CONSTRUCTING FARMING PROCESS ORIENTED ASEAN GAP FOR THIEU THANH HA LITCHI

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I. Introduction

Thieu Thanh Ha litchi is a specialty, which has been given certificate for protected geographical indication by Department of Intellectual Property by Decision number 353/QĐ-SHTT, dated 25 May 2007. However, Thieu litchi prices are falling. Fresh litchi price in 1997, 1998, 2003 and 2007 were 14000 – 15000 vnd/kg, 10000 - 12000 vnd/kg, 3500 – 4500 vnd/kg, and 2000 vnd/kg respectively. The reason for price reduction is that the demand-supply balance in domestic market is out of balance and the litchi quality from farm households is not uniform. In order to upgrade the value of Thieu Thanh Ha litchi, markets should be diversified with production of high quality product for high priced domestic and export market. To meet strict requirement of the large potential market, Thieu Thanh Ha litchi should organise and manage production that meets Asean GAP requirements.

Within this context, the project ”upgrading value chain for Thieu Thanh Ha litchi”, supported by German technical cooperation agency (GTZ), the Centre for agrarian systems research and development consultancy, has implemented research to develop a farming system oriented towards Asean GAP for Thieu Thanh Ha litchi.

II. Issues for attention in constructing farming systems oriented towards Asean GAP for thieu Thanh Ha litchi.

1. To study suitable land for thieu litchi to have typical quality.
2. Planting materials
3. Fertilizer use
4. Plant protection
5. Irrigation
6. Harvest
7. Some typical techniques
8. Management of farm households for implementing Asean GAP for thieu Thanh Ha

III. Methodology

Field research in combination with laboratory analysis to determine which land is suitable for thieu litchi and to determine water resources for irrigation for thieu litchi.

Using GIS to determine suitable zones planning for thieu litchi.

Using participatory and expert experience methods in constructing farming systems for Thieu litchi, constructing internal management system for household management for implementing GAP

IV. Results

1. **Suitable land for thieu litchi for typical quality production:**
   Using method of field survey, soil sampling, litchi fruit sampling.
   Analysis in laboratory agro-chemistry indicators and litchi fruit quality indicators.
   Determining relationship between soil and typical quality of litchi fruit.

Determine suitable soil elements for thieu litchi to ensure quality. Study results show that soil indicators to be suitable to plant thieu litchi are described below:

Soil Requirements

Ord	Soil element	Requirement on soil quality
1	Soil type	- Alluvium soil without deposits, slight acid. - Alluvium soil without deposits and with grey layers and motley.
3	Soil texture	Heavy mixed sand to heavy mixed clay and sand
4	pHH_2O	5,5 - 8,1
5	pHKCl	5,2 - 7,5
6	OC, %	0, 85 - 2,15
7	N, %	0,08 - 0,19
8	P_2O_5, %	0,06 - 0,3
9	K_20, % 1 stage	1.6 - 2,82
10	K_20, % 2 stage	1.64 – 2.7
11	Na^+ ldl/100g 1 stage	0,44 – 2,55
12	Na^+ ldl/100g 2 stage	0.48 – 2.55
13	Bo, ppm 1 stage	35 – 47
14	Bo, ppm 2 stage	27 – 33
15	Mo, ppm 1 stage	27 – 36
16	Mo, ppm 2 stage	23 – 26

Using method of map layers of single agro-chemistry indicators, which determine typical high quality of Thieu Thanh Ha litchi, it has been determined that:

+ The most suitable land for thieu litchi in Thanh Ha district is 6,020 ha (see the map in appendix).

+ Main soil type is slight acid alluvium with motley layers and gray alluvium in medium land (Land classified based on the high level), soil texrure is medium heavy and soil's pH is from to neutral to slightly acid

2. Planting materials:

To ensure thieu litchi quality and limit disease transmit from the area to other areas, planting materials for the region planned for suitable thieu litchi are recommended as follows:

- It should be Thanh Ha thieu litchi variety which is selected from outstanding trees in farmer's garden in Thanh Ha district.
- Multiplying seedling by proven method.
- Farmer should multiply seedling for himself or take from neighbour farmers to ensure that the seedling planting has clear origin.
- Seedlings from out of Thanh Ha should not be used.

3. Fertiliser Use

3.1 Principles

- Fertilizer use should not cause waste which affects the soil environment.
- Fertilizer use efficiency is high.

