. Caliman Bahia had legumes planted in the inter row space and grassed inter rows were viewed at some farms. However there were a number of farms visited that had bare inter-row spaces.

## **Harvesting**

Due to the low cost of labour in Brazil one of the most obvious differences between Brazil and Australia is the number of staff. On the day we visited JTA farms, there were over 20 staff members harvesting in one paddock.

### **Method**

Some of the farms visited had staff walking the rows and picking directly into a bucket that they carried, or when the trees were taller, climbing a ladder to pick the fruit that were then placed into a bucket that was carried on another staff member's head. These buckets are then taken back to the trailer when full. This allowed a number of rows to be harvested in one pass of the tractor. Other farms picked directly from the trailer.

### **Picking Trailers**

Some of the farms producing for the domestic market emptied their buckets straight into the trailer without the use of containers. These trailers had high sides and at one farm the picking trailers would hold 2.5 tonnes of fruit when full. These were then taken back to the shed, the sides dropped down, and the fruit was packed directly from the trailer into boxes. There was no washing of fruit on these farms.

Most of the farms we visited had plastic crates on the trailers. The fruit were either placed directly into these when the staff picked off of the trailer, or the full buckets were emptied into these.

The trailers that were used to pick from usually had adjustable platforms on the sides to put the staff at fruit height. One of the farms had rails along the side that staff members could climb and lean against to get higher up the canopy. Hydraulic trailers were not used. Refer to photo 8 for a typical trailer.

## **Packing**

### **Domestic**

Fruit for the domestic market is managed very differently to fruit for the export market. The domestic market does not require producers to have quality assurance

and from what we saw it did not appear workplace health and safety was required or at least not to a level anywhere near what is necessary here in Australia.

At the sheds that only supply to the domestic market, the fruit is packed directly from the picking trailer without being washed. Refer to photo 9. Sheds that supply the export market as well as the domestic market still put domestic fruit along the grading machine therefore it is washed and treated with fungicide prior to packing. The stems are also left on the fruit as this reduces the incidence of stem end rots.

The fruit are wrapped in either newspaper or butchers paper and packed into either wooden boxes or occasionally cardboard boxes. Lids are not used. There is some use of socks on the domestic market as we saw this at Ceagesp (Sao Paulo Markets).

The sheds that these papaya are packed from commonly have dirt floors. There are exceptions such as the sheds that also pack for the export market, which are of a very high standard in terms of both hygiene and mechanization.

Wooden boxes for the domestic market generally held 8kg of solos.

### **Export**

Producers supplying the export market must comply with Europ Gap, the Systems Approach and other QA systems. Therefore these sheds are of a very high standard in terms of both hygiene and mechanisation. Although these sheds were highly mechanized there were still a number of occasions where staff members were performing tasks that Australian producers would make more efficient to save on staff costs.

Staff are required to wear hair nets and coats, jewellery must be removed and shoes are cleaned in a footbath prior to entering the shed.

Although the systems vary slightly from farm to farm below is a general guide to the process.

- Fruit are brought to the shed in plastic crates
- The fruit is emptied into a trough that contains chlorine and often a detergent
- The fruit are automatically graded according to weight and are placed in plastic crates
- The fruit are treated with hot and cold dips
- The fruit are treated with a fungicide dip
- The fruit are either taken to be pre-cooled before packing or packed immediately. From this point on all fruit remain in cool rooms which are sealed from fruit fly
- Pre-cooling rooms are set between 8- 14°C and all packing is carried out in rooms cooled to 14-16°C
- After packing pallets are kept in a cold room from which they are loaded directly into a container which has the same temperature as the cold room

### ***Picking crates***

These crates are standard plastic crates that are lined with foam to minimize damage to the fruit. The fruit may be picked into a bucket or similar however transferred to these containers on the picking trailer.

### ***Chlorine dip***

The rates used varied from shed to shed and ranged from 3ppm to 100ppm. All fruit is emptied from the crate directly into this dip. The crate liner is also emptied into the

dip so it is sterilized and then removed. Caliman Agricola was the only packing shed viewed that also put the crates through a chlorine wash.

