DEVELOPMENT AND IMPLEMENTATION OF GAP ON PITAYA IN VIETNAM: STATUS AND CHALLENGES

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ABSTRACT

In Vietnam, dragon fruit or pitaya is widely grown in seven ecological zones of the country. The total area of pitaya in the year 2014 was 36,686 ha, a 2.3-fold from 2010. There are about 26,890 ha bearing fruit with a total production of 602,680 tonnes. There are three main production areas for pitaya in the Provinces of Binhthuan of about 24,191 ha with 430,120 tonnes, Tiengiang of 4,052 ha with 75,109 tonnes and Longan of 5,568 ha with 78,500 tonnes. The average yield is about 22.4 to 25 t/ha and flowering can be manipulated for the plants to produce fruit the whole year round. Vietnamese dragon fruit has been exported to over 40 countries and territories in the world. By the year 2014, 8,284 ha had been certified for GlobalGAP/VietGAP, occupying 24.5% of the total production area, making good contribution to the exportation in terms of quantity, quality uniformity an enhanced GAP benefits awareness by producers, exporters and customers. The Australian projects and New Zealand experts have successful helped to put the first important foundation on the development of GAP in pitaya and fruit tree industry of Vietnam. All the GlobalGAP standards have been successfully transferred through development of manuals, capacity building for both SOFRI and project partners and has expanded to many agricultural players in Vietnam. Event though there are many challenges ahead, the GAP initiative will continue to spread to the rest of the Pitaya industry and many other fruit crops.

Keywords: GlobalGAP, VietGAP, SOFRI, PFR, dragon fruit, pitaya, manual, capacity building, challenge

INTRODUCTION

Dragon fruit or pitaya (Hydrocereus undatus) is considered to be one of the most important fruit crop in terms of income for producers, packers, exporters in the Provinces of Binh Thuan, Tien Giang and Long An in Vietnam. The total area of pitaya in Vietnam increases annually: in the year 2000 total area was 5,512 ha, in 2005 it was 8,607, 2010 was 16,302 ha and in the year 2014 it was 36,686 ha. The total production in 2005 was 134,465 tonnes, in 2010 it was 361,780 ton and in the year 2014 it was about 602,680 tonnes. In Vietnam, pitaya is produced mostly for export, 80-86% compared to domestic consumption of only about 15-20%. Vietnamese pitaya has been exported to over 40 countries and territories in the world. The main markets are China, Thailand, Indonesia, Malaysia, Singapore and then the Netherlands, Spain, Germany, UK, Canada, USA, etc. Under tropical conditions, fruit can be harvested from April to September during the main season, while flower initiation can force fruiting to be harvested from October to March. There are two main varieties are cultivated such as white flesh and red flesh with red peel. Since 2005, the Good Agricultural Practice
has been applied to the pitaya industry with the first EUREPGAP certification awarded to the Vietnamese fruit industry for pitaya at the HamMinh cooperative, BinhThuan Province, with 11 ha in 2006. Subsequently, many farms, groups of growers, cooperatives, clusters of farmers have been certified for GlobalGAP and VietGAP standards. By the year 2014, 8,284 ha had been certified for GlobalGAP/VietGAP, occupying 24.5% the total production area. In this paper, the development and implementation of GAP on pitaya in Vietnam will be presented and discussed.

**PITAYA PRODUCTION IN VIETNAM**

In Vietnam, pitaya is widely grown in seven ecological zones of the country. In the year 2000 the total area in production was 5,512 ha; in 2005 it was 8,607 ha (1.6-fold increase from 2010); in 2010 it was 16,302 ha; and in the year 2014 it was 36,686 ha (2.3-fold increase from 2010) with about 26,890 ha bearing fruit. The total production had increased from 134,465 tonnes in 2005 to 361,780 tonnes in 2010 (2.69-fold increase) and again increased to 602,680 tonnes for the year 2014 (1.7-fold increase from 2010). There are three main areas for pitaya such as Binhthuan (Hamthuanbac, Hamthuannam, Bacbinh, Hamtan, Tuypnhong districts, Lagi town and Phanthiet city) with about 24,191 ha and a production of 430,120 tonnes, Tiengiang (Chogao, Gocongtay, Tanphuoc) of 4,052 ha with 75,109 tonnes and Longan (Chauthanh, Tantru) of 5,568 ha with 78,500 tonnes. In addition, in the South, in many other provinces e.g. Vinhlong, Travin, Cantho, Angiang, Camau, Dongnal, Taynh, Baria-Vungtau, etc. and in the North, Vinhphuc, Quangnhinh, Haiduong, Hanoi, Thanhhoa, Nghean, etc provinces, pitaya have also been planted but with smaller areas. (Table 1).