- To avoid waste in investment for litchi farmers.
- Do not use growth stimulate agents to affect to fruit quality.
- Do not use fertiliser of unclear origin.

3.2 Basics to determine dose and type of fertilizers for litchi trees

- Based on nutrition demand for each growth development period of tree.
- Based on tree age.
- Based on previous productivity of the tree.

3.3 Technique of fertilizer use for thieu litchi trees planting in Thanh Ha

3.3.1 Fertilizer application technique in basic construction period

Time for fertilizer application: 1 month after planting can apply a top-dressing. For first 2- 3 years, 2 fertilizer applications per 1 bud series. First application when buds begin to show, the second one when buds are almost fully grown, and their leaves change from pink to green.

- Fertilizer doses: 20g of nitrogen + 50g of phosphorous + 15 - 20g of potassium/ tree /application.
- How to apply: If soil dry, diluting fertilizer to irrigate or dig 2 -3 holes around root system, putting fertilizer in and covering up by soil, after applying , pouring water on.

3.3.2 Technique of fertilizer application for litchi trees at harvest age

a) Top-dressing technique for autumn buds (fertilizer application after harvesting)

- After harvesting fruits, supplementary fertiliser is required to allow trees to develop autumn buds. For the well drained areas, the best time for first fertilizer application is end of July – early August and for the second application from the middle of September. For poorly drained areas, to avoid floodly in July and August causing trees death, top-dressing should be appled once in early September.

- *Fertilizer application technique*: Depends on climate conditions and soil mositure levels. The different methods of fertilizer application are:

In dry climates dilute fertilizer with irrigation according to the tree's shadow on ground,

If it is dry and in drought, dilute fertilizers and apply irrigation to trees. Irrigate to 50cm beyond the shadow of the tree canopy and away from the trunk., keeping areas for irrigation is 50 cm far from the tree canopy both inside and outside. Combine fertilizer application with soil cultivation and irrigation to improve effectiveness of fertilizer use.

If it rains heavily and soil moisture is high, apply spread fertilizer, then cover the fertilizer by soil.

- *Fertilizer rate*: Depends on soil type and tree age. For higher fertility land, e.g outside dike land, then apply less fertilizer. For the land inside the field higher fertilizer rate are required and for house gardens, the highest amount of fertilizer should be applied. Fertilizer levels can be based on the capacity to produce fruit. Fertilizer requirements for one year (for each 100 kg of fruit, apply soil 2 – 2.5 kg of nitrogen + 4 - 5 kg phosphorous + 2 kg potassium).

- *Fertilizer distribution:*

+ For flushing autumn buds, apply 1/2 of total nitrogenous, 1/2 of total phosphorous and ¼ of total potassium (fertilizer amount is divided equally by 2).

(This fertilizer application only for land in fields, gardens, and well drained lands, and should be applied in the second half of July).

+ Dose for top dressing for the second top dressing is similar to the first one. The most suitable time for this top dressing is in September. Do not continue top-dressing into October, since trees can easily develop winter buds.

- For the trees which have not given fruit in previous years, it depends on special cases to choose suitable top dressing doses: for land inside field, the dose is 1/2 of the above dose; for the land outside dike, and strong trees, the dose is 1/3 of above dose.

b) Technique of top-dressing for flushing flowers

Appliactiobn Time: : Apply fertilizer for thieu litchi trees in the period of after cold spell, ie. means in early of February.

Fertilizer amount: Apply balanced fertilizer containing urea, phosphorous and potassium. If supplement fertilizer with irrigation. For this period, apply at a rate of 1/4 of the normal amount of urea, phosphorous and potassium. If soil is dry,dilute fertilizer with water to combine fertilizer applications with irrigation. Leaf fertilizers can also be applied..

c) Technique of top dressing for fruiting

Times of applying: Top dressing for fruiting is carried out twice, the first time is when the fruits have just formed and the second 25 – 30 days later (about middle of April).

First time for top dressing for fruiting

- Time for applying: The first time for top dressing for fruiting is when the fruit just formed, about 10 days after flowering. The fruit size is about a green bean seed size (normally called rattan fruit period).
- Fertilizer dose for applying: To allow the fruits to grow fast, apply mainly potassium and manure. In the period of top dressing for fruiting, the amounts of area, potassium and phosphorous are divided equally but all manure should be concentrated for the first application.