### ***Sizing machines***

All of the export sheds we visited had grading machines that graded the fruit by weight. Bello fruit was in the process of having a grading machine installed as their shed was relatively new. These machines speed up the process and are more accurate than eye. Refer to photo 10.

The fruit are tipped into the chlorine at the beginning of this machine, they then move along by conveyor through a wash (Agrapex had tools similar to spinning mop heads that the fruit would pass by) and finally onto the grading portion of the machine. Some farms required staff to place pieces of fruit into the cups, which are what the fruit are graded from. This was one practice that would be mechanized in Australia however due to the low staff costs they are able to have staff do this.

### ***Hot and Cold dips***

The hot and cold dips are used to treat fruit fly eggs and also for fungus (anthracnose and chocolate spot). Most of the sheds had individual dips in the floor of the shed for hot, cold and the fungicide. This required the crates to be slid into a frame that allowed 16 crates to be treated at once. These frames were moved by crane into and out of the dips. Refer to photo 11. Caliman Agricola was the most advanced shed that we viewed. It was the only shed that had the hot and cold dips as part of their conveyor system. Refer to photo 12. This took place before the fruit was graded at this shed. This method was a lot less labour intensive and meant that they did not require a staff member to operate a crane all day. The temperatures varied slightly between farms however the length of treatment did not. Treatments are as follows:

Hot temperature 47.5-49 °C for 20 minutes

Cold temperature 10-12 °C for 20 minutes

### ***Fungicide dip***

This takes place after hot/cold treatment. Fungicide used and length of time varies between farms. Eg Bello used tap temperature water with Sportak 75mL/100L for 2 minutes, Agrapex used Thiabendazole for a shorter period of 30-40 seconds.

### ***Wax***

Most of the sheds also applied a wax to the fruit. One shed that did not dry the fruit after waxing reported that there was some damage to fruit as a result therefore it appeared necessary to dry fruit after waxing. In addition to the appearance, the wax helps improve the shelf life by reducing the respiration rate, which in turn inhibits the production of ethylene thereby delaying ripening. Wax was applied at different stages of the process at all sheds.

### ***Pre-cooling***

All fruit is taken into the cold room, still in the large plastic crates after being washed and dipped. The fruit is either pre cooled before it is packed or packed immediately. Bello pre cools to a temperature of 14 °C, while the lowest pre-cooling temperature we saw was at Lembrance where they bring it back quickly with a temperature of 8 °C. The temperature in the packing area ranges from 14-16 °C.

### ***Packaging***

All of the fruit is packed on an angle so that the fruit leans over in the box. This gives a tighter pack. The boxes are packed by weight not by count as is done in Australia. Golden and Sunrise were most often packed in a 3.5kg carton, however Caliman Agricola also packed a 2.3kg carton. Formosa varieties are packed in larger cartons, Caliman Agricola packed them in an 8.5kg carton. At Bello the 3.5kg cartons were stacked on pallets 18 cartons high and 12 cartons per layer. This gives a count of 216 cartons per pallet.

The large majority of fruit we saw were wrapped in paper before being placed in the box. The only exception to this was at Caliman Agricola where we also saw plastic inserts used inside some of the boxes. These inserts had grooves that the pieces of fruit sat in. We did not see socks at any of the sheds we visited however we did see some on domestic fruit at the markets therefore it is possible that some export fruit may be placed in socks. Refer to photo 13 & 14.

Stickers were placed on the fruit by hand. Most of the sheds we visited stickered all fruit however Agrapex only stickered 3 fruit per carton, regardless of the carton count.

All of the boxes were marked to record the ripeness of the fruit in the box and the number of fruit in the box (count). At Bello fruit the packer number was also put on the box to allow easy identification of the packer should there be a problem with the carton. The cartons used were all cardboard cartons, without lids. The base was very sturdy and there were coverings on the corners at the top of the box to allow the next box to be stacked on top.

### ***Cold room***

Full pallets are then moved into a final cold room, where they are stored for transport. The pallets are loaded directly from this last cold room into the container that is transported by road to the port.

