Field and Renewable Energy Crops Research Institute

Department of Agriculture

Ministry of Agriculture and Cooperatives

ก้าวไกลกับกรมวิชาการเกษตร

Preface

Field and Renewable Energy Crops Research Institute, henceforth FCRI, is responsible for conducting researches and developments for knowledge and innovation in field crops and renewable energy crops and provide technical services and transfer technologies, integrated cooperation from all sectors in order to develop systemic knowledge, innovation and management for international standard of yield and product qualities with environmentally friendly and competitively practices.

The objective of the publication is to introduce organizational of structure, mission, crop situations, outstanding researches and international cooperation projects of Field Crops and Renewable Energy Crops Research Institute.

I would like to express my sincerely thank to all executives, researchers and staff who have been created field crops and renewable energy crops technologies for food security both qualities and quantities under sufficient economy as well as reduction inequality and increase in farmers' life qualities.

Sumana Ngampongsai

(Sumana Ngampongsai)

Director, FCRI

29 March 2020

Contents







FCRI Vision

FCRI

Creating innovative technologies in field crops and renewable energy crops for economic values, securities in food, energy and water resources as well as life quality improvement under environmentally friendly practices and sustainable

“Innovation for Life and Sustain”









FCRI Mission

FCRI

Research and development for knowledge and innovation in field crops and renewable energy crops in order to support economic drive capacity building of competition for the country and to support food and energy security and improve life quality of farmers and people

To provide technical services and transfer technologies to improve productivity competitive and life quality with environmentally friendly practices

To integrated cooperation from all sectors in order to develop systemic knowledge and innovation for improving quality of yields and products, utilize innovation to reach its maximal value of the country with international standard of environmentally friendly

To develop on Field and Renewable Energy Crops Research Institute to become high competence, modern good governance and creation of professional researchers

FCRI Value

FCRI

Professionalism Creative Thinking Modernize and Sustain

Professionalism

Creative

Modernize

Sustain

Strategic Issue

FCRI

01 Improve services to become an excellent modern and high performance organization

02 Develop industrial field crops technologies to reach international standards, demands of productions for domestic consumption and exportation and increasing competitive ability and value added

03 Create field crops and renewable energy crops technologies for food security both qualities and quantities under sufficient economy as well as reduction inequality and increase in life quality

04 Develop field crops and renewable energy crop technologies with environmentally friendly practices for sustainable biodiversity-based economy

05 Develop biotechnologies for innovative products and identity from field crops

Ultimate Goal

FCRI

Ultimate Goal

1. Production and values of field and renewable energy crops both for domestic and export markets continuously grow

2. Research papers of field and renewable energy crops can increase self-reliant potential in agriculture of farmers and raw material values with reduction of raw materials imported from overseas leading to increase economic benefits by 20% within 5 years

3. Research papers increase products from field crops and economic benefits by 20% within 5 years

Ultimate Goal

FCRI

4. Research papers and technologies can continuously increase the ratio of using renewable energy crop productions for renewable energy at least 30% by 2032

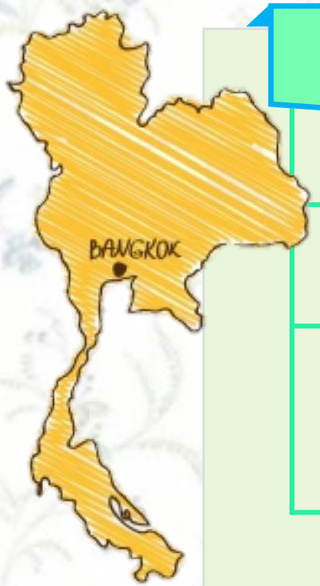
5. With research technologies, farmers would increase their incomes by 4% per annum, strengthen Small and Micro Community Enterprise over 100 groups and earn better money at least 15% per annum

6. The FCRI have outstanding competence, progressive and modern staff at least 85%

7. At least 85% of farmers, entrepreneurs and agricultural institutes have confidence and acceptance of FCRI and research papers