**Table 1. Area, yield and production of dragon fruit in major production zones**

<table>
<thead>
<tr>
<th>No</th>
<th>Items</th>
<th>Unit</th>
<th>2005</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>Ha</td>
<td>8,607</td>
<td>16,207</td>
<td>22,021</td>
<td>23,586</td>
<td>26,528</td>
<td>33,811</td>
</tr>
<tr>
<td></td>
<td>Harvesting</td>
<td>Ha</td>
<td>7,498</td>
<td>13,444</td>
<td>18,228</td>
<td>19,326</td>
<td>22,233</td>
<td>25,095</td>
</tr>
<tr>
<td></td>
<td>Yield</td>
<td>Ton/ha</td>
<td>17.9</td>
<td>26.6</td>
<td>25.4</td>
<td>24.7</td>
<td>23.4</td>
<td>23.3</td>
</tr>
<tr>
<td></td>
<td>Production</td>
<td>Ton</td>
<td>134,465</td>
<td>357,480</td>
<td>463,040</td>
<td>477,784</td>
<td>519,245</td>
<td>583,729</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1. Binhthuan</td>
<td>Total</td>
<td>Ha</td>
<td>5,799</td>
<td>13,404</td>
<td>18,616</td>
<td>19,419</td>
<td>20,551</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Harvesting</td>
<td>Ha</td>
<td>4,880</td>
<td>10,825</td>
<td>15,287</td>
<td>15,807</td>
<td>18,184</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Yield</td>
<td>Ton/ha</td>
<td>19.8</td>
<td>27.6</td>
<td>26.0</td>
<td>24.8</td>
<td>22.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Production</td>
<td>Ton</td>
<td>96,806</td>
<td>299,302</td>
<td>397,584</td>
<td>392,373</td>
<td>400,800</td>
</tr>
<tr>
<td></td>
<td>2. Longan</td>
<td>Total</td>
<td>Ha</td>
<td>1,155</td>
<td>918</td>
<td>1,247</td>
<td>1,718</td>
<td>2,838</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Harvesting</td>
<td>Ha</td>
<td>1,152</td>
<td>809</td>
<td>972</td>
<td>1,387</td>
<td>1,685</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Yield</td>
<td>Ton/ha</td>
<td>13.0</td>
<td>31.4</td>
<td>31.0</td>
<td>30.5</td>
<td>36.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Production</td>
<td>Ton</td>
<td>15,004</td>
<td>225,380</td>
<td>30,154</td>
<td>42,303</td>
<td>61,622</td>
</tr>
<tr>
<td></td>
<td>3. Tiengiang</td>
<td>Total</td>
<td>Ha</td>
<td>1,653</td>
<td>1,885</td>
<td>2,158</td>
<td>2,449</td>
<td>3,139</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Harvesting</td>
<td>Ha</td>
<td>1,466</td>
<td>1,810</td>
<td>1,969</td>
<td>2,132</td>
<td>2,364</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Yield</td>
<td>Ton/ha</td>
<td>15.5</td>
<td>18.1</td>
<td>17.9</td>
<td>20.2</td>
<td>24.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Production</td>
<td>Ton</td>
<td>22,655</td>
<td>32,798</td>
<td>35,302</td>
<td>43,108</td>
<td>56,823</td>
</tr>
</tbody>
</table>
The average yield of pitaya in the country is about 22.4 t/ha. Pitaya in Longan has the highest yield of 35.4 t/ha, followed by Tiengiang 25 t/ha, Binhthuan is about 21.6 t/ha. In other provinces the yield of pitaya is from 15 to 17 t/ha (Crop Production Department, 2014).