## **Logistics**

Export fruit is transported in containers. This means that from the farm the container is not opened until after it reaches its destination port. These containers are temperature controlled (8-10 °C) and atmosphere controlled to provide the longest shelf life possible. Brazil is not located within close proximity to either of its export markets of the US and Europe. Fruit shipped to Europe takes 21 days from picking to arrival at the destination port.

The fruit is transported from the farm to the port by road. The two main ports from which boats are loaded are Salvador and Sao Paulo. Most export products are shipped however there is a small amount air freighted. 90% of Lembrance's fruit is shipped and the remaining 10% is by air. Caliman Agricola airfreights all fruit to the US. Bello claims that organic papaya must be airfreighted as it has a shorter shelf life.

According to Caliman Agricola, prior to September 11, most of their papaya was back-freighted on planes and export flourished. Since then costs have increased and there is less opportunity to get papaya on flights, so shipping is becoming more common. Caliman have established a new farm in the North East of Brazil, as this location has better access to the shipping channels for export.

## **Shelf life**

The shelf life of export fruit is important, to ensure that it arrives in good condition. The businesses supplying the export market take samples of their fruit so that they can monitor shelf life all year round. Lembrance takes 3 samples throughout the packing process including one at the final destination. This allows them to compare the fruit from different stages and identify where problems may be occurring within their process.

To increase the shelf life, fruit are treated with hot and cold-water dips, fungicide and wax. Through comparisons with treated fruit and untreated fruit, Agrapex have found that when stored at the correct temperature of 8-10 °C, treated fruit has 20 days more shelf life than untreated. This reduces to 10 days when kept at room temperature in the shelf life room.

## **Export Markets**

Fifteen years ago there were only two companies in Brazil exporting papaya and ten years ago there were only four companies. Now there are many companies exporting papaya. The export market provides a more stable return than the domestic market that is prone to large fluctuations.

Brazil exports papaya to the US and Europe. Brazil has a good relationship with their European partners and supply 75% of the European market. They have very little competition from other countries for this market (*pers. Comm.* Franciso Faleiro Caliman Agricola). Europe is more demanding of quality than the US.

Brazil's main competitors are Ecuador, Belize (Central America) and Mexico. Belize is said to have good quality and Mexico is said to be cheap but poorer quality. Mexico has a trade agreement with the US so they are not required to have as high quality as some other countries such as Brazil. One of the producers we spoke with had visited other papaya producing countries including Hawaii, however he believed that Brazil produced a better product due to their handling practices and hygiene.

The US takes papaya all year round while Europe demand papaya mainly in the summer months. Europe's summer corresponds with Brazil's winter therefore production is lower at this peak demand time. This makes the use of contracts or futures to Europe risky as it is difficult to guarantee supply. The only way to get a fixed sale price with export product is by airfreight. It is not possible when shipping as some payment is delayed until after sale. Therefore the producer receives one payment when the product leaves their shore and the remainder after the product has been sold.

## **Ceagesp (Central Market)**

Ceagesp is the name of the organization that owns and manages the Sao Paulo central markets. The Sao Paulo markets are responsible for the sale of 12,000 tonnes of fruit and vegetables daily. There are 1,400 products from 17 countries throughout the world. The markets cover an area of 70 ha, of which 22ha is under roof. Each day 30,000 to 40,000 people pass through these markets. There are 13 other Ceagesp markets in the state of Sao Paulo.

There are approximately 40 agents selling papaya at these markets. In terms of sales, this Ceagesp market in Sao Paulo city is responsible for selling 137,000 tonnes of papaya annually. This is equivalent to 8% of Brazil's production. This figure does not include direct sales to supermarkets, therefore this is not the total of papaya sales in the city of Sao Paulo.

In terms of volume, papaya is the 2<sup>nd</sup> largest selling fruit after oranges (fresh juice). By value, papaya is the 4<sup>th</sup> most valuable fruit. The lists below outline the other know fruits in these two categories.

