



THAI AGRICULTURAL STANDARD

TAS 5901-2010

**GOOD AGRICULTURAL PRACTICES FOR
CASSAVA**

National Bureau of Agricultural Commodity and Food Standards

Ministry of Agriculture and Cooperatives

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Good Agricultural Practices for Cassava**

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Thailand is the first rank of the world cassava exports. Nevertheless, nowadays there are problems on practices in cassava cultivation, causing the decrease of both quantity and quality that does not meet the market requirements. So, the Agricultural Standards Committee deems it necessary to establish an agricultural standard on Good Agricultural Practices for Cassava as guidance for farmers leading to increase the number of farm certification.

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

Department of Agriculture. 2008. Good Agricultural Practices for Cassava. Department of Agriculture, Ministry of Agriculture and Cooperatives.

TAS 9001- 2009. Thai Agricultural Standard: Good Agricultural Practices for Food Crops, National Bureau of Agricultural Commodity and food Standards.



NOTIFICATION OF THE MINISTRY OF AGRICULTURE AND COOPERATIVES
SUBJECT: THAI AGRICULTURAL STANDARD:
GOOD AGRICULTURAL PRACTICES FOR CASSAVA
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 Cassava as a voluntary standard in accordance with the Agricultural Standards Act B.E. 2551 (2008) to promote such agricultural commodity to meet its standards on quality 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 Cassava (TAS 5901-2010) as a voluntary standard, details of which are attached herewith.

Notified on 28 April B.E. 2553 (2010)
Mr. Theera Wongsamut
Minister of Agriculture and Cooperatives

**THAI AGRICULTURAL STANDARD
GOOD AGRICULTURAL PRACTICES FOR CASSAVA**

1 SCOPE

This agricultural standard establishes the requirements for production practices for cassava, *Manihot esculenta* (L.) Crantz, Family Euphorbiaceae covering planting area, to the drying area or collection center in order to obtain the cassava that is of good quality, safe and suitable for use taking into account the environment, health, safety and welfare of workers.

2 DEFINITIONS

For the purpose of this standard:

2.1 **Visual Inspection** means the inspection of any external appearance 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 operation and process are also necessary to be inspected visually.

2.2 **Traceability/product tracing** means the ability to follow the movement of a food through specified stage(s) of production, processing and distribution.

2.3 **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.

2.4 **Pest** means living organism such as disease, insect, animal and weed that is harmful to crop.

3 REQUIREMENTS AND INSPECTION METHODS

Requirements and inspection methods shall be as in Table 1.

Table 1 Requirements and Inspection Methods
(Section 3)

ITEMS	REQUIREMENTS	INSPECTION METHODS
1. Planting location	1. The planting area and water sources shall not be exposed to the risk of heavy metal, and pesticide residue contamination at the level exceeded the requirements of related law and regulations.	1. Visual inspection of the environment. If there is any risk, the soil and water quality shall be analysed.

ITEMS	REQUIREMENTS	INSPECTION METHODS
2. Use of pesticides	2. If it is necessary to use, the worker shall have the knowledge to properly apply and follow the recommendations of the Department of Agriculture (DOA), Ministry of Agriculture and Cooperatives or the instruction on the labels registered thereto. Pesticide contamination to the public water sources shall be cautious.	2. Assess workers' knowledge or evidence of training or inspect their practices. Check records in case of pesticide application.
3. Pre- harvest production	3.1 Soil shall be conserved and nourished.	3.1 Visual inspection of soil preparation or interview and check record of soil nourishment depending on the areas.
	3.2 Stem cuttings shall be free from pest.	3.2 Visual inspection and check the record on the sources of stem cuttings.
	3.3 Pest shall be efficiently controlled after planting within three months.	3.3 Check records and/or visual inspection
4. Harvest	4. Cassava shall be harvested during 8 to 18 months of age.	4. Check records
5. Transport	5. Harvested cassava shall be transport to drying area or collection center rapidly or no later than two days.	5. Check records
6. Worker health	6. Provide appropriate and sufficient health care to workers.	6. Visual inspection and interview.
7. Record keeping	7.1 The following data shall be recorded in order to assess and trace the practices. - the sources of variety and stem cutting, fertilizer and pesticide - pesticide application - soil nourishment e.g. organic fertilization, chemical fertilization, and/or crop rotation. - Weed and other pest control - Date of planting, harvesting, and transportation. - Trader information or the source of collection center where each lot of	7.1 Check records

ITEMS	REQUIREMENTS	INSPECTION METHODS
	cassava is sold.	
	7.2 Records shall be kept at least 18 months from the date of transportation.	7.2 Visual inspection or interview

4 GUIDANCE ON GOOD AGRICULTURAL PRACTICES FOR CASSAVA

The recommendations on good agricultural practices for cassava are to provide farmers with good practices from planting, to drying area or collection center in order to obtain the certification of Good Agricultural Practices for Cassava. Details of the recommendations are given in Appendix A.