Second time for top dressing for fruiting

- Time for applying: The second application of top dressing for fruiting is carried out 25 –30 days after the first application i.e the middle of April.

- Fertilizer dose for applying: The amounts of fertilizer for the second time are similarly to those for the first time. In this period, it is preferable to apply irrigation as well.

4. Plant protection

4.1 Principles of chemical use for plant protection for thieu litchi trees.

- To pay attention on using IPM measures in plant protection to minimise chemical use.
- To pay attention on using chemicals having biology origin to minimise chemical side effects and minimise environmental and human health impacts.
- To determine the main diseases and insects that damage litchi and be aware of suitable protection and treatment measures.
- Appliy correct chemical dilution in compliance with directions printed on package labels.
- Only using chemicals approved by the Ministry of Agriculture and Rural Development.
- To guarantee withholding periods od at least 15 days from chemical spraying to harvest time

4.2 Rules for pesticide, agro-chemicals and fertilizer management

- Pesticide and fertilizer are supplied by service agencies of the Association. Each agency has its own store-room.

- Service suppliers have to be trained in plant protection (have official licence) and are able to provide the advisory services to households.
- Plant protection service suppliers have to often update the list of permitted pesticides

4.3 Basics to determine using plant protection chemicals

- Based on climate status (for Peronophythora litchi bệnh mốc sương: In flowering period, if it is cloudy, drizzling rain, then need to immediately apply protection spray).
- Based on exist frequency of the litchi damage diseases and insects.

4.4 Measures of protecting from some diseases and insects for litchi

4.4.1 Protection from diseases and insects

The measures for plant protection are applied to reduce production costs and to protect the environment and for food security. Plant protection should start with agronomic techniques, especially pruning and fertilizer application. Good for pruning and canopy management together with good hygiene to remove disease sources, will provide good ventilation to litchi garden and a lower humidity degree will limit conditions that will allow insect damage and diseases to develop.

a, Technique of pruning and creating canopy for litchi trees in basic constructions period
Technique for creating canopy: at 30 – 50 cm from ground includes letting 3 -4 1 level branches, which are evenly distributed around the trunk and at suitable angles from 45 - 70^0 to the trunk with avoiding upper branches overlapping lower branches. Pruning branches to avoid crossing braches, too many branches, small and weak branches.

b, Pruning branches for litchi trees in fruit bearing period.
Time for pruning: 10 – 15 days after harvested (about early of July), is best. At other time sof the year prune branches that are not-suitably located.

Branch type should be pruned:

- Too dense branches, sprouting branches and those that overlap each other.
- Seriously diseased branches: Branches are infected by worms or disease.
- Branches are concealed, blocked or stunted that are unlikely to produce flowers or fruit.
- Too many sprouted branches including young branches with abnormal growth, or with long sprouts.
- Buds when trees were bearing fruits
- Tops of branches which had have no fruit in the previous year.

d. Technique of pruning

prune inside canopy first then the outside canopy. To prune the big branches first then small branches, to avoid creating empty areas, ensure that the branches are distributed evenly around the tree.

4.4.2 Treating insects and diseases

It is necessary to ovoid insects and diseases, but it is not possible to totally replace treatments to control insects and diseases. To treat insects and diseases effectively, it is important to correctly identify insects and diseases at the early stages of incidence and to use the right chemicals for treatment. Monitor gardens regularly, every 5 – 7 days. Typicla insects and diseases appear according to season. At budding flowering, and for young fruits, pay attention to plant-louses, stink bugs and leaf insects; In the dry season, pay attention to Eriophyes litchi.

In the fruiting season, pay attention to diseases of peronophythora, collectotriclumn gloeosporioides, conopomorpha sinesis bradley.

Some measures for plant protection for litchi

Eriophyes litchi

- Damage characteristics: Newly born eriophyes damage young buds, flowers and young fruits. Eriophyes develop year-round, but are most developed in spring. Eriophyes live on the`undersides of leaves, and extract nutrition, which makes leaves smaller and wavy to reduce phytosynthesis capacity, resulting in the leaves drying and droping.

- Plant protection measure:

+ Clear garden: collecting, cutting buds infecting eriophyes. This measure needs to be implemented before the leaf colour changes to yellow, when leaf appears wavy.