Vietnamese pitaya have been exported to over 40 countries and territories in the world. The main markets being China, Thailand, Indonesia, Malaysia, Singapore and then Holland, Spain, Germany, UK, Canada, USA, etc. (Lap et al. 2013).

Under tropical conditions, fruit can be harvested from April to September for main season production; light induced flowering can forcing production of fruit for harvesting from October to March of the following year. In the offseason, light has been used to induce pitaya flowering. Originally the industry used 65 watt incandescent bulbs but subsequently changed to 20 watt compact power saving bulbs and now there is a shift to 7 watt LED lights.

There are two main pitaya varieties cultivated in Vietnam for commercial production: the white flesh with red peel and red flesh with red peel. The white flesh variety is from a natural selection and the red flesh red peel variety a result of the SOFRI breeding program, and released in 2005. Production of this variety is currently around 4,500 to 5,000 hectare (Crop Production Department, 2014).

DEVELOPMENT AND IMPLEMENTATION OF GAP ON PITAYA IN VIETNAM

EUREPGAP/GLOBALGAP STANDARDS

The supply chain for pitaya in Vietnam (Sanh et al. 2010) is complicated and processes through many steps (Figure 1) that lead to share of the benefit to many players but to the main player (farmer) gaining the least. To understand that situation, the establishment of the group of growers to cooperate with the packinghouse to produce pitaya under certain standards plays very important role to set up the millstone for the industry later on.

Since 2005, the Good Agricultural Practice has been applied to pitaya industry zone with the first EUREPGAP certification awarded to Vietnamese fruit industry for pitaya was the HamMinh Cooperative, with 11 ha in 2006, following another 7 ha farm received certification in 2007. In late 2007 one other group of farmers of 80 ha received EUREPGAP certification. Since 2008 to the present, 230 ha have been certified and recertified. The above achievements were due to the AusAID project fund to Vietnamese institution and pitaya industry along with a USA project to help farmers to implement GAP. And SOFRI and PFR played a major role in implementing these projects. The AusAID project established a private sector working pilot of exporter/packer and supplying pitaya growers in which the European high value market driven standards of BRC at the packer and EUREPGAP/GlobalGAP at the farmer level were implemented. Project implementation delivery included:
Improving Pitaya Production and Marketing

Benchmarking survey of pitaya production
The benchmarking survey of pitaya production was conducted by end of July 2005. There were 125 farmers in Binh Thuan and 30 farmers in Long An and Tien Giang Provinces interviewed to collect data on cultivation practices and other related techniques. They were relevant to practical production of pitaya as compared to EUREPGAP standards for improvement to satisfy the requirements, and the result delivered as a Power Point presentation to SOFRI personnel, packers, farmers, MARD and DARD personnel of Binh Thuan in 2007.

Development of quality manual
The manual was first written in English and then translated into Vietnamese. The manual was based on the specific background which meet the requirements of quality systems for the project pilot model for the farmer section complying to EUREPGAP and section for packer to BRC (British Retailers Consortium, Global standard: Food). The manual is subject to revision whenever the standard or condition changed. By late of 2007 and early 2008, SOFRI’s project staff had revised the manual as Version 2.0 upgrading the EUREPGAP to GlobalGAP standards, and the quality management system for packer compliance with BRC standards – Issue 5 (Hoa et al. 2011).

ESTABLISHMENT OF PROGRAMME FOR IMPLEMENTING GAP PILOT MODELS
Chosen standards of quality management systems
EUREPGAP standard has been chosen for production farm to link people together for carrying out the same standards, later when the revised version for GlobalGAP has been released, the new version for pitaya also updated and at packing house, BRC standard was selected for implementation. The both standards were supplementing to each other to ensure pitaya being produced and packed in a quality, legality and meeting the requirements of high value markets, “satisfaction of customers’ demands” on traceability.