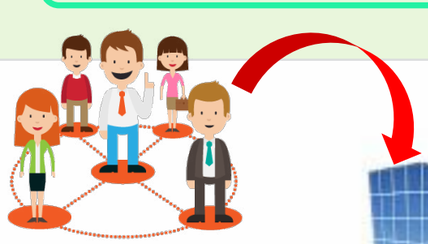
Organizational Structure

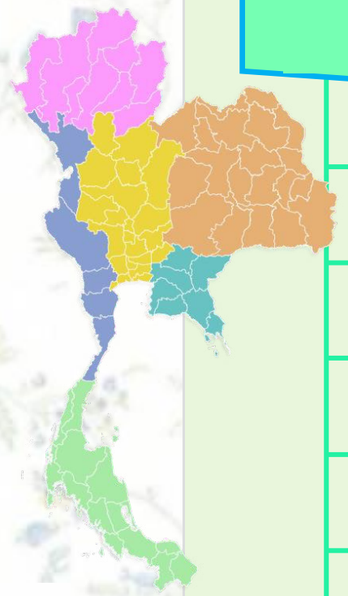
FCRI



Head Office

- Administration office
- Research Project Administration Group
- Research Group



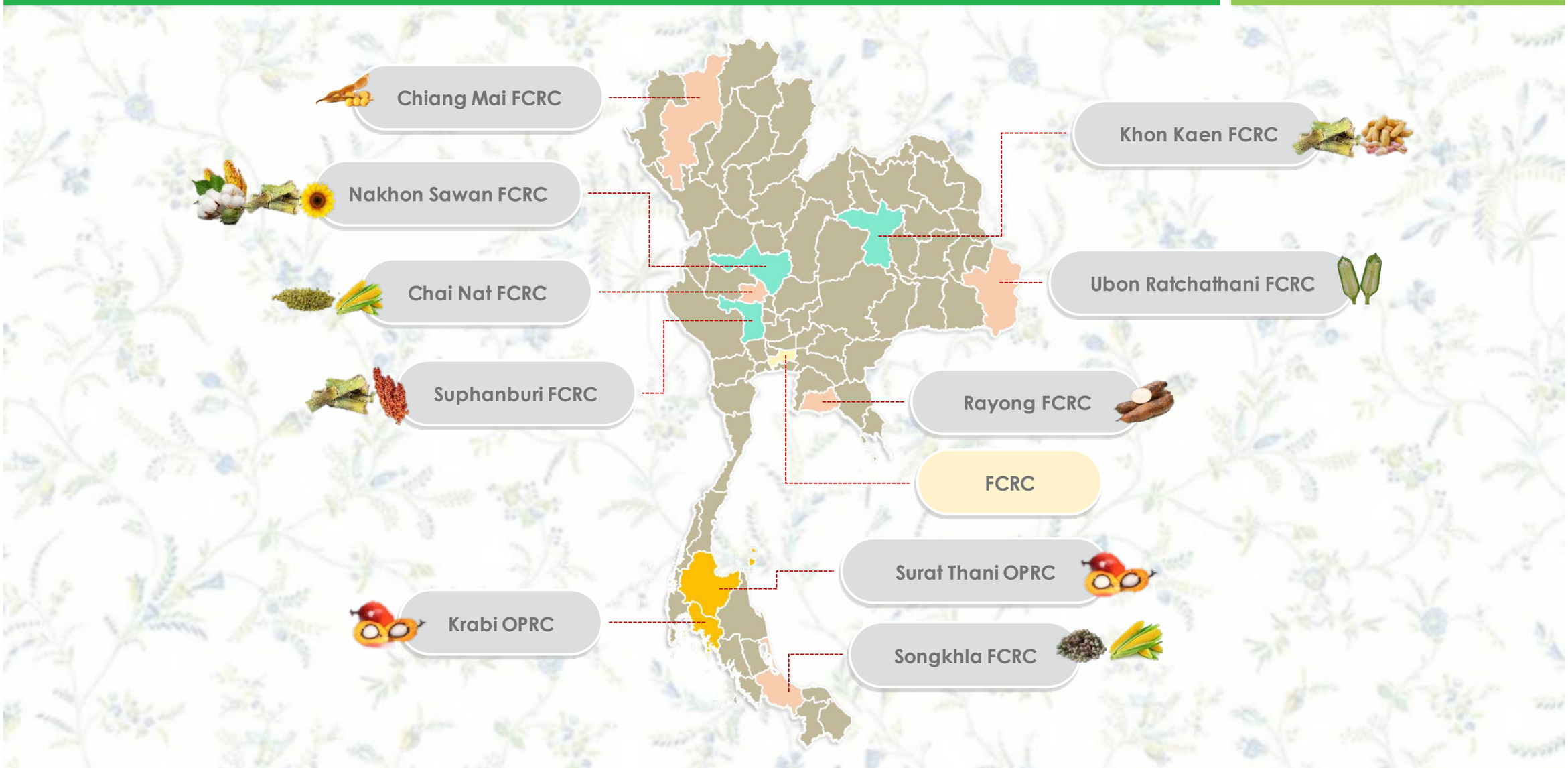


Research Centers

- Chiang Mai FCRC
- Khon Kaen FCRC
- Ubon Ratchathani FCRC
- Nakhon Sawan FCRC
- Chai Nat FCRC
- Suphanburi FCRC
- Rayong FCRC
- Songkhla FCRC
- Surat Thani OPRC
- Krabi OPRC

Field and Renewable Energy Crops Research Institute

FCRI



Human Resources of FCRI

FCRI

Head Office / Research Centers	Academic Personnel					General Personnel			Total
	Director	Expert Level	Senior Professional Level	Professional Level	Practitioner Level	Senior Level	Experienced Level	Operational Level	
Head Office	1	3	5	8	6		3	3	29
Chiang Mai	1		4	3	6		3	1	18
Khon Kaen	1		4	6	8		5	1	25
Chai Nat	1		3	4	2		2	1	13
Nakhon Sawan	1		4	2	5	1	1	1	14
Rayong	1		2	6	5		2	1	17
Ubon Ratchathani	1		5	4	1	1	2	2	16
Surat Thani	1		1	10	2		2	1	17
Krabi	1			2	2			1	6
Songkhla	1		1	3	2		2	2	10
Suphanburi	1		4	5	3		3	2	18
Total	11	3	31	53	42	2	25	16	183