APPENDIX A

GUIDANCE ON GOOD AGRICULTURAL PRACTICES FOR CASSAVA

(Section 4)

A.1 Planting location

A.1.1 If the environment of planting area or water source is in the location exposed to any risk of heavy metal and pesticide contamination such as near industrial plants or the areas with heavy use of chemicals or pesticides, soil and water shall be sampled for analysis of heavy metals^{1/}, pH and other contaminants at the early stage of production. During the harvest, cassava tubers shall be sampled for heavy metals and pesticide residues and sent for analysis at official laboratory or officially accredited laboratory. The analytical reports shall be kept as evidence.

A.1.2 Land use history shall be recorded for each plot indicating name of the farmers, address, name of the plot keeper (if any), address, area size, plot location, types and varieties and other details (if any).

A.2 Use of pesticides

A.2.1 Workers should have knowledge on the pests and regularly survey pests such as leave blight, mealy bugs, red mite, whitefly and other pests. If it is necessary to use pesticides, the workers should select proper pesticides and apply dosage coincided with the pest found from the survey and use according to the recommendations of the Department of Agriculture (DOA), Ministry of Agriculture and Cooperatives or the instruction on the labels registered with by the DOA and record the application in the form given in Appendix B (Sample form: Record form on pest survey and pesticide application). Furthermore, the equipment and chemical sprayers shall be checked so that they are ready to use efficiently. The workers shall wear protective clothing and personal protective equipment such as masks, gloves, hats and boots to protect themselves from pesticide exposure.

A.2.2 Pesticides shall be kept in secured and well ventilated storage to be out of reach of children and pets and protected from sunlight and rain. 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.

A.3 Pre- harvest production

A.3.1 Soil shall be conserved and nourished.

^{1/} Reference from National Environment Board No.25 (2547) entitled Soil Quality Standard

A.3.1.1 Soil conservation to prevent soil erosion can be done by proper soil preparation such as

- (1) Traditional area; tillage is used to get rid of roots, rhizomes, tubers and stolons of perennial weeds.
- (2) Slope area; furrowing across the slope or growing Vetivar grass in strip cropping is used to protect the soil erosion from water runoff.
- (3) Compacted soil or hardpan soil; ripper is used to break up the hard pan.

A.3.1.2 Soil nourishment to prevent soil fertility loss and soil deterioration can be done as follows:

- (1) The use of organic fertilizer to increase organic matter in soil; the materials should be composted or processed by other methods to gain complete fermentation in order to decrease the amount of pathogenic microorganisms. The rate of organic fertilizer is 500-1,000 kg per Rai.
- (2) The use of chemical fertilizer; only fertilizers registered with the DOA are allowed. The formula of 15-7-18 or 15-15-15 should be used at the rate of 30 – 50 kg per Rai for clay loam or pebble clay and at the rate of 50 – 100 kg per Rai for sandy loam or sandy soil. Fertilizer shall be used only once after planting 1-2 months when soil is moist enough by side application along sides of the rows and till over.
- (3) Crop rotation or crops nourishing such as peanut, jack bean, cowpea, and jute shall be cultivated every other year or cultivated them between rows of seasonal crop to maintain soil fertility rather than only cassava cultivation.

A.3.2 The selection of stem cuttings

Prior to planting, high yield variety of stem cuttings shall be selected according to the official recommendation. They should be well adapted in that planting environment and be free from pest. The stem cuttings shall be the age of 8 to 12 months and they shall be used within 30 days. They should be soaked in Thiametixam 25% WG^{2/} solution at the concentration of 4 grams per 20 liters of water for 5-10 minutes in order to prevent mealy bugs.

A.3.3 Pest control

During growing season, planting area shall be regularly checked. Within 3 months after planting, weeds shall be efficiently controlled. There was a severe outbreak of mealy bugs in 2551 B.E. (2008) which have never been found before. So, the significant pest shall be controlled as follows:

A.3.3.1 Weed control

- (1) Plow 1 time and dry soil 7-10 days, then terrace 1 time. Get rid of the weed root, rhizome, tubers and stolons of perennial weeds.
- (2) Weeding at least two times through the growing season as follows:

The first weeding: immediately spray herbicide after planting prior to weed germination or at the stage of seedling. Weeding using spades, small machine or animal between the planting rows shall be used when cassava is at 1 – 2 months of age before fertilizing.

^{2/} WG (Water dispersible granules) means granule type.

The second weeding: use spades or spraying the herbicide again if there are annual narrow leave weeds more than 50% of the area.

(3) The significant weeds are as follows:

- Annual weeds are the weeds which life cycle is within one season and is normally propagated by seeds.

Narrow leave type are such as hairy fountain grass, foxtail grass, goose grass, finger grass, crowfoot grass, jungle rice grass, sprangletop grass, etc.

Broad leave type are such as swamp cabbage, goat weed, horse purslane, pigweed purslane, desert horsepurslane, spiny amaranth, asthma weed, small white flower morningglory, etc.

Sedge type are such as umbrella sedge, etc.