#### By volume

1. Oranges (fresh juice)
2. Papaya
3. Tangerine
4. Watermelon
5. Mango
6. Apple
7. Banana
8. Limes
9. Pear
10. Pineapple

#### By value

1. Pear
2. Apple
3. Orange
4. Papaya
5. ?
6. ?
7. Banana

## Employment

In the Bahia state alone, the papaya industry employs 25,000 people and is worth A\$15,000,000 to the local economy. Most of the staff at the farms we visited were transported by bus to the farm daily. Staff quarters were also common on the farms with some of choosing to live on farm. The facilities for staff at the farms that supply to the export market were of a high standard. At the farms that only supplied papaya to the domestic market, facilities were very basic. Often these were dirt floor sheds, without running water or power, with no designated lunch area.

One of the farms we visited stated that labour is a problem in Brazil. The culture of the people is to not stay in one place so that they do not feel “owned” by the employer. For this reason staff are generally not long term and usually stay for a period of 3 months. Caliman Agricola commented that labour was a problem for them on their new farm in the North East as people are not familiar with papaya and therefore not skilled in its production.

However there are always people looking for work as there is limited welfare in Brazil. The unemployed only receive 3 months of benefits out of every 12 months. If an employee is fired they will receive a further 3, 4 or 5 months of pay depending on the length of employment. It was not clear as to whether this is paid by the employer however one would assume that this is the case.

Employees receive what is referred to as a 13<sup>th</sup> salary. This means that in the month of December employees are paid twice. There is a system similar to our super and from what we could ascertain during the tour both the employee and employer have to contribute to this. One of the places we visited also pays their staff holiday loading at a rate of 1.5. It was not discussed whether this is a common practice or unique to their business.

## Systems Approach

The Systems Approach is a program adopted by the Brazilian papaya industry to ensure that papaya are free of fruit fly for both the domestic and export markets. It is Brazil’s own assurance system that incorporates interstate certifications (ICA) with export requirements. This system was crucial in allowing market access to the US. Prior to 1998 the US did not accept papaya from Brazil due to fruit fly. The two fruit flies are *ceratitis capitata* and *anastrepha fraterculus*.

The states work together for aspects of the Systems Approach however certification is given at a state level. This program was originally started in the state of Espirito

Santo. This approach was adopted due to the differences in climate and soil types between the regions.

To comply with the program, producers must:  
Survey for fruit fly at both production (traps) and harvest (visual) stages  
Ensure that there is no ripe fruit in the paddock  
Pick at first yellow break on skin  
Guarantee “zero” fruit fly in produce

In practical terms this means export fruit must be treated with hot and cold water and storage and packing areas must be completely sealed to prevent fruit fly entering.

It is also important that producers control other diseases such as Da Meleira as it makes the plant more susceptible to fruit fly attacks.

To ensure that producers are complying with the Systems Approach, Brazil has technical officers that visit the farms to look at their practices. Occasionally the US will also send a technical officer to view practices.

## **Integrated Production**

The other program currently being adopted by the Brazilian papaya industry is “Integrated Production”. This is a nationally certified system encouraging improved quality and environmental practices. Fruit produced under this program are labelled accordingly. This program aims to provide and promote:

- Guaranteed quality
- Minimize environmental impacts
- Rational use of chemicals
- Staff training &
- Traceability

The Integrated Production program is not a compulsory program however the Brazilian government encourages producers to adopt these practices.

In response to one of our questions about the lack or apparent lack of regulation, it was commented that it would not be possible for the Brazilian government to force compliance of a number of new regulations on growers all at once. Rather the government is taking a slower approach in an attempt to get more involvement and subsequently better results.

## **Chemical Registration**

Discussions with David Martins, Entomologist with government department Incaper, gave us an understanding of the procedures involved with getting chemicals registered in Brazil.

All chemicals must have trial data to develop residue data (MRL) and efficacy data, which Brazil calls agronomic data. Most of this data is collected from trial work carried out in Brazil however it appeared that overseas data could be used. Because the papaya industry is such a large industry in Brazil chemical companies contribute financially to these trials.



Three residue tests are required from three different labs (i.e. three tests total), to support all chemical registration applications. All chemical registrations have to pass three Ministers, the Minister for Health, the Minister for Agriculture and the Minister for Environment.

The Minister for Health is also responsible for taking random tests from supermarkets and shops off of the domestic market. These results are passed onto the producer. There is reportedly only a small amount of testing.