Human Resources of FCRI

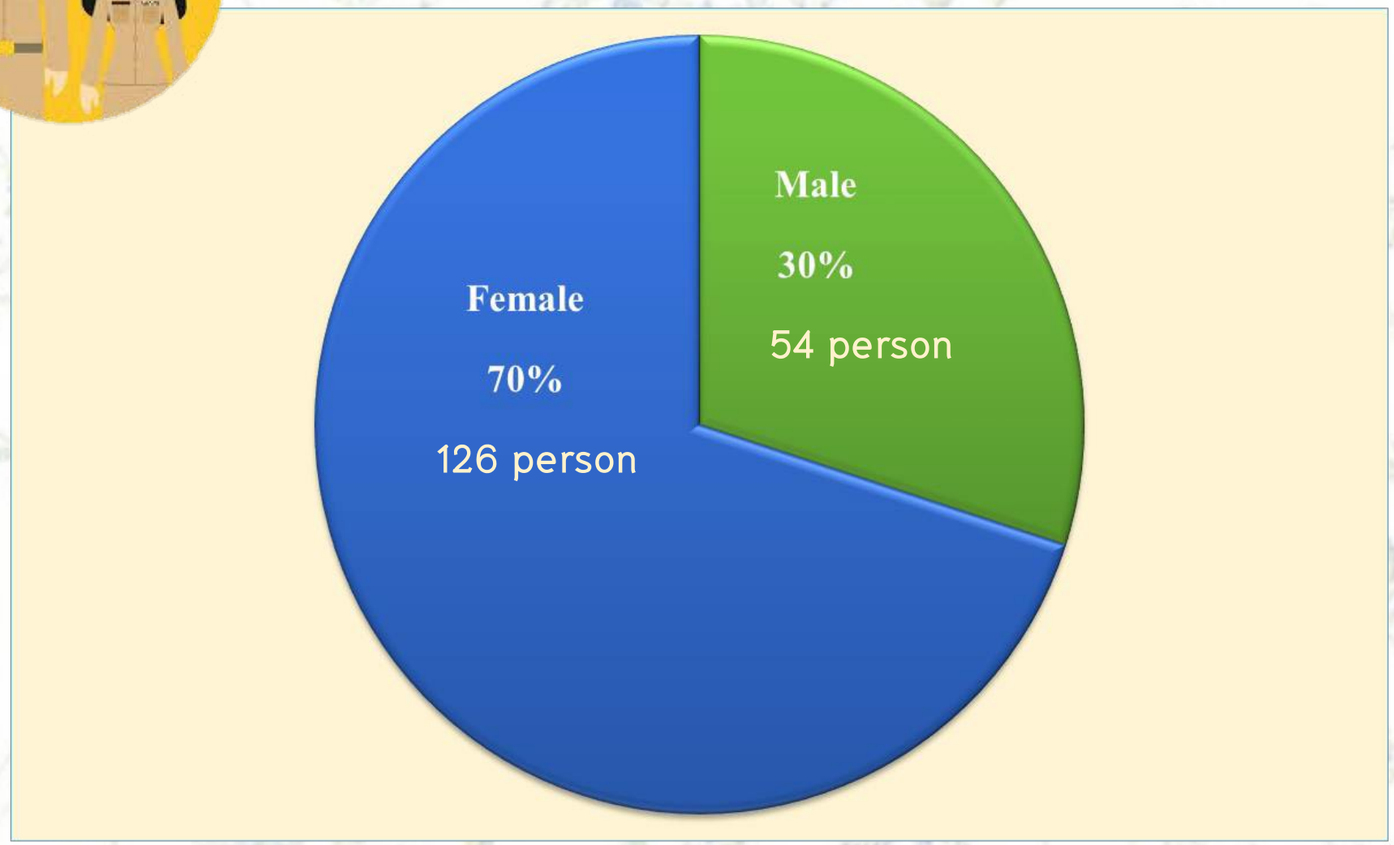
FCRI

Head Office / Research Centers	Education Background of Academic Personnel			Education Background of General Personnel				Total
	Ph.D.	Master	Bachelor	Master	Bachelor	Dip. Voc. Cert.	Voc. Cert.	
Head Office	7	13	3	1	2		3	29
Chiang Mai	1	13		1	2	1		18
Khon Kaen	3	13	3		4	2		25
Chai Nat		8	2		3			13
Nakhon Sawan	1	7	3		1	1	1	14
Rayong	2	11	1		2	1		17
Ubon Ratchathani		9	2		1	3	1	16
Surat Thani	3	9	2			3		17
Krabi	1	3	1			1		6
Songkhla		6				2	2	10
Suphanburi		7	6		3	2		18
Total	18	99	23	2	18	16	7	183

