GOOD AGRICULTURAL PRACTICES FOR
ORNAMENTAL CURCUMA

National Bureau of Agricultural Commodity and Food Standards
Ministry of Agriculture and Cooperatives

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TAS 5503-2010

GOOD AGRICULTURAL PRACTICES FOR ORNAMENTAL CURCUMA

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Curcuma is a group of flowers which is beautiful in shape and color and long lasting bloom. The export value of curcuma is second to orchids. Nevertheless, curcuma cultivation has faced a problem of wilt disease in rhizomes which causes producers to change the planting area. In addition, the good practices or standards in harvest and post-harvest such as trimming, packing that affect the quality are not developed. So, the Agricultural Standards Committee deems it necessary to establish an agricultural standard on Good Agricultural Practices for ornamental curcuma.

The standard is based on the information of the following document:

NOTIFICATION OF THE MINISTRY OF AGRICULTURE AND COOPERATIVES

SUBJECT: THAI AGRICULTURAL STANDARD:
GOOD AGRICULTURAL PRACTICES FOR ORNAMENTAL CURCUMA
UNDER THE AGRICULTURAL STANDARDS ACT B.E. 2551 (2008)

Whereas the Agricultural Standards Committee deems it necessary to establish an agricultural standard on good Agricultural Practices for Ornamental Curcuma as a voluntary standard in accordance with the Agricultural Standards Act B.E. 2551 (2008) to promote such agricultural commodity to meet its quality, standard and safety.

By virtue of Section 5, Section 15 and Section 16 of the Agricultural Standards Act B.E. 2551(2008), the Minister of Agriculture and Cooperatives hereby issues this Notification on the Establishment of Agricultural Standard: Good Agricultural Practices for Ornamental Curcuma (TAS 5503-2010) as a voluntary standard, details of which are attached herewith.

Notified on 12 November B.E. 2553 (2010)
Mr. Theera Wongsamut
Minister of Agriculture and Cooperatives
THAI AGRICULTURAL STANDARD
GOOD AGRICULTURAL PRACTICES FOR ORNAMENTAL CURCUMA

1 SCOPE

This agricultural standard covers good agricultural practices for ornamental curcuma at all steps of production through post-harvest handling in order to obtain the good quality of inflorescences and/or rhizomes for commercial purposes.

2 DEFINITIONS

For the purpose of this standard:

2.1 Ornamental curcuma means all species of plants in genus Curcuma (turmeric) and hybrids of cross-species or genus of curcuma to obtain inflorescences used for decoration.

2.2 Rhizome means part of propagated ornamental curcuma which is the underground stem with or without the storage root.

2.3 Inflorescence means fresh ornamental curcuma composed of stem and coma bract some may have true flower.

2.4 Wilt means disease caused by bacteria Ralstonia solanacearum.

2.5 Visual inspection means the inspection of any external appearances of an entity such as a produce, product, or apparent environment condition. This is basically examined by eyes and the other sensory evaluation may be applied depending on quality factors in question, and additional tools such as magnifying glass could be used. Inspection of working procedure and process are also necessary to be inspected visually.

2.6 Pesticide means a hazardous substance used in agriculture regulated by the Department of Agriculture in accordance with the Notification of the Ministry of Industry entitled the List of Hazardous Substances issued by virtue of the Hazardous Substance Act B.E.2535 (1992) and its amendments.

2.7 Pest means living organisms such as disease, insects, animal and weed that is damaging to plant.

2.8 Postharvest means management practices of inflorescences and/or rhizomes since harvesting through distribution.
# 3 REQUIREMENTS AND INSPECTION METHODS

Requirements and inspection methods shall be as in Table 1.