## **Industry Structure**

Unlike Australia, there are no producer organizations for the papaya industry in Brazil. During the tour, positive feedback was frequently received about the establishment of Papaya Australia.

There is no form of levy collection to fund research and development or promotions. All research is funded by the government, which means that they also decide what is researched. The lack of grower organizations means that there is no formal process through which producers have input. However most research is carried out on farm so there are already good linkages in place between producers and government.

Brazilian papayas are only promoted on the export market, there is no domestic promotions.

## **Chemical Collection**

Brazil has a system similar to Drum Muster that began in 2003. When a producer purchases a chemical, ADAB is notified and this allows a crosscheck to see if producers are returning equal quantities to what they are purchasing. It is compulsory for producers to comply with this system. Farmers have to triple rinse containers and take them to a collection centre, where they are bundled into 60kg units, ready for recycling.

Officials reported only small losses from the program. When producers are found to not be complying they are initially notified, if they repeat the offence they are then fined. As part of this program producers are provided with a guide from an agronomist as to what chemicals and how much of these chemicals they can use.

The chemical companies are responsible for the cost of recycling and the Brazilian government provides the infra structure at the chemical collection centres. Any profits from the recycling are split between the retail businesses selling the chemicals.

## **IMPLICATIONS FOR AUSTRALIAN HORTICULTURE**

After visiting the producers in Brazil it is clear that there is little Australian producers could learn from the domestic producers. These producers have poor handling practices, no Workplace Health and Safety, limited regulation and at times primitive practices. However they are able to still provide a product that domestic consumers are satisfied with.

The export producers on the other hand are very advanced in terms of productivity, mechanisation, quality assurance and workplace health and safety. Although the

Brazilian government does not force much regulation on producers at present, their consumers do require particularly high standards.

Packing and presentation is one area that is particularly impressive. This includes the packaging products used and the way the fruit is laid in the carton. Currently the Australian industry uses larger boxes than the Brazilians. This is primarily due to the size of the yellow varieties that are produced in Australia. However the smaller solos do present well in the 3.5kg cartons used by Brazilian producers.

The grading systems greatly increase the speed of sorting and are more accurate than the eye. Sorting for defect fruit would still be required however this could be done before fruit is graded by weight. This type of system is only effective for the solo varieties and would not work with the yellow varieties that Australia produces.

This leads to the next point; varieties. This was one of the main areas that producers were interested in. It is a major problem in the Australian industry that there is not a single variety that meets consumer and producer requirements. Consumer research shows that the solo varieties are more popular in terms of flavour. However these varieties often have more skin blemishes, which consumers do not find appealing and lower yields, that producers do not find appealing, than the yellow varieties.

The current promotion campaign by the Australian papaya industry is trying to educate consumers that while the skin may have blemishes the fruit inside is not affected. Current consumption rates in Australia are less than 1kg per person annually. This is in stark contrast to Brazil where the annual consumption rate of papaya is over 8kg per person.

In order for the Australian papaya industry to expand its current domestic market greater consumer acceptance is required. There will always be a market for yellow varieties as taste and preference vary between consumers, however greater production of solo varieties will allow market growth domestically.

The export producers visited during the tour paid very close attention to all aspects of production. They usually had an agronomist on staff and plants were checked regularly. This ensured diseases were identified before they became a problem. Soil and leaf tests were taken regularly and fertiliser programs adapted accordingly. Fertiliser was also applied in small amounts frequently. This is a practice that should be adopted by producers in Australia, especially in Far North Queensland where high rainfall occurs. Soil moisture was also maintained at optimum levels which ensured plants were never water stressed.

## **TECHNOLOGY TRANSFER**

- An article was written on return from the tour to provide information on the purpose of the tour and contact details for those wanting more information. This was printed in Growcom's Fruit and Vegetable News and also released as a Media Release.
- An information night was held at the South Johnstone DPI on 8 June. This was open to all producers, industry members and interested parties. The evening included a presentation and the opportunity for participants to share information. Seven of the eight participants were able to attend this event.

- The first of three videos was played at the Innisfail Papaw and Papaya Growers Association meeting on 11 May.