At packer level
In Vietnam, Hoang Hau Dragon fruit Ltd. Co. is the biggest exporter, therefore Hoang Hau Company’s dragon fruit packing house was selected as packaging pilot model. The project team had negotiated with Mr. Tran Ngoc Hiep (director) about level of implementation and the collaboration in development of the packing house to comply with BRC standard. The quality manual (in English and Vietnamese) was provided to Mr. Hiep. While, in the meantime, SOFRI’s project team had conducted a number of trainings/consultancies for the personnel working in the packing house and farm management. The contents of trainings and consultants included: customers and customers’ demands; quality systems and objectives; packinghouse management; indicators of “progress” from farm through packing house to exporters; linkage between farmers and packers, and their responsibilities; purpose and implication of the pitaya quality manual; identification for areas of improvement at farm and in packinghouse; staff responsibilities as related to their positions; role and responsibility of internal auditor; and process of improvement and promotion for sustainable production.

At farm level
The farmer group was set up and trainings were conducted for farmers on quality systems which fetch back more benefits if compliance to GAP. The project had also focused and instructed farmers specifically to help them to approach and comply with the standards before the auditing of certify body. The selected farmers’ groups, however, could not meet the requirements due to lack of investment and too much depend on middlemen – collectors and these issues were not expected by project. The project, therefore, came back with selected the contracted farmers’ group supplying for packing house of Hoang Hau Dragon Fruit Co. and then to process the project as above said including the training on GAP, safe production, cultivation techniques, plant protection and all other criteria for GAP implementation, establishment of the farm, practicing to apply the GAP standards to their own farms, continue improvement for compliance to the standards.

CERTIFICATION AND EXPANSION OF THE PITATY PILOT MODELS
Project team had negotiated with SGS Vietnam (Société Générale de Surveillance), an international certify body responsible for Vietnam, Indonesia and New Zealand, to provide information on auditing, evaluation, and the potential of certifying of project. General information on progress of implementation of the pilot model based on internal audit checklist of BRC/EUREPGAP to evaluate the model, certification and lastly, 80 ha of pitaya was certified for EUREPGAP in 2007.

Based on the certified project pilot model, Hoang Hau Dragon Fruit Co. and its contracted supplying farmers’ group, got re-certificated by October 2008, with increase
Improving Pitaya Production and Marketing

in area up to 230 ha. And it was repeated in 2009 with their own source of fund. In the process, SOFRI staff continued providing technical support. The achievement came from the enhancement of capability of local project facilitators in techniques, organization and implementation.

Later, the project team has worked to expand the GlobalGAP pitaya model in Long An province. In early of 2013 the Duongxuan Cooperative with 37 member farmers and one packinghouse, Hoang Phat Co., received GlobalGAP certification. In Binhthuan, ten other organizations/farms have been certified on 222.7 ha for GlobalGAP standards (Dung 2014)

In addition, with the knowledge gained from the project, SOFRI staff had developed GlobalGAP standards for mango (11.7ha on Cat Hoa Loc mango in 2008 at Can Tho), Cat Hoa Loc and Cat Chu in Dong Thap province in 2011, rambutan (24ha in 2011 in Vinh Long), sweet potato in Vinh Long province in 2012 and many other fruit and vegetable crops (Thoai et al. 2012).

Building capacity
While delivering the project, one SOFRI staff had visited fruit GlobalGAP farms and BRC packinghouses in New Zealand and also participated in 2-day training course for internal auditing at Hasting NZ, in July 2006. After that, through the agreement from New Zealand Organization of Quality (NZOQ), a training course for internal auditing had been delivered to 8 staff of SOFRI by John Campbell, using parts of training materials of the same course provided by NZOQ. In addition, in the year 2009, SGS-Vietnam had organized a training course for Lead Auditor (LAC) in which two SOFRI’s staff were invited and qualified to be the GlobalGAP lead auditor.

As above said, Vietnam project team had also learnt through the project in the documentation of the materials, management, operation procedures, etc. SOFRI’s project team, therefore, had up-graded successfully the pitaya quality manual version 2.0 and even for other crops such as mango, rambutan, sweet potato and citrus crops.

SOFRI’s staff and other facilitators from established model of GlobalGAP of 30 people had also trained by SGS-Vietnam for GlobalGAP, HACCP, Internal Audit and Inspection in 2008, these personnel provided their efforts to bring GlobalGAP standards to provincial agricultural staff and farmers and in return many other crop production obtained GlobalGAP certificates.