Human Resources of FCRI

FCRI

Government Officer

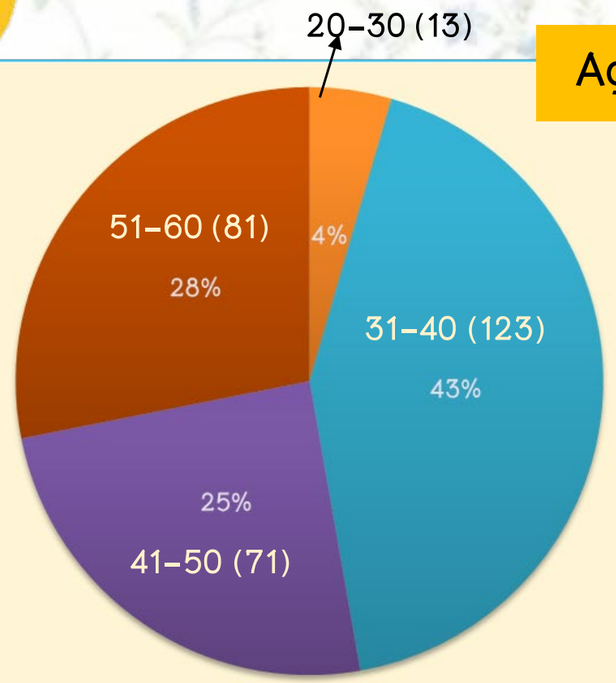


Human Resources of FCRI

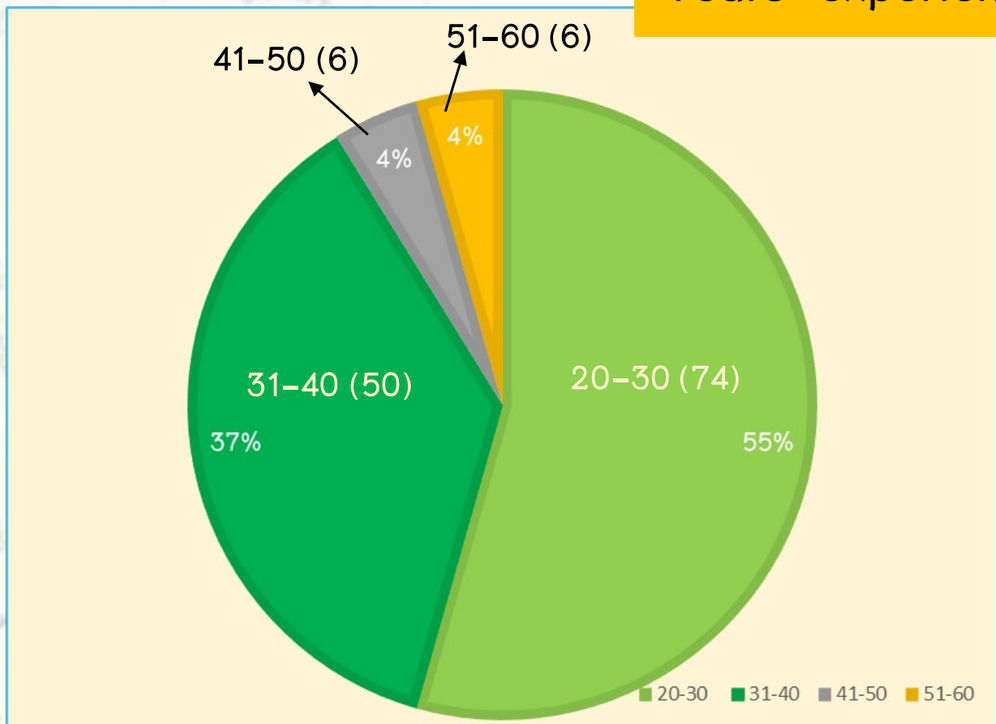
FCRI

Government Officer

Age group



Years' experience

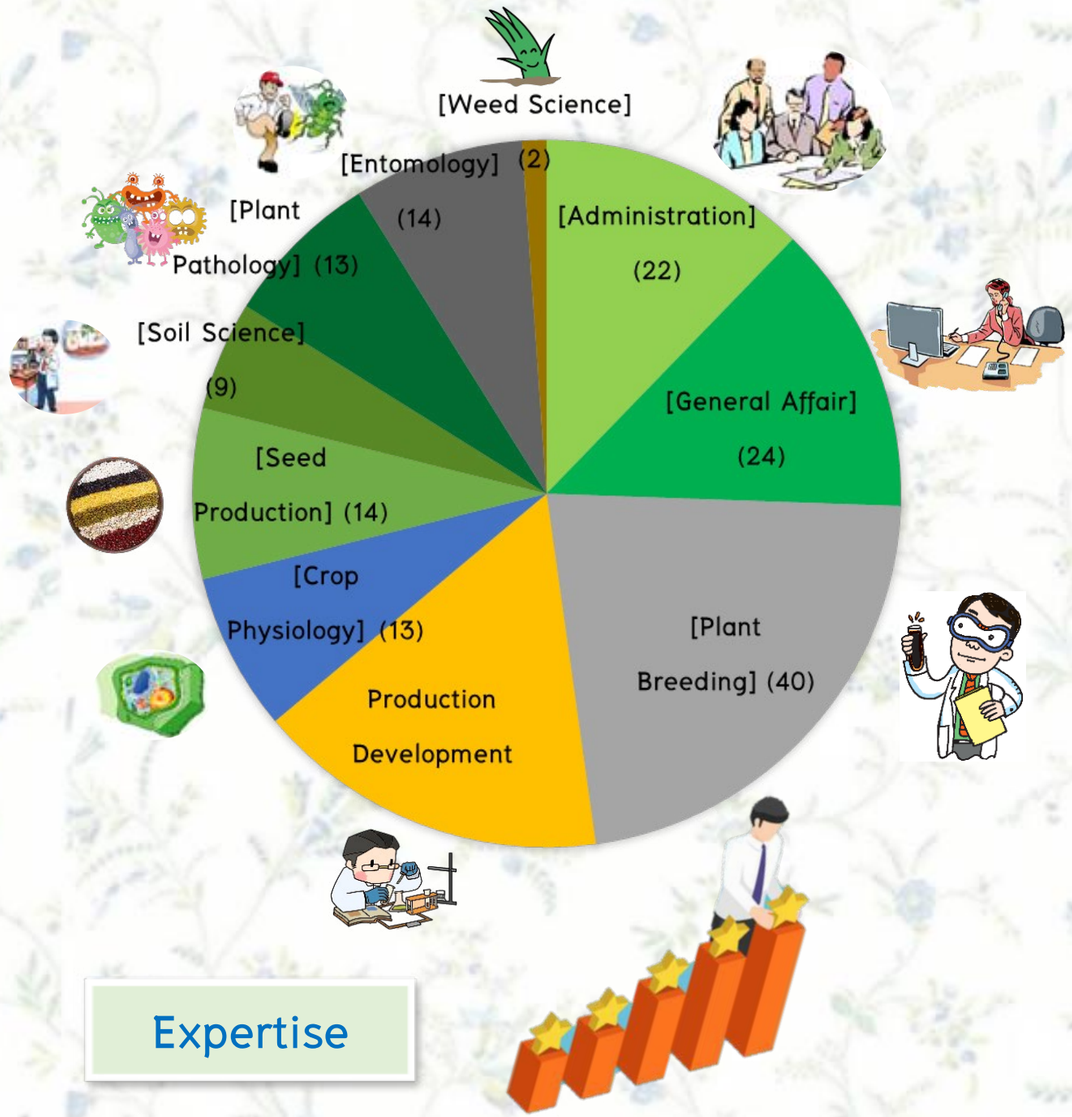


Human Resources of FCRI

FCRI

Job Position

Position Category



Expertise

Plant Situation year 2018 / 2019

FCRI

Plant Situation year 2018 / 2019

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Sugarcane

Planted Area 1.83 mil ha

Production 131 mil tons

Average Yield 71 tons/ha

Farm Value 3,316 mil $US

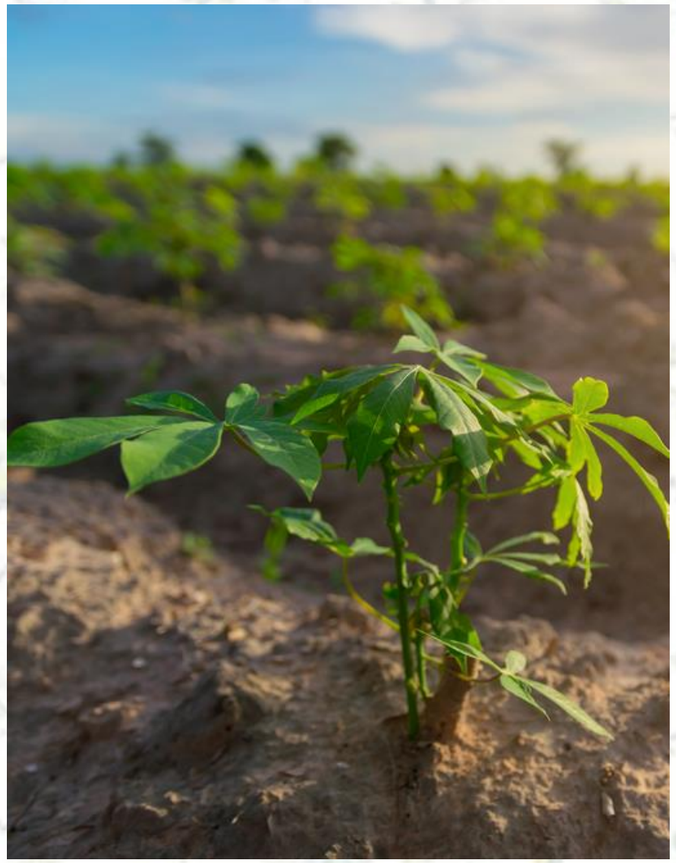
Favorite varieties for farmers

- Khon Kaen 3 = 74%
- LK 92-11 = 20%
- U Thong 12 and U Thong 15 = 7%

Plant Situation year 2018 / 2019

FCRI

Cassava



Planted Area 1.4 mil ha

Production 31 mil tons

Average Yield 22.6 tons/ha

Farm Value 2,045 mil $US

Favorite varieties for farmers

Rayong 5 Rayong 72 Rayong 7

and Rayong 9 = 65%

Plant Situation year 2018 / 2019

FCRI

Oil palm

Planted Area 0.92 mil ha

Harvested Area 0.81 mil ha

Production (fresh fruit bunch) 15.39 mil tons

Average Yield 21.25 tons/ha

Farm Value 3,900 mil $US

Favorite varieties for farmers

Surat Thani 1-9 = 23%

Plant Situation year 2018 / 2019

FCRI

Maize

Planted Area 1.11 mil ha

Production 31.5 mil tons

Average Yield 4.65 tons/ha

Farm Value 1,357 mil $US

Favorite varieties for farmers

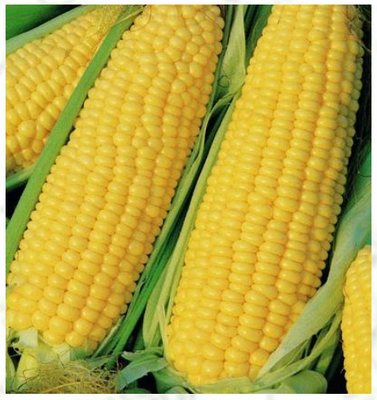
Private sector: 95%

Government sector: 5%

Plant Situation year 2018 / 2019

FCRI

Sweet Corn



Planted Area 39,520 ha

Harvested Area 39,040 ha

Production 537,000 tons

Average Yield 13.76 tons/ha

Favorite varieties for farmers

Private sector: 98%

Government sector: 2%

Plant Situation year 2018 / 2019

FCRI

Soybean





Planted Area 24,210 ha

Production 43,000 tons

Average Yield 1.794 tons/ha

Farm Value 22.83 mil $US

Favorite varieties for farmers

Chiang Mai 60 = 90%

Other = 10%

Plant Situation year 2018 / 2019

FCRI

Mungbean

Planted Area 130,216 ha

Production 111,235 tons

Average Yield

0.86 tons/ha

Favorite varieties for farmers

Chai Nat 84-1 = 40% Chai Nat 72 = 40%

Other = 20%

Plant Situation year 2018 / 2019

FCRI

Black Gram

Planted Area 8,461 ha

Harvested Area 7,374 ha

Production 6,283 tons

Average Yield 0.85 tons/ha

Favorite varieties for farmers

- Chai Nat 80 = 50%
- Phitsanulok 2 = 30%
- Chai Nat 4 and Chai Nat 6 = 20%

Plant Situation year 2018 / 2019

FCRI

Peanut

Planted Area 15,996 ha

Production 33,830 tons

Average Yield 2.11 tons/ha

Favorite varieties for farmers