+ Chemical measure: Pegasus 500ND with a concentration of 1/800, applying 600 litre/ha; Ortus 3SC with a concentration of 1/800, applying 600 litre/ha; Regent 800 WG, with a concentration of 1gram/10 litre of water, applying 600 litre/ha;

Spray when first eriophyes are discovered in the garden.

Stink bugs

Damage and emerging characteristics: Stink bugs lay eggs on the under-side of leaves, in clusters of 13 – 14 eggs. Stink bugs lay eggs in March. Eggs last for 11-15 days and young worms and mature worm last 25 – 30 days. This is the period when damage occurs. They attack young buds, flowers and fruit to interfere with bud and flower development and acuse young fruit to drop.

Plant protection measure:

Handcraft measures: When spring comes, stink bugs usually concentrate on litchi trees to reproduce and lay eggs in very high density, then it is possible to use rackets to catch and kill mature stink bugs.

Picking and drop eggs clusters: Observing under-sides of leaf, pick off an kill egg clusters.

Chemical measure: Using chemicals Dipterex 0,2%, Sherpa 25EC at 0,1% concentration applied at 600 litres/ha to kill mature stink bugs and young bugs. The best time to spray is when young stink bugs have just hatched.

Fruit chiselled worm

Damage and emerging characteristics: Butterflies lay eggs in trees with luxuriant branches and leaves. They lay eggs at night time, on fruit stems, leaf veins, flower stems and young buds. Young hatched worms attack flowers and fruit stems causing dried flowers,fruit spoiling and reduced quality.

Plant protection measure:

Farming measures: Worms pupate in old leaf, young worms usually chisel leaf stems, fruit stems, flower stems and they have many broods year around. Therefore, clear gardens after harvest prune and cut off old branches to improve aeration to reduce pupae density and butterfly numbers.

Chemical measure: Setting 3-5 pheromone traps, in each garden, to monitor mature worms. Apply chemical sprays 5 – 7 days after the appearance of large numbers of mature worms. Alternatively when fruit seeds partly change colour change, about 1.5 months before

harvest, the young worms have just hatched atart to chisel and go into fruit. Use Padan 95 SP at 0.1% concentration, Pegasus 500ND at 1/800 concentration applied at 600 litre/ha, regularly spraying of 2 – 3 times at 10 day intervals.

Litchi damage plant-louses

Aphididae: There are 2 types with and without wings.

The wingless type mainly damages litchi tree. It has a pear ahape and when young is light yellow like young litchi leaves.

Damage behaviour: They are appeared usually in winter in young buds. Plant louses lay many young and move very fast like ants. They suck resin of young buds, which makes the bud wavy and reduces growth with a change in bud colour to yellow. In flowering and young fruit periods, flowers and fruit dry and drop. Plant louses usually appear in winter up to end of May and always go together with the bud and flower bud series.

Toxoptera aurantii:

Aprearance and damage behaviours: Plant louses are concentrated on under-sides of young leaf. Plant louses appear year round but the mostly in the spring when litchi trees have flowers. Main damage is to suck resin. In addition, their faeces encourage black fungus development. These fungus cover the top-side of leaves with a black soot, which reduces the photosynthetic capacity of trees.

Wax plant-louses:

Wax plant-louses are white in colour, very small, and are concentrated on stem, branches, young buds and the top-sides of leaves (mainly in medium old leaf). When they are mature, they are covered by a waxy coat.

The plant-louses appear year round. In winter, they live in the under-canopy on old leaf branches. In spring, they develop vigorously in young buds and flower buds. They suck resin and flower buds, which causes branches to develop slowly, young buds to be stunted and flowers to dry and drop. This is the most dangerous of the plant-louses and the most difficult to control.

Plant protection measure :

- For Aphididae and Toxoptera aurantii, when discovered, spray Sherpa 5EC at 1/800 concentration or Sherzol at 1/500 concentration, applying 600 – 700 litre/ha
- For wax plant-louses, their wax coat makes absorption of chemicals difficult. To increase chemical effect, dilute chemicals with kerosene to disperse the wax coat and help chemical absorbtion. It is frequent to use cantex petroleum (plant protection petroleum) at a 5-10/1000 concentration and dilute the above chemicals by 0.5/1000 to eliminate high of more than 90% of plant-louses.