#### Future activities

- A CD containing a report and photos will be mailed to every papaya producer in Australia with the industry publication Papaya Post
- The June 2005 edition of the Papaya Post will feature information
- The second and third videos will be played at future IP&PGA meetings
- Tour participants will also continue to share their experiences

# ITINERARY



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## **PAPAYA TOUR TO BRAZIL**

**Revised on 22<sup>ND</sup> of April/2005**

- DAY 01** - **FRI – 22/APR - Arrival in RIO DE JANEIRO – BRAZIL**  
22:15 - Arrival of flight RG8715 at International Airport of Rio de Janeiro , Immigration, Customs and transfer to Hotel in Ipanema Beach.  
Ipanema Plaza Hotel  
Rua Farma de Amoedo, 34  
Tel: 55 21 3687 2000 / Fax: 55 21 3687 2001  
Meals: None
- DAY 02** - **SAT – 23/APR - RIO DE JANEIRO**  
Breakfast at hotel.  
09:00 Departure from hotel for a city tour featuring the statue of Christ the Redeemer, a cable car ride to the summit of Sugar Loaf and a tour of the beach front suburbs of Copacabana and Ipanema, home of the wealthiest citizens and the city's most stylish shops. The suburbs are in sharp contrast to the shanty towns which clothe the higher slopes of the mountains behind. Lunch during city tour.  
20:00 In the evening, transfer from hotel for a Samba Carnival Dinner Show.  
Ipanema Plaza Hotel  
Rua Farma de Amoedo, 34  
Tel: 55 21 3687 2000 / Fax: 55 21 3687 2001  
Meals: Breakfast, Lunch and Dinner
- DAY 03** - **SUN – 24/APR - RIO DE JANEIRO / PORTO SEGURO (BAHIA STATE)**  
Breakfast at hotel.  
06:30 Early transfer to the International Airport of Rio de Janeiro.  
08:00 Flight RG2361 to Porto Seguro, Bahia State.  
09:25 Arrival in Porto Seguro, reception and transfer to hotel.  
Afternoon city tour to see the main tourist points. The state of Bahia is one of the most papaya producing in the world due its good weather conditions and climate, altitude of 200 meters above the sea level and abundant pluvial resources and irrigation. The papaya producing area is located in the south. These are is composed by 21 towns which produces 80% of papaya in the state and the coping area is about 13,000ha. Details:  
- Production: 1,560 Ton/day. Predominance: Sunrise soil. - Exportation: Golden soil and Tainung1.  
70% of papaya production in Brazil is concentrated in the states of Bahia and Espírito Santo. Nowadays, Brazil is the biggest papaya producer in the world and the 3<sup>rd</sup> biggest exporter (the exportations in 2003 was more than US\$ 29 million).  
Porto Calem Hotel



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IATA 07-5-0123-1

55 - AGRIBUSINESS

Av: Beira Mar, 1999  
Tel/Fax: 55 73 3288 2430  
Meals: Breakfast / flight service meals

**DAY 04 - MON – 25/APR - PORTO SEGURO / TEIXEIRA DE FREITAS**

07:30 Breakfast at hotel.  
08:00 Departure to Eunapolis.  
09:30 Meeting with members of Research and Technical Assistance of the following Institutions:  
- EBDA – Bahia’s Agricultural Development Company – Mr Jose Altino Machado Filho – Research Manager  
- ADAB – Bahia State Farming and Cattle Raising Defense Agency – Mr Paulo de Oliveira Andrade – Technical Co-ordinator  
- EMBRAPA CNPMF – Brazilian Farming and Cattle Raising Research Company (manioc and fruit) – Mrs Arlene Gomes – Researcher  
SEBRAE – Mr Paulo Barreto – Teixeira Freitas Regional Manager  
10:30 Visit to a papaya farm.  
12:00 Lunch in Eunapolis.  
13:00 Departure to LEMBRANCE FARM.  
14:30 Field visit and Packing operations at LEMBRANCE.  
17:00 Departure to Itamaraju  
19:00 Arrival in Teixeira Freitas.