- Tinan 9 = 60%
- Khon Kaen 6 = 20%
- Khon Kaen 84-8 SJ 38 and Khon Kaen 5 = 14%
- Kalasin 2 = 5%

Plant Situation year 2018 / 2019

FCRI

Sesame

Planted Area 1,367 ha

Harvested Area 1,217 ha

Production 1,132 tons

Average Yield 1.04 tons/ha

Favorite varieties for farmers

Ubon Ratchathani 1, 2, 3 = 10%

Native species = 90%

Plant Situation year 2018 / 2019

FCRI

Sorghum

Planted Area 4,781 ha

Harvested Area 4,770 ha

Production 5,958 tons

Average Yield 1.25 tons/ha

Favorite variety for farmers

Hybrid Seed

Plant Situation year 2018 / 2019

FCRI

Cotton

Area

Planted Area 160 ha

Harvested Area 128 ha

Production

Yield 160 tons

Average Yield 1.25 tons/ha

Varieties

Favorite varieties for farmers

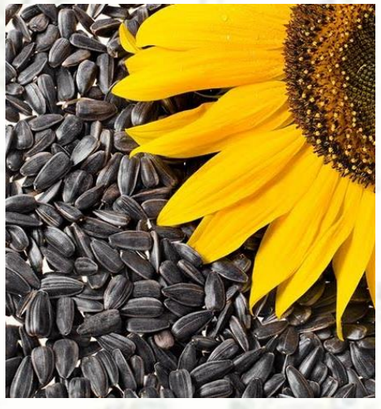
DOA Varieties = 80%

Other = 20%

Plant Situation year 2018 / 2019

FCRI

Sunflower



Planted Area 1,982.4 ha

Harvested Area 1,982.4 ha

Production 3,551 tons

Average Yield 1.7625 tons/ha

Favorite varieties for farmers

Private sector: 92%

Government sector: 8%

Summary

Operating Performances Year 2018 / 2019

Research works of 2018: New field crop varieties

FCRI

Four new field crop varieties

Oil plam

"Surat Thani 9"

Thick pulp, thin hard shell and high crude palm oil per each fruit

Cotton

"Tak Fa 6"

High yield

Brown staple

Blackgram

"Chai Nat 4"

Suitability for producing beansprout

blackgram

"Chai Nat 6"

Suitability for producing beansprout

Research works of 2019: New field crop varieties

FCRI

Eight field crop varieties

Mungbean

"Chai Nat 3"

Large size seeds, suitable for processing sticky and soft vermicelli

Maize

"Nakhon Sawan 4"

Drought tolerance and perfect root system

Maize

"Nakhon Sawan 5"

Short harvest, Drought tolerance Resistance to Northern Corn Leaf Blight and Southern Rust disease

Cassava

"Rayong 15"

Short harvest and high starch content

Research works of 2019: New field crop varieties

FCRI

Eight field crop varieties

Cotton

"Tak Fa 7"

High yield Big boll size

Tolerance Cotton leaf

hopper resistance to Cotton

leaf-roll disease

Waxy Corn

"Chai Nat 2"

High yield, white-purple

seed and having soft and

sticky quality of seed

Juice cane

"Si Samrong 1"

High sugar content,

moderately resistance to

smut disease and

red rot-wilt disease

Peanut

"Khon Kaen 9"

High protein content and

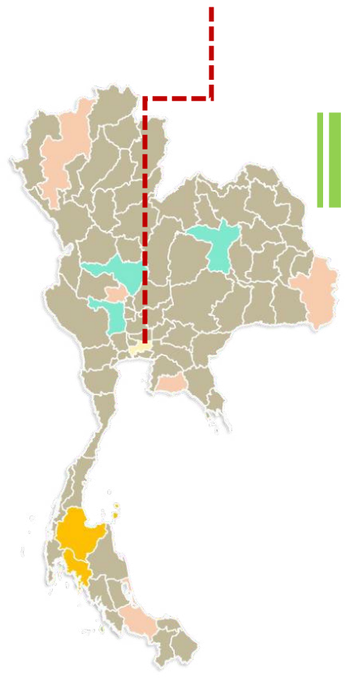
high dry-pod yield

Outstanding Researches

Research centers, Mandate crops & seed production plan

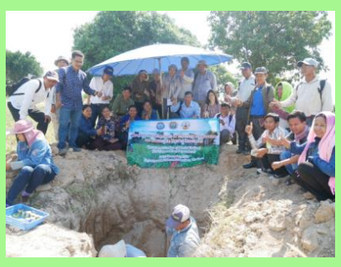
Field and Renewable Energy Crops Research Institute