Worm đo củi:

Damage characteristics:

Worm đo củi damage during some growth periods of trees. The most frequent period is from flowering to young fruiting period. Young worms are most active at night time, and hide on the leaf canopy during day time. They eat flowers and chisel into young fruit making them to drop. Young worms have a characteristics of feigning death and change colour according to the environment. In some cases, young worms stick to branches with an erect habit like a branch.

Time to appear and damage:

During the year there are many series, but the most important time the end of February and early of March when the worms eat flowers. From the end of March to the middle of April worms eat young fruit, which makes fruit drop or cause fruit damage.

Plant protection measures :

Cutting and pruning branches to create an airy canopy. During flowering and the young fruits period, if flowers drop or young fruit is damaged chemical sprays should be used.

Special effective chemicals: Paran 50EC at 0.1% concentration; Pounce 10EC at 0.1% concentrate, applying 600 – 800 litres/ ha, spraying in the cool of the afternoon.

Peronophythora litchi

Symptom: At beginning, there are black spots which expand very quickly causing flower clusters to become burn dried. After the initial fruit cluster damage a smoothly white powder coat appears.

Emerging rule: The disease damages flowers and fruit up to harvest. The most dangerous time is the flowering and fruiting period and the disease can cause series of flowers and fruits to be burned. During the fruit ripening period, the disease also is serious.

Plant protection measure: For Peronophythora litchi, spraying method is the most important. In the flowering period, if is cloudy, high humidity level or high rainfall, spray Boocdo regularly every 7-10 days. Spray 2-3 times before trees flower.

For fruit bearing period, if temperature is high do not spray with Boocdo.

For ripe fruit, if it has high rainfall, spray for protection with Rizomil MZ 72 WP at 0.3% concentration, every 7-10 days.

Collectotrichum gloeosporioides

Symptom: The disease causes damage for all buds, leaves, flowers and fruits. For leaves and buds, the disease causes burning. For flowers, the disease makes the flower cluster burn. For fruits, the disease spoils fruit, especially causing fruits to change their colour when ripe, which from red to motley blue. The disease traces at the beginning are a brown colour, then change to black blue, then black and spoilt.

Emerging rule: On leaf, the disease appears year round but the most serious period is in September and October, on flowers in March and April; and on fruits in May but the most serious time is in June and July when the fruit ripens. Rain and windy conditions influence disease development, with higher rainfall producing more serious disease. Drainage of gardens also affects disease development. Applying too much nitrogen, flood and bad drainage makes the disease be more serious.

Plant protection measure:

+ Pruning branches to create canopy after each harvest to make the garden more airy.
+ Avoid floods and improve drainage for gardens
+ Chemical use: Benlat 50 WP, bavistin 50fl at 0.15% concentration. Spraying just after disease appears.

5. Irrigation

To carry supplement irrigation to meet demand of water for plants in each period.

Water resources for irrigation is from the Rang river (belongs to Thai Binh river system) through Huong gate or from underground. Do not use dirty water to irrigate leaves and fruit since that can create disease sources for trees.

Irrigation Periods

For trees yet to fruit: Drainage in the rainy season and irrigation in the dry season to ensure trees to grow well.
For fruiting trees: In March and April, the period just before harvest, irrigate on the days which have westerly winds, irrigating the foot of trees and the tree canopy to limit fruit drop.

6. Harvesting

Harvest when litchi are ripe to ensure quality (harvesting when litchi colour is from 2/3 to total red). Pick fruit in the morning when there is no rain. Arrange fruit in thin layers in a cool place then pack in boxes or baskets to transport to markets.

7. Some other typical techniques

7.1 Controlling winter buds technique

For litchi trees, buds emerging in November and December have do not result in production and litchi trees which have winter buds usually have no fruit during the next year. Therefore, control litchi trees so they do not develop buds in this period.

Controlling winter buds: picking winter buds

- Controlling winter buds by chemical: spraying solution of Ethrel at a concentration of 800 - 1000ppm or HPC 97, spraying when buds still are red colour and 8 – 10 cm long.
- To turn over soil under tree's canopy to allow soil moisture to reduce quickly when it rains heavily in November and December.
- Controlling roots, making a ring for tree covers, teeing branches.