One very important input of the project personnel to fruit industry in Vietnam was the contribution to the building up and releasing of VietGAP standards in the year 2008 by Ministry of Agriculture and Rural Development (MARD). During that time, SOFRI staff had played key role in developing the general regulations of VietGAP standards; this standard was issued on 28th December 2008.

Publications
During delivering project and onwards, a number of publications had been published, in which some major publishes listed below:

- Handbook for trainer for GAP fruit and vegetables (Training guidelines for trainer who are playing role as extension workers, technicians, members of Farming
Improving Pitaya Production and Marketing

The Pitaya GlobalGAP quality manual both in English and Vietnamese languages have been updated in 2010.

The Citrus GlobalGAP quality manual both in English and Vietnamese languages have been developed in 2009.

The Rambutan GlobalGAP quality manual in Vietnamese languages has been developed in 2012.

The Sweet Potatoes GlobalGAP quality manual in Vietnamese languages has been developed in 2013.

The Water Melon GlobalGAP quality manual in Vietnamese languages has been developed in 2013.


VietGAP STANDARDS

VietGAP standard was issued and validated on 28th December 2008 through the Decision 99/2008/QD-BNN on October 10th, 2008 signed by the Minister of MARD (Crop Production Department MARD, 2008). After this issuing, SOFRI was also the first organization who guided pineapple farmers to run successful VietGAP production model in the year 2009 for 30 ha of 22 farmers. Up to now, there were 32 VietGAP models have been successfully consulted by SOFRI and certified by the certification body, including one for pitaya.

According to the Crop Production Department, MARD is building a route to upgrade the good agricultural practice standard (VietGAP) for vegetables, fruits, tea towards integration with the international GAP (GlobalGAP) after 2015. MARD will promote the application to obtain VietGAP certification if all conditions are met, including focusing production scale or coordination between farmers. In addition, MARD is continuously revising the VietGAP regulations for some crops to better match the conditions of Vietnam and in harmony with international standards.

MARD also asked Crop Production Department to accelerate developing the guidance documents of implementing the Decision No. 01/2012/QD-TTg dated 01.09.2012 of the Prime Minister on a number of policies to support VietGAP application in agriculture, forestry and fisheries; and technical regulations on food safety conditions for vegetables, fruits, tea leaves during production and preliminary processes.

According to MARD, there was a significant number of successful VietGAP models so far, but it occupied only 1% in the total production area for fruit crops. MARD and the
local authorities will continue to guide the production facilities, especially in the field of producing fruit and vegetable to organize the production and implement technical standards under VietGAP in order to ensure product safety.

For pitaya, Binhthuan leaders have provided strongly supports to develop and certify GAP for pitaya product in their areas. For VietGAP, the certified area has been increasing year by year from 6,529 ha (2012), 7,395 ha (2013) and 7,500 ha in the year 2014 (Dung, 2014). While in Tiengiang province, four groups with 67 ha have been certified for VietGAP standards. Of them, one first model has been developed by SOFRI staff and the manual and protocol for VietGAP on pitaya have been developed. In this province, they are conducting project to develop and apply high technologies for 100 ha better yield, quality and get VietGAP certificate in 2015 and 2016. While in Longan, they had program to train 400 farmers about the awareness of GlobalGAP or VietGAP and the farmers themselves apply VietGAP standards on their own farms.

The survey conducted by Sanh et al. (2010) on the perception of farmers to VietGAP, the results shown that more farmers keen to apply VietGAP on their farms. They indicated the advantages of VietGAP for: (i) better knowledge on production and supplying safe product to customers; (ii) better health care for farmers, society and eco-friendly environment; (iii) better management in production, reducing the use of chemicals; (iv) higher income through higher prices for their products; and (v) good opportunity to cooperated with packers and exporters for selling their product in proper chain.

**CHALLENGES IN APPLYING GAP STANDARDS**

Unfortunately, there were some farmers and others to hesitate to apply VietGAP standards. Results of the survey by Sanh et al. 2010 indicated that major reasons for their hesitance are: (i) not yet clear about the standards (44.2%); (ii) hard for them to apply (32.6%); (iii) they know about the standards but they do not like; (iv) no one to guide them to apply (2.3%); (vi) no source of fund to operate (9.3%); and (vii) other reasons (7.0%). Furthermore, many of them know clear about the standards its advantages and benefits, but they still hesitate to apply on their farms since the price of certified pitaya product is not higher than that of the normal product.