FCRI



Outstanding Research

Development of Training Programme on Cassava in Border Provinces (Farm and Soil Management)



Chiang Mai Field Crops Research Center

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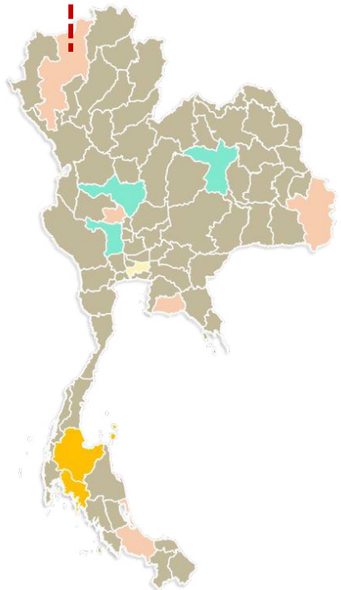


Mandate crops and Seed production

Soybean

Vegetable Soybean

Outstanding Research

Enhancement and Development of Thai Soybean Products Through New Innovations to Commercialization

Soybean Yogurt Lotion

Soybean Liquid soap

Soybean French Fries

Soybean Yogurt

Khon Kaen Field Crops Research Center

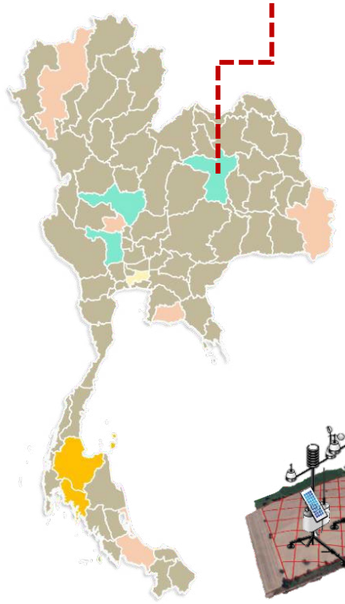
FCRI

Mandate crops and Seed production

Sugarcane

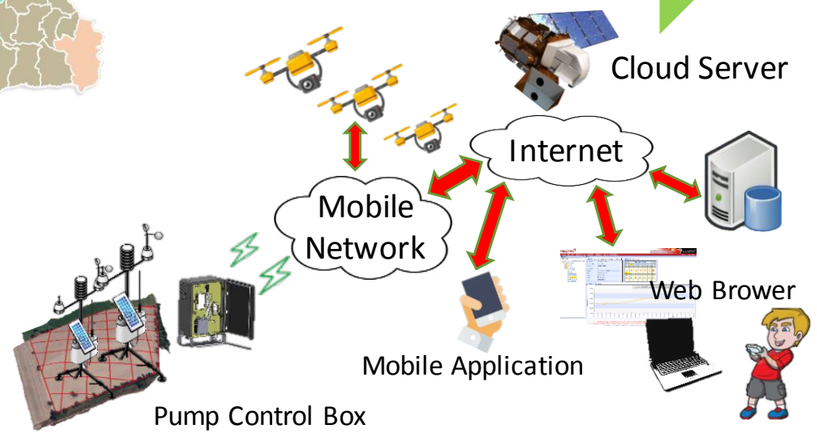
Peanut

Cassava



Outstanding Research

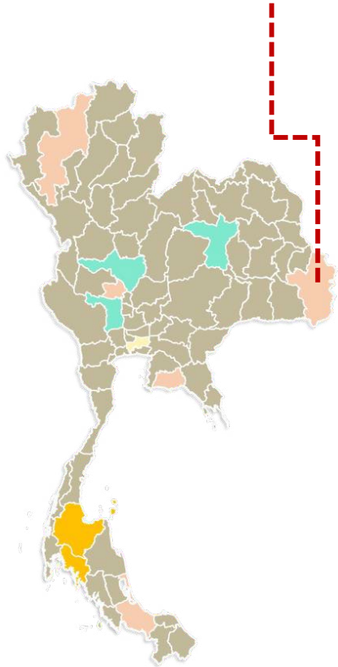
Smart Farm/Intelligent farm for sugarcane production



This research center works as a demonstration farm for sugarcane production with smart farming technique in order to facilitate the farmers to access to the archives easily, consequently, they can perform the crop production accurately with high technology.