7.2 Technique of alluvium depositing:

Every 3 to 4 years, deposit alluvium for litchi gardens to exploit alluvium potential and to increase quality of litchi fruits.
Carry out method:

- In dry season, suck alluvium mud from river put into the canals of beds.
- Dry mud during a dry season.
- In next spring, dig, turn over, break soil in the bed canals into small grains, then cover to the face of beds

8. Farm household management in GAP implementation for thieu Thanh Ha litchi

Training farm households on GAP process for thieu litchi

Training key groups of farmers to transfer GAP process for thieu litchi

Selecting 12 key farmers located in 4 communes of Thanh Ha district.

Capacity building for key group of farmers in transferring GAP process for thieu litchi through implementing training course for TOT. With method of theory training in combination with practical, the training course has trained the trainers on training skills. The key group of farmers includes 12 farmers who have enough capacity to transfer GAP process to individual farm households.

Training farmers to implementing GAP

For farmers to easily learn process and apply it in practice, the content of GAP process for thieu litchi is divided by 4 parts corresponding to each farming period for litchi trees. These are farming after harvest, controlling winter bids, taking care of flowers, and taking care of fruit.

In the beginning of the project, the transferring the GAP process for Thieu Thanh Ha litchi was implemented by project staff (CASRAD staff). Nowadays, when the key group has enough capacity, transferring process is implemented by the key group of farmers.

Farm household management in GAP implementation

Establishing system of monitoring GAP implementation

In order to implement GAP, a people's organisation system should be established to allow them to monitor each other. Internal monitoring systems for a Thanh Ha thieu litchi production and distribution association is seen as a model of self-management.

1. Association level: Head of monitoring board
   - Preparing monitoring plans for the Association for each monitoring period.
   - Organising meetings to disseminate plans and methodologies for organising and managing monitoring for all monitoring board members.
   - Monitoring and speeding up implementing of monitoring staff.
   - Evaluation of progress of monitoring work to present to president of the Association.

2. Sub-Association level: Each sub-association has a head in charge of:.
   - Monitoring and speeding up monitoring activity in his/her sub-association.
   - Evaluating progress of monitoring work of his sub-association for each period to present result to head of monitoring board.

3. Household group level: Under sub-association level is a household group level. Each group has one monitoring officer who monitors one household cluster group.
   - To be in charge of production implementation and monitoring progress in implementation by members in his/her group.
   - Collecting information, checking and analysing treating information collected by members.
   - Evauating progress of monitoring work of his/her group to present to sub-association

4. Member level: 10 household in a cluster make 1 group

Collect evidence of GAP application for thieu litchi from farm households and to report to monitoring officer in charge of these households.

Constructing tools and regulation for monitoring

For implementation of monitoring work, establish a monitoring organisation system, and develop monitoring operation principles and tools.

Monitoring tools for GAP for thieu Thanh Ha litchi implementation include a record book system, including forms and indicators for monitoring. This record book system will be stored and used as a basis for evaluation of GAP implementation.

Monitoring principles are detailed by internal management regulations of the Thanh Ha thieu litchi production and distribution Association. Content of the regulations include:

- Regulations on production implementation for thieu Thanh Ha litchi.
- Regulations on monitoring production progress implementation.
- Regulations on controlling and evaluating litchi fruit quality and controlling use of trade marks and labels.
- Rights and responsibilities of stakeholders.

Activities to identify the origin of GAP product

Design systems of label and quality assurance: Labels are designed aims to distinguish GAP produced litchi products from other products. The information on the label helps identify the producer's name, harvest date and as the labels are attached to all litchi bundles, the producer's information will be directly available to consumers. The quality assurance certification is attached to each product batch. The information in this certification helps define the producer's name, harvest date, product quality, product quantity and name of quality controller. Each batch has one quality control certification ticket, so the information is only available to wholesalers.

Hence, the label and quality assurance system allows identification of the origin of each product batch. The quality of this product is not only guarantteed by producers but also quality controllers.

V. Difficulties and limitations in the construction and implementation of Thanh Ha litchi production procedure based on GAP ASEAN standards.

1. Historical research and production zone management;

- Up until now, there has only been an assessment on soil condition to ensure the quality of Thanh Ha litchi.
- There have not been any studies on chemical and biological pollution dangers in production zones due to production activities.