Table 1 Requirements and Inspection Methods (Section 3)

<table>
<thead>
<tr>
<th>ITEMS</th>
<th>REQUIREMENTS</th>
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<td>1. Planting area / planting materials</td>
<td>1. Management of planting area / planting materials suitable for plant growth and prevention the outbreak of wilt.</td>
<td>1. Check the records or interview</td>
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<tr>
<td>2. Water used in the production process</td>
<td>2. Managing water used in the production process to prevent the infection of wilt.</td>
<td>2. Check the records or interview</td>
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<tr>
<td>3. The use of pesticides</td>
<td>3.1 Pesticides shall be registered with the Department of Agriculture and prohibited substances shall not be used.</td>
<td>3.1 Check the records and inspect the storage of pesticides</td>
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<td>3.2 Follow the recommendations of the Department of Agriculture, or the instruction on the labels registered with the Department of Agriculture.</td>
<td>3.2 Check the records</td>
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<td>3.3 There shall be proper and safe storage, application, and disposal with the awareness of contamination to public water sources.</td>
<td>3.3 Inspect the storage of pesticides and interview</td>
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<td>3.4 Equipment used for pesticide application shall be in good conditions. The application method shall not affect safety of workers.</td>
<td>3.4 Check equipment used for pesticides</td>
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<td>4. Pre-harvest</td>
<td>4.1 Select healthy varieties, pest free, and obtained from the reliable sources.</td>
<td>4.1 Check the records of source of variety and/or interview</td>
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<td>4.2 Pest surveillance starts at planting, if pest found, it shall be destroyed.</td>
<td>4.2 Check the records</td>
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<td>4.3 Having sanitation management in planting area in order not to harbor pest accumulation.</td>
<td>4.3 Visual inspection of planting area</td>
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<td>5. Harvest and postharvest</td>
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<td>ITEMS</td>
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<td>5.1.3 Visual inspection of grading the quality and size</td>
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<td>5.1.5 Carefully pack the inflorescences in containers to prevent damage.</td>
<td>5.1.5 Visual inspection of packing</td>
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<td><strong>5.2 Rhizomes</strong></td>
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<tr>
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<td>5.2.2 Clean and carefully trim rhizomes.</td>
<td>5.2.2 Visual inspection of cleaning and trimming.</td>
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<td>5.2.3 Check the records</td>
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<td>5.2.4 Dry rhizomes in shade, clean and well ventilated.</td>
<td>5.2.4 Visual inspection of drying methods</td>
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<td>5.2.5 Grade the quality and size of rhizomes.</td>
<td>5.2.5 Visual inspection of quality and size grading</td>
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<td>5.2.6 Carefully pack rhizomes in containers to prevent damage.</td>
<td>5.2.6 Visual inspection of packing</td>
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<td><strong>6. Personal health and safety of workers</strong></td>
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<td>6.1 Provide appropriate and sufficient health care to workers.</td>
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<td>6.2 Provide effective and adequate personal protective equipment for workers who expose to pesticides.</td>
<td>6.2 Visual inspection of equipment</td>
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<td><strong>7. Record keeping</strong></td>
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<td>7.1 Record the following information: (1) Management of planting area / planting materials (2) Managing water used in the production process (3) Application of pesticides (4) Sources of rhizomes (5) Pest surveillance and control (6) Pest control after harvest</td>
<td>7.1 Check the records</td>
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<td>7.2</td>
<td>Records shall be kept at least 1 year.</td>
<td>7.2 Check the records</td>
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4. GUIDANCE ON GOOD AGRICULTURAL PRACTICES FOR ORNAMENTAL CURCUMA

Recommendations on good agricultural practices for ornamental curcuma are to provide good practices for ornamental curcuma production for farmers every step starting from planting to post-harvest handling in order to obtain the good quality of inflorescence/rhizomes. Details of the recommendations are given in Appendix A.
APPENDIX A
GUIDANCE ON GOOD AGRICULTURAL PRACTICES FOR
ORNAMENTAL CURCUMA
(Section 4)

A.1 Planting area/planting materials

A.1.1 Planting area management

A.1.1.1 At the preparatory stage of production, soil sample shall be taken at least once for analysis such as acidity-alkaline (pH) should be 5.5-6.5 which is suitable for ornamental curcuma growth, and detection of the disease caused by wilt by sending soil sample to the government or accredited laboratory for analysis and the reports are kept for evidence.