Ubon Ratchathani Field Crops Research Center

FCRI



Outstanding Research

Mandate crops and Seed production

Sesame

Oil palm

Peanut

Cassava

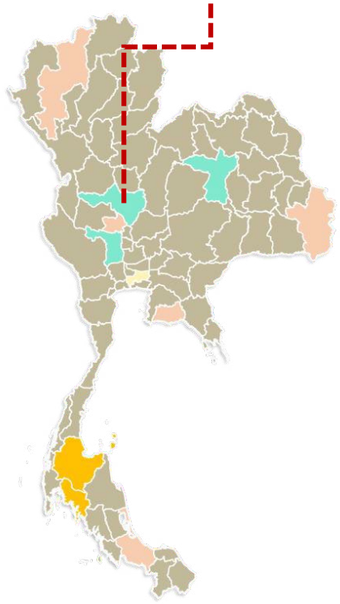
Sesame....From Field to Paddy Field

Cowpea

Sugarcane

Nakhon Sawan Field Crops Research Center

FCRI



Mandate crops and Seed production

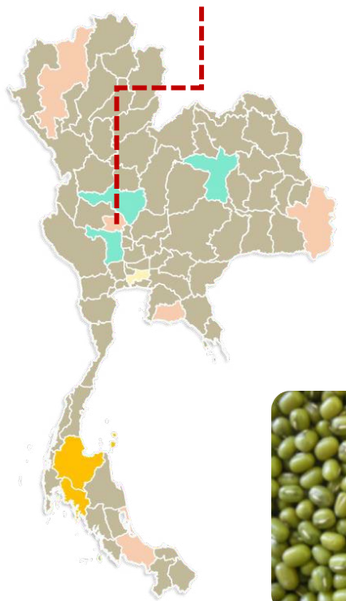
Maize Sugarcane Cotton Sunflower

Outstanding Research

Effect of Planting Date and Cultivar on Kernel and Ear Rot of Maize

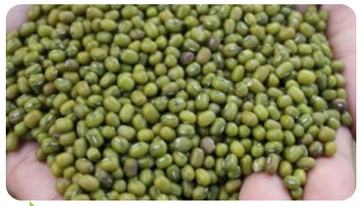
Chai Nat Field Crops Research Center

FCRI



Mandate crops and Seed production

Mungbean



Specialty corns

Outstanding Research

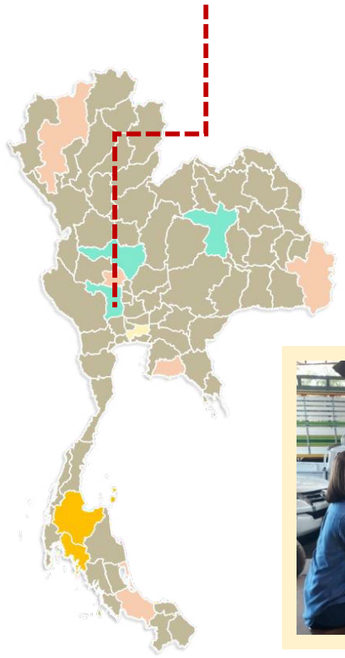
Innovation of Field Crops Vareities : Mungbean and Waxy corn

Mungbean “Chai Nat 3”

Waxy Corn “Chai Nat 2”

Suphanburi Field Crops Research Center

FCRI



Mandate crops and Seed production

Sugarcane

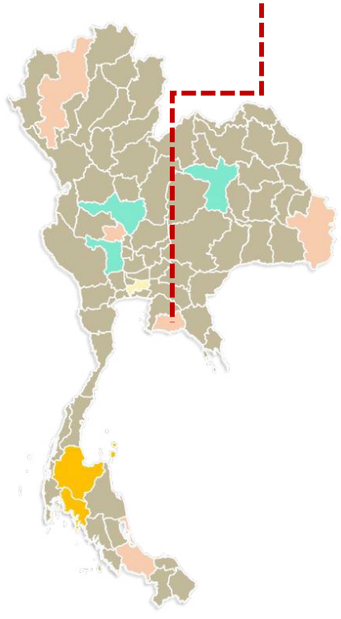
Sorghum

Outstanding Research

Sugarcane technology transfer from DOA to farmer

Rayong Field Crops Research Center

FCRI



Outstanding Research

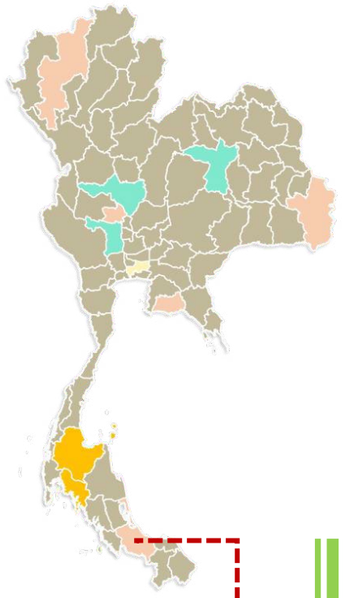
Mandate crops and Seed production

Cassava

Nutrient Management on Cassava Promising lines

Songkhla Field Crops Research Center

FCRI



Specialty corns

Mandate crops and Seed production

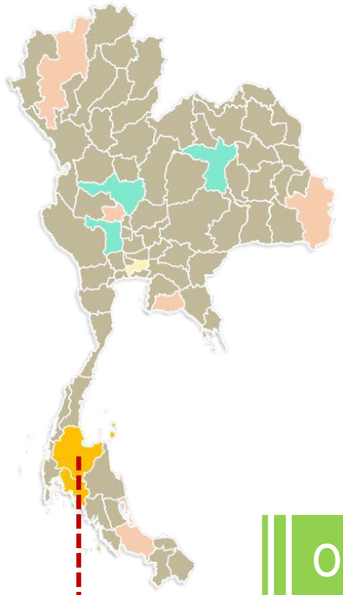
Bambara nut

Outstanding Research

Evaluation yield of Elite Juice cane Clones in Abandoned Upland Paddy Field

Surat Thani Oil Palm Research Center

FCRI



Mandate crops and Seed production

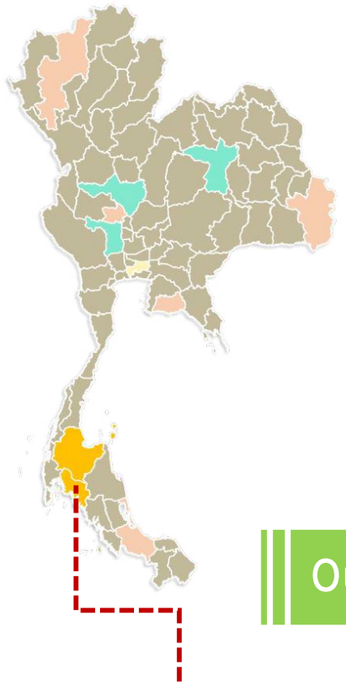
Oil palm

Outstanding Research

1. Testing backcross of oil palm interspecific hybrids line from *E. guineensis* x *E. oleifera* Cycle II
2. Chemical efficiency testing by trunk injection to control the coconut black headed catterpilla; Opisina arenosella (Walker)

Krabi Oil Plam Research Center

FCRI



Mandate crops and Seed production

Oil palm

Outstanding Research

Study on the efficiency of the chemical fertilizers and compost usage for oil palm seedling production during the peroid of main nursery (8–12 months)

Seed production plan of field crops and oil palm varieties 2019–2020

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Type	Class	Counting unit	2019	2020
Sugarcane	Foundation cutting	sticks	2,750,000	2,950,000
Cassava	Registered cutting	sticks	13,200,000	12,000,000
Maize	Hybrid Seed	tonnes	22.00	16.15
	Pure line	tonnes	12.00	14.00
Oil palm	–	tonnes	–	636,000
Sweet corn	Inbred Line Seed	tonnes	0.12	0.28
Sweet corn	Hybrid Seed	tonnes	3.10	3.30
Small Waxy corn	Certified Seed	tonnes	7.40	6.54
Peanut	Breeder Seed	tonnes	4.30	4.30
	Foundation Seed	tonnes	41.50	41.50
	Registered Seed	tonnes	58.00	58.00
	Certified Seed	tonnes	97.00	142.00
Vegetable Soybean	Certified Seed	tonnes	–	5.00