2. Fertilizer and additive chemicals

- There are no assessments on pollution dangers due to fertilizer application of farmers. However, as Thieu litchi is a long term fruit tree type, farmers tend to exploit existing fertility instead of over investing in fertiliser. Therefore, the pollution danger due to fertilizer application from farmers is unlikely to happen.
- The standard household tank systems to compost organic fertilizer have not been built.

3. Irrigation

- There is no assessment on water pollution danger for irrigation. However, Thanh Ha is located in a delta near the sea (20km from sea), and far from industrial zones, between two big rivers Rang and Thai Binh (belongs to Thai Binh river system). The water sources are unlikely to be polluted.

4. Plant protection

There is no system to control and dispose pesticide containers after use.

5. Harvest and post harvest processing

- Lack of store-rooms to classify and pack litchi products in production zones. Thanh Ha district has only one coolstore and one qualified processing mill for packing. This mill is located in Cam Che commune, and not in the central Thieu litchi production zone. Most products are packed in households and collection areas.

6. Farm managementi

- Activities to identify the origin of GAP

The use of labels for product packages is still limited. In 2007, there are only 150 tons out of 30,000 tons of the whole area accounting for 3.5 per cent of fresh litchi of the whole Association.

- *Monitoring activities*

This activity has only been implemented within the Association with 150 households on 49 hectares

VI. Conclusion and recommendations

1. Conclusion

The construction and implementation of GAP procedure for Thanh Ha litchi has followed the ASEAN GAP standards.

The internal monitoring organisation system, tools and operation principles for monitoring GAP for thieu Thanh Ha litchi of Thanh Ha thieu litchi production and distribution Association is an effective and sustainable model, as in this model farmers self-manage the production and quality monitoring. Hopefully, this provides lessons in GAP production management for other trees and crops and in other localities.

Nevertheless, there are some limitations:

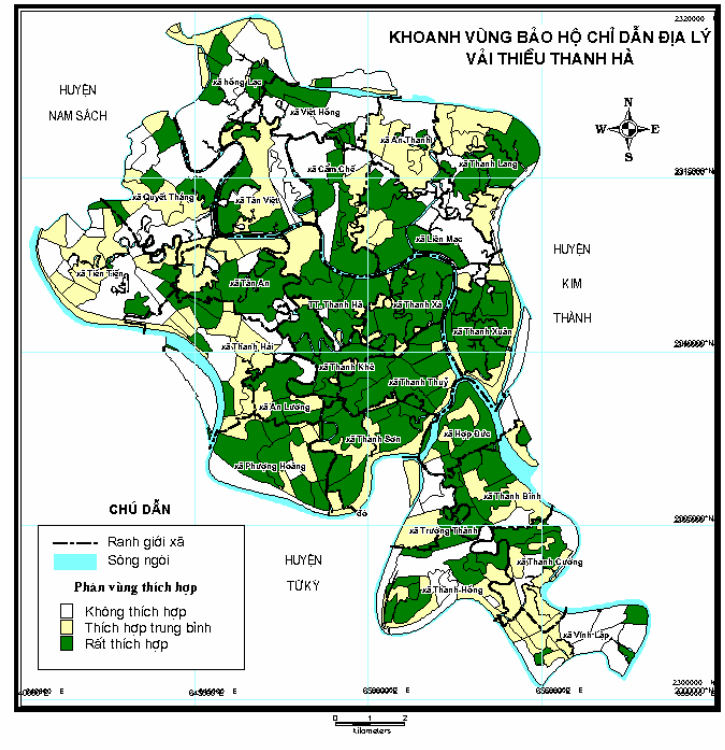
- Assessments ofpollution danger in production zones is not complete.
- Infrastructure for pollution control and product packaging process is inadequate.
- The implementation of GAP remains at a small scale with only 49 hectares over 6020 hectares participating

2. Recommendations

- Assess the land and water pollution potential due to production and general living activities of farmers.
- Develop solutions to minimize and prevent pollution.
- Construct infrastructure for agro-chemicals and waste management.
- Ensure that protection equipment and suitable tools are available for producers.
- Strengthen infrastructure for product packaging and preservation in production zones.

Appendix

Map of suitable zones for planning Thieu litchi of Thanh Ha – Hai Duong


KHOANH VÙNG BẢO HỘ CHỈ DẪN ĐỊA LÝ
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Phân vùng thích hợp
Không thích hợp
Thích hợp trung bình
Rất thích hợp
Kilometers