Águia Hotel  
Tel/Fax: 55 73 3292 9310  
Meals: Breakfast and Lunch

**DAY 05 - TUE – 26/APR - TEIXEIRA DE FREITAS**

Breakfast at hotel.  
07:30 Departure to Prado.  
09:00 Visit to JTA FARM (the biggest domestic market crop with about 750 hectares for Sunrise Soil papaya production)  
13:00 Lunch in Prado.  
13:00 Departure to CALIMAN FARM (Formosa Papaya exporter) where you will be accompanied by the Papaya Integrated Production Co-ordinator, Mr Jailson Lopes Cruz from EMBRAP who will do a speech about their PIP’s methodology program and areas of work.  
17:00 Return to Teixeira de Freitas.

Águia Hotel  
Tel/Fax: 55 73 3292 9310  
Meals: Breakfast and Lunch



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**DAY 06 - WED – 27/APR – TEIXEIRA DE FREITAS / LINHARES**

- Breakfast at hotel.
- 08:00 Visit to the center where empty chemicals packs are received (Campo Limpo Project)
- 09:00 Departure to Itabatã.
- 10:00 Visit to GONDO FARM (BS, Sunrise Soil, Golden and Formosa papaya grower) This farm also grows passion fruit, vegetables and raises cattle.
- 12:00 Lunch in Itabatã
- 13:00 Visit the packing operations at BELLO FRUIT (Sunrise Soil, Golden exporter)
- 15:00 Visit to BELLO FRUIT's producing area.
- 17:30 Departure to Linhares in Espirito Santo State.
- Los Pagos Hotel  
Rod BR 101 Km 144  
Tel/Fax: 55 27 3373 2928  
Meals: Breakfast and Lunch

**DAY 07 - THU –28/APR - LINHARES**

- Breakfast at hotel.
- 08:00 Visit INCAPER – Rural Papaya Research Station. Interview with the Director Mr David Martins.
- 11:30 Lunch.
- 13:00 Visit to CALIMAN AGRICOLA which is the most traditional and the biggest papaya exporter in Brazil (35% of papaya exportation). There is a modern packing house and a high productive standard cropping area. The company has gotten many quality certificates allowing the world wide exportations.
- 18:00 Arrival at hotel. Free evening.
- Los Pagos Hotel  
Rod BR 101 Km 144  
Tel/Fax: 55 27 3373 2928  
Meals: Breakfast and Lunch

**DAY 08 - FRI – 29/APR - LINHARES / VITORIA / SÃO PAULO**

- 07:30 Breakfast at hotel.
- 08:00 Visit to AGRAPEX Packing House – This company exports papaya to several countries in the world. It is a company owned by the Former President of BRASPEX – Brazilian Papaya Exporters. Interview with the owner.



Rua Eliseu Guilherme, 1086  
Fone-Fax 55 (16) 3931-2999  
14025 020 - Ribeirão Preto - SP - BRASIL  
diniscor@diniscor.com.br  
www.diniscor.com.br  
IATA:57-5-0123-1

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11:00 Departure to Vitoria (200km – 3 ½ hours), the capital city of Espirito Santo State.  
19:10 Flight RG 3315 to São Paulo (Domestic Airport of Congonhas).  
20:38 Arrival, reception and Transfer to hotel.

Transamerica Flat Congonhas  
R: Vieira de Moraes, 1690 – Campo Belo  
Tel: 55 11 5094 3377 / Fax: 55 11 5049 0785  
Meals: Breakfast and Lunch

**DAY 09 - SAT – 30/APR/ - SÃO PAULO / SANTIAGO / AUSTRALIA**

07:30 Breakfast at hotel.  
08:30 Departure from hotel.  
09:00 Visit to CEAGESP the biggest center of vegetables, fruits and, where products (average: 10,000 tons/day) are received and sold by producers directly to final consumers.  
11:00 City tour to the main tourist points of São Paulo city such as Ibirapuera Park, Paulista Avenue, the Cathedral, etc.  
14:00 Transfer to the International Airport to connect your LA/QF flight homewards.  
16:30 Flight LA 751 to Santiago in Chile. End of our services.  
Meals: Breakfast

## **RECOMMENDATIONS**

Consumer acceptance of the varieties produced in Brazil and consumer feedback in Australia indicates that the red fleshed varieties are most popular with consumers. This is not to say that there isn't a market for all varieties, rather there is potential for greater market expansion with these red varieties. The tour participants each purchased Caliman 01 seed. This will provide the Australian industry with the opportunity to evaluate this variety.