According to Crop Production Department (2012), there were many challenges in implementation of GAP in pitaya products: (i) the general planning of pitaya production and the plan for GAP production have not completed and comprehensive for different planted regions, market fluctuation, the infrastructure system is still poor, the land per household is small, the cost for implementation is high, therefore most for the GAP models are still at the demonstration site, which cannot be up-scaling; (ii) the policy for GAP is there but not strong enough to support the groups and farmers to apply GAP standards; (iii) awareness of people on safety products is still limited, the customer is not ready to pay more for safe products; (iv) VietGAP has not yet had the logo so the people cannot recognize which product produced by VietGAP standards; and (v) the use of certificate is sometime not proper.

Hoa (2012) also cited some of the challenges in GAP implementation under Vietnam conditions. They are: (i) the certified models are mostly small leading to small amount of production, which is not suitable to subsequently supply to the contracted supplier,
therefore, some groups of farmers, local agricultural officers turned their back to GAP production; (ii) the central government has not had the general planning for pitaya, while each province it has its own planning, but not link to each other for large production and cannot control the unprompted development; (iii) the Prime Minister issued policies to support GAP development, but at the Ministry level, they have not detailed for the industry to utilize them; (iv) the cooperative or cluster of growers are still limited in numbers and weak in functioning; (v) the linkage amongst growers themselves and between growers to packers, collectors and exporters are weak and too formality and complicated, and the roles of local government, scientists are not clear within the linkages; (vi) it takes time for farmers to change their habits from traditional production; and (vii) the cost for auditing and certify is high, which retards the farmers to bear the cost for recertification.

On 18-19th March 2014, the Vietnam Academic of Agricultural Science (VAAS) and Syngenta Foundation for Sustainable Agriculture (SFSA) have jointly organized the workshop on “Good Agricultural Practice – VietGAP: Current Status, Orientation and Development for Safe Vegetable Production in Vietnam” at the VAAS headquarters in Hanoi. In that workshop, Dr. Bo’s presentation showed that there are seven reasons causing obstacles in VietGAP implementation in Vietnam: (1) Not clear communication between different stakeholders; (2) No strong enforcement & punishment applied to violators; (3) Complex assignment between different ministries related to food safety (MARD is responsible in the field; Ministry of Trade in the market; Ministry of Health in the daily meals; (4) Growers do not know who is consumer. What are standards for their produces; (5) Consumers do not trust on growers especially on pesticide use; (6) Consumer’s perception and knowledge on food safety are low; and (7) Weakness in collaboration between different associations.

SUGGESTIONS AND SOLUTIONS

Thuy (2014) suggested that the GAP system should be combined with the application of new and modern technologies for large and uniform product with high quality. It should be done in three steps: (i) the business man, packers, exporters must link to the GAP production zone; (ii) the packer/exporters must build up and properly run the quality control system both at their factory and the large GAP production area; and (iii) the use of the quality control system to manage the production zone toward applying new technologies for safety product.

The experiences in Taiwan in gathering farmers to the cooperative for production and marketing are much in advance, which should be shared to Vietnamese growers, agricultural officers and scientists. Since the cooperative is the key tool for future collaboration for GAP implementation, especially under Vietnam conditions of small holder of 0.4 to 0.5 ha/household. In additions, the extension system must be strong to train more local technical staff as the TOT for farmers training both technical aspects, experiences in organizing cooperative activities and GAP knowledge, etc. The good policies from the government are key elements to supports farmers, packers, exporters to apply GAP and other advanced standards to their activities. The infrastructure and the logistic must be invested and properly focused will also bring better results.
CONCLUSION

In Vietnam, all the GlobalGAP standards have been successfully transferred through development of manuals, capacity building for both SOFRI and project partners, and has expanded to many agricultural players in Vietnam. But there are many challenges ahead for the GAP initiative to spread to the rest of the pitaya industry and many other fruit crops.

ACKNOWLEDGEMENT

We, the SOFRI personnel wish to thank CARD programme for funding to the projects, the FFTC and other organizers of this Workshop to give us the opportunities to share our experiences to people.

REFERENCES