A.1.1.2 The preparation of planting areas
(1) First, tilling and weeding out of areas then drying the soil for 20 – 30 days.
(2) Second, applying urea at the rate of 80 kg/rai then plough, mix lime 800 kg/rai. and watering until soil soaked. Dry soil at least 21 days to prevent or destroy the disease agent cause of the wilt.

A.1.2 Planting materials management

In case planting in bag, the planting materials such as raw husk, sand, etc. shall be prepared. Fermenting planting materials by piling and soaking outdoor, turn up the piles every 10-15 days, watering until soil soaked. Fermenting period should be 30 days to destroy the disease agent caused of wilt.

A.2 Water used in the production process

A.2.1 At the preparatory stage of production, water sample shall be taken at least once for analysis and sent to the official laboratory or accredited laboratory for detecting disease caused of wilt. In case such water has been found to be contaminated with the wilt, take 20 % chlorine powder at the rate of 5 gm./200 liter of water, leave the treated water overnight before use.

The property of water used in the production process should be acid-base (pH) 5.5 to 6.5, it shall be obtained from source where is not exposed to any risk of wilt disease. The use of effluent from industries or other activities that will potentially cause contamination is not allowed. Where necessary, evidence or proof showing that the water has been treated and can be used for agriculture are required.
A.3 The use of pesticides

A.3.1 Pesticides shall be legally registered and adhered with registration number and instructions of using with ornaments given on the product label. Banned pesticides shall not be used, particularly those prohibited from manufacturing, import, export, or in possession according to the Hazardous Substance Act B.E. 2535 and its amendments.

A.3.2 The use of pesticides shall be corresponded to the pest found from survey. Details concerning properties and method of pesticide use on the label shall be read prior to application which shall be followed and/or referred to the recommendation of the Department of Agriculture or other official agencies. Pesticide application shall be recorded.

A.3.3 Each pesticide shall be kept in tightly sealed container with clear label and in group. They shall be kept separately from fertilizers, plant growth regulators and other plant nutrient supplement. The leftover pesticide must not be transferred from its original container. The empty pesticide containers shall be destroyed to prevent the reuse and discarded at the designated place or buried at a distance away from public water source and with the depth to prevent animals digging. Burning of empty pesticide containers is prohibited and beware of contamination to public water sources.

A.3.4 Responsible workers for pest control should have knowledge on the pests, and be able to select proper pesticides and their application rate, type of sprayer and nozzle and know how to spray pesticides. Sprayers should be kept in good condition and ready for use. Spraying workers shall wear personal protective clothing and equipment such as masks, gloves, hats and boots to protect themselves from pesticides.

A.4 Pre-harvest

A.4.1 Select healthy rhizomes which is free from pest and obtained from a reliable source. The bud shall not be dark or brunet, no knot caused by nematodes. The sources of rhizomes shall be recorded.

A.4.2 Pest surveillance shall be conducted starting at planting period. Attention shall be paid on regular survey on infection or infestation such as wilt, leaf spot, mealy bug, dark blue beetle, and other pests. List of diseases and pests of ornamental curcuma is provides in Appendix B. If pest is found, proper control of such pest shall be applied. The survey and control of pest shall be recorded.

A.4.3 Having sanitation management in planting area not to harbor pest accumulation such as cleaning both inside and surrounding of the planting area, disposal of weed, garbage refuse and others which may be the host of pest and carrier.