In terms of managing pests and diseases, while chemicals are not the only option they greatly assist producers. The papaya industry in Australia struggles to register chemicals, as they are only a small industry. Therefore chemical companies do not provide financial support and the industry has to fund all research to generate data themselves. The opportunity cost of this is not investing in the further development of the industry or being able to explore opportunities that may exist.

This study tour provided participants with an opportunity to view and experience something that they would normally never have the chance to do. This strengthened the relationship between participating growers, some of who had never met one another before. After participating in this tour it is definitely an activity that the industry should continue to support in the future.



## **ACKNOWLEDGEMENTS**

Thank you to all tour participants for your enthusiasm, support and friendships. You made it a very informative and enjoyable tour. Thank you to our guides in Brazil, the technical officers who accompanied us, and AgTour Australia for organizing the tour. Also the information collected during this tour would not have been possible had it not been for the openness and honesty displayed by the businesses visited. Finally the support that Horticulture Australia provided was greatly appreciated by all tour participants.

## **CONTACT LIST**

The following is a list of government agencies who either provided presentations to the tour participants or joined participants on visits.

ADAB – Bahia State Farming and Cattle Raising Defense Agency  
EBDA – Bahia’s Agricultural Development Company  
EMBRAPA CNPMF – Brazilian Farming and Cattle Raising Research Company  
SEBRAE – promotes better business activity  
INCAPER – Rural Papaya Research Station

There are two key contacts established who can speak English  
Jose Aires Ventura of Incaper, email: [ventura@incaper.es.gov.br](mailto:ventura@incaper.es.gov.br) &  
Dr Jose Altino of EBDA, email: [altino@unb.br](mailto:altino@unb.br)

## **BIBLIOGRAPHY**

(*pers.comm.*, Jose Altino Machado Filho, ADAB)  
(*pers.comm.*, Francisco Faleiro, Caliman)  
(*pers. Comm.*, Geraldo, Caliman Agricola)

## **APPENDIX**

### **Photo Gallery**

# PHOTO GALLERY

**Diagram 1 – Map of Brazil (Microsoft Map)**



The area on the eastern coast between the two red arrows is where the tour travelled by bus. The top arrow represents Porto Seguro and the bottom arrow represents Vitória.

**Photo 1**



Sunrise Solo on left and Golden Solo on right. Both fruit are at similar stages of ripeness. Also note the sand soil.

**Photo 2**



Caliman 01 variety

**Photo 3**



3.5kg cardboard carton for the export market

**Photo 4**



Wooden boxes for domestic market hold about 8kg of fruit.

**Photo 5**



The nursery at Lembrance. There are 8 of these racks.

**Photo 6**



Circles on fruit are obvious symptoms caused by Ring Spot Virus.

**Photo 7**

**Photo 8**



Picking height is adjustable by moving platform up and down frame.

**Photo 9**



Packing fruit straight off of the picking trailer at one farm.

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DOENÇAS

**VÍRUS DA MELEIRA DO MAMOEIRO *Papaya Meleira Virus - PMV***

Figura 19 - Sintoma de meleira em frutos

Figura 20 - Fruto à esquerda com meleira

Figura 21 - Meleira no ápice foliar

Symptoms of Da Meleira as illustrated in the ADAB Disease Identification of Papaya booklet.

**Photo 10**



Fruit are automatically graded by weight at Lembrance.

**Photo 11**



Fruit being lowered into the hot dip at Bello Fruit.

**Photo 12**



The hot and cold dips are included as part of the conveyor system at Caliman Agricola.

**Photo 13**



Export fruit are usually wrapped in tissue paper and placed on an angle in the box.

**Photo 14**



Caliman Agricola were using plastic inserts in their cartons, that the fruit simply sat in.