- Perennial weeds are weeds which is bred by roots, rhizomes, tubers and stems rather than seeds.

Narrow leave type are such as running grass, cogon, grass, yellow hairy fountain grass, etc.

Broad leave type are such as siam weed, creeping plant, spreading dayflower, sensitive plant, etc.

Sedge type are such as nutgrass, etc.

A.3.3.2 Control of mealy bugs

(1) Avoid planting cassava in dry season.

(2) Plow and till the soil several times, and dry the soil at least 14 days.

(3) Stem cuttings should be soaked with Thiamethoxam 25% WG or Imidacloprid 70 % WG at the concentration of 4 grams per 20 liters of water or Dinotefuran 10 % WP^{3/} at the concentration of 40 grams per 20 liters of water for 5-10 minutes.

(4) If the outbreak of mealy bugs occurs when the cassava is at the age of 4-8 months, cut the part of plants damaged by mealy bugs and remove, burn or eliminate from the planting areas. Immediately spray pesticides especially at the area of the mealy bugs found. The severe outbreak of mealy bugs should not be neglected due to the fact that cassava may not form tubers due to the damage of xylem and phloem. If the severe outbreak has occurred, the leaves would be curl and the eggs of mealy bugs covered with white fiber similar to cotton wool are found. The plant shall be uprooted randomly in order to see whether the tuber could be sold or not. If any, they should be immediately sold. If not, they should be all uprooted.

(5) If the outbreak of mealy bugs has occurred when the cassavas are at the age of more than 8 months, cut the part of plants damaged by mealy bugs and remove, burn or eliminate from the planting areas. Spray pesticides according to the recommendations of the DOA or instruction on the labels registered with DOA, Ministry of Agriculture and Cooperatives and dig the tubers for selling.

A.4 Harvest

^{3/} WP (wetable powder) means form of powder.

Cassava shall be harvested at the age of 8-18 months. Normally, the appropriate age is 12 months. If farmers use the varieties introduced by the officials, the quantity of starch is 20% higher than the traditional ones. To obtain good quality of fresh cassava tubers, these practices should be followed:

- 1) Cut the stems with knives above the ground about 30 cm. Uproot the tubers by using equipment or the digging machines and the cut stems shall be covered the soil as green manure.
- 2) Cut off tubers without or with the least rhizomes.
- 3) Tap the tubers in order to loosen soil and sand as much as possible.

In case cassava is chopped at the drying area for producing quality cassava chips, the practices should be as follows:

- 1) Chop tubers by cassava chip machines at the clean ground which may be concrete or soil covered with floor covering materials.
- 2) Dry the cassava chips by regularly spreading over the ground (12 tons of fresh tubers per 1 Rai of drying area) and turning 5 times a day (2 times in the morning, and 3 times in the afternoon).
- 3) If the weather is clear with strong sunlight, drying time is 3 days.
- 4) Cover with canvas to prevent from dew and rain at night.
- 5) If there is a problem of insect damage, clean the drying area to get rid of the habitat and food source of insects.

A.5 Transport

Fresh harvested cassava shall be transported rapidly from the planting areas to drying area or the collection center within 2 days in order to prevent the risk of microorganisms causing rotten produce and lower percentage of starch. The trucks for cassava transportation should not be used for soil, animals or dung which can cause the contamination of disease. The trucks should be cleaned appropriately before the transportation.

A.6 Worker Health

A.6.1 Appropriate and sufficient health care shall be provided for the workers. In case workers have been sick, they should inform the manager. The workers who use the pesticides should have appropriate health check.

A.6.2 The worker welfares such as meal, water, first-aid medical should be appropriately provided.

A.7 Record keeping

A.7.1 Record keeping of assessing and tracing at the farm level shall be as follows:

- Size of planting areas, yield per/Rai
- Source of stem cuttings and names of varieties, fertilizer and pesticides

- Application of pesticides
- Nourishment of soil e.g. organic and chemical fertilization, and/or crop rotation
- Weed and other pest control
- Date of planting, harvesting, and transportation
- Trader information or the sources of collection center where each lot of cassava is sold

A.7.2 Records shall be kept at least 18 months from the date of transportation.

APPENDIX B

RECORD FORM ON PEST SURVEY AND PESTICIDE APPLICATION

(Section A.2)

Farmer's name.....Family name.....

ID Number Plot code.....

Planting area..... Plant name..... Variety.....Plot number.....

Plot size.....Rai. Total plant number.....plants. Crop year.....

Production process	Pest survey				Pesticide application					Other control	Worker's name
	Date	Survey Output			Date	Pesticide name	Active ingredient (%), formula	Dosage	Total Quantity		
		pest	Not Found	Found							

N.B. application dosage used e.g. g/Rai or kg/Rai or ml/water 20 L

APPENDIX C
UNIT

The units and symbols used in this standard and the units recognized by the International System of units (*Le Système International d' Unités*) or SI are as follows:

Measurement	Unit	Symbol
Length	centimetre	cm
Volume	Litre	L
	Cubic centimetre	cm ³
Weight	gram	g