A.5 Postharvest

A.5.1 Inflorescence

A.5.1.1 Harvest inflorescences when the coma bracts blooming are not less than two-thirds, the middle coma bract are blooming and pointed shape. Inflorescences shall be harvested in morning by cutting or pulling off then rapidly soaks the stalk in clean water.
A.5.1.2 After harvest, pest control methods shall be provided such as clean knives and scissors for cutting flower in 70% alcohol or concentrated sodiumhypochlorite (5.25% to 6.0%) 100 ml/l before and after use. Inflorescences shall be washed with suds and clean water or dipped in water temperature 50 °C for 60 minutes and then rinsed with clean water and shaking off or drying out by electric fan.

A.5.1.3 Grading the quality and size of inflorescences
(1) Inflorescences shall be selected to be free from pests or sign of damage by inspection the axillary of bracts or stalks.
(2) Grade quality and size according to the standard or the requirement of trading partners.

A.5.1.4 Use clean water and containers for maintenance of inflorescence quality every step of post- harvest handlings and apply according to the recommendation of the official concerned such as:
(1) Pull off true flowers by forceps from the axillary of lower bracts especially blooming flowers in order to prevent the rotting of true flowers during long transportation. (The stalks shall be soaked all time in water or chemical to prolong shelflife). 
(2) Provide plant growth regulators in Cytokinins group by using benzylaminopurine (BAP) or benzyladenine (BA) concentrated at 100 mg/l to 200 mg/l by spraying or dipping only part of inflorescences and drying out (The stalks shall be soaked all time in water or chemical to prolong shelflife).

A.5.1.5 Inflorescences shall be carefully packed into the box. The quantity of inflorescences shall not be excessiveso that will affect the quality. For preventing damages, the stalks shall be covered with water saturated cotton or chemical which prolong shelflife before packing, or inserting in plastic tubes with water or chemical to prolong shelflife.

A.5.2 Rhizomes

A.5.2.1 Harvest rhizomes when leaves above ground turn brown not less than 70% of clump. In case planting areas are solid soil, watering shall be provided one day before harvesting rhizome. Digging rhizomes carefully in order to prevent the defect and should not lay the rhizomes contacting ground. There shall be supporting materials on the ground in order to prevent the infection of pest.

A.5.2.2 Clean and trim rhizomes carefully for preventing damage as follows:
(1) Clearly clean rhizomes from soil and planting materials attached to the corner of storage roots. The cleaned rhizomes shall be packed in clean containers free from soil.
(2) Knives and scissors for trimming rhizomes shall be submerged in 70% alcohol or bleaching agent (concentrated sodiumhypochlorite 5.25% to 6.0%) 100 ml/l every time after trimming each rhizome in order to prevent the spread of pest to others.

A.5.2.3 Soak rhizomes with pesticides for prevention of pest infection during storage, according to recommendation of the government or concerned agencies or the recommendation on the label registered with the Department of Agriculture, Ministry of Agriculture and Cooperatives.
A.5.2.4 Dry rhizomes in shade, clean, and well ventilated. The time for drying depends on
the moisture of rhizomes and the condition of climate in each area.

A.5.2.5 Grade quality and size according to the standard or the requirement of trading
partners.

A.5.2.6 Keeping the rhizomes 2 weeks before packing in order to observe the sign of wilt.
Rhizomes shall be carefully packed into the box. The quantity of rhizomes shall not be
excessive so that will affect the quality.

A.6 Personal health and safety of workers

A.6.1 Appropriate and sufficient health care shall be provided for workers. In case workers
have been injured or sick, they shall see a doctor.

A.6.2 There shall be adequate personal protective equipment such as masks, gloves, hat,
and shoes in order to prevent workers exposed to toxic substances.

A.7 Record keeping

A.7.1 Record keeping for further auditing shall be as follows:
(1) Management of planting area / planting materials
(2) Managing water used in the production process
(3) Application of pesticides
(4) Sources of rhizomes
(5) Pest surveillance and control
(6) Pest control methods after harvest

A.7.2 Records shall be kept at least 1 year.