Seed production plan of field crops and oil palm varieties 2019–2020

FCRI

Type	Class	Counting unit	2019	2020
Mungbean	Certified Seed	tonnes	248.00	253.50
Peanut	Foundation Seed	tonnes	14.00	14.00
	Registered Seed	tonnes	73.00	72.00
	Certified Seed	tonnes	90	91
Cowpea	Registered Seed	tonnes	1.70	1.70
Bambara groundnut	Registered Seed	tonnes	2.00	7.00
Sunflower	Breeder Seed	tonnes	0.05	0.10
	Foundation Seed	tonnes	0.50	0.30
Sorghum	Breeder Seed	tonnes	0.50	0.05
	Foundation Seed	tonnes	5.00	0.50
	Foundation Seed	tonnes	–	4.00
Sesame	Foundation Seed	tonnes	1.50	2.00
Cotton	Breeder Seed	tonnes	0.05	0.05
	Foundation Seed	tonnes	0.50	0.50

International collaborative project

FCRI

KOPIA

Mungbean / Sugarcane /
Maize / Cassava

JIRCAS

Sugarcane

CIAT Cassava

Maize / Sweet Corn

CIMMYT

JICA Cassava

IAEA

Mungbean / Soybean
/ Cotton

TIGA Cassava

AFACI

Soybean / Peanut /
Maize / Cassava

JAAS

Soybean

YAAS

Soybean / Peanut /
Sugarcane / Maize /
Sweet Corn

Crops and Agricultural Technology researches

Eight Certified Field Crops

Eight Certified Field Crops

1.) Mungbean variety “Chai Nat 3” 2.) Late maturity Hybrid maize cv. “Nakhon Sawan 4”

3.) Early maturity Hybrid maize cv. “Nakhon Sawan 5” 4.) Cassava variety “Rayong 15”

5.) Cotton variety “Tak Fa7” 6.) Waxy Corn: “Chai Nat 2”

7.) Sugarcane cv. “Si samrong 1” 8). Peanut variety “Khon Kaen 9”

FCRI Research plan year 2019

Annual research year 2019: 69 topics

DOA Recommended field crop varieties for farmers

FCRI

No.	Field crops	Planted Area (rai) (1 rai = 0.16 ha)	DOA recommended field crops varieties for farmers	Planted area (%)	Planted area of DOA field crops varieties (rai)	Average yields (tons per rai)	Yield (tons)	Sale price (baht/ton)	Price (MB)
1	Sugarcane	11,400,000	Khon Kaen 3, U Thong 12 & U Thong 15	81	9,234,000	11.42	105,452,280	763	80,460
2	Cassava	8,700,000	Rayong 5, Rayong 72, Rayong 9 & Rayong 7	65	5,633,550	3.62	20,393,451	2,200	44,866
3	Oil palm	5,100,000	Surat Thani 1–9	24.68	1,258,680	3.40	4,279,512	7,400	31,668
4	Maize	6,800,000	Nakhon Sawan 3	5	340,000	1.106	376,040	8,250	3,102
5	Sweet corn	247,000	Songkhla 84–1 & Chai Nat 2	0.67	1,655	2.20	3,641	7,660	28
6	Small Waxy corn	35,215	Sukhothai 1	5.77	2,032	1.32	2,682	10,250	27
7	Sweet Waxy corn	100,000	Chai Nat 84–1	0.22	220	1.80	396	11,000	4

DOA Recommended field crop varieties for farmers

FCRI

No.	Field crops	Planted Area (rai) (1 rai = 0.16 ha)	DOA recommended field crops varieties for farmers	Planted area (%)	Planted area of DOA field crops varieties (rai)	Average yields (tons per rai)	Yield (tons)	Sale price (baht/ton)	Price (MB)
8	Soybean	160,000	Chiang Mai 60	90	136,181	0.29	39,492	18,330	765
9	Mungbean	855,000	Chai Nat 84-1 & Chai Nat 72	80	684,000	0.14	95,760	23,800	2,279
10	Peanut	124,000	Tinan 9, Khon Kaen 6, SJ 38, Khon Kaen 84-8, Khon Kaen 5 & Kalasin 2	99	122,760	0.34	41,738	51,000	2,129
11	Sesame	8,543	Ubon Ratchathani 1 and 2, Ubon Ratchathani 3	10	854	0.17	145	55,000	8
12	Cotton	1,000	Takfa 3, Takfa 84-4, Takfa 86-5, Takfa 6 & Takfa 7	80	800	0.20	160	35,000	6
13	Bambara groundnut	3,000	Songkhla 1	95	2,850	0.45	1,282	27,000	35
Total									165,547

Annual Achievement year 2019

FCRI

Applicable Research projects

Sugarcane production–enhancing research project

- Five demonstration farms for costs–minimizing sugarcane production
- Production of 10,000 hygiene sugarcane seedlings
- Reproduction of 20,000 Ring–legged Earwigs (*Euborellia annulipes* Lucus)
  - 40% distributing to farmers and industries
  - 20% to be used as the breeding stock for DOA

Cassava production–enhancing research project

- Reproduction of 70,000 pairs of parasitic wasps (*Anagyrus lopezi*)
  - 15% distributing to farmers
  - Parented varietie

Applicable Research projects (continue)

Project of Technology Transfer for Optimum of post rice field harvest cropping

1. Peanut seeds production (Registered seed)
   – Tainan 9 and Khon Kaen 84–1 for 1 ton for the support of optimum of post rice field harvest cropping.

2. Produce high quality peanut seeds with elimination of Aflatoxin contamination in seeds production and transforming process.

Annual Achievement year 2019

FCRI

Urgent research projects

Project of cropping system improvement in paddy field with the collaboration between Department of Agriculture and Rice Department

Prevention and control measures of cassava mosaic disease spreading

Fall armyworm in maize monitoring and warning systems

Project of a demonstration farm for sugarcane, cassava and maize production with smart farming technique “Smart Agriculture”

Pest and disease management

FCRI

1. Control of cassava mosaic disease

Epidemic situation

The active surveillance for cassava mosaic disease in the border area and cassava cuttings production area of Thailand has been continuously conducted by Department of Agriculture (DOA) and Department of Agricultural Extension (DOAE).

In the growing season of 2018–2019, the disease incidence of cassava mosaic disease had more severe than last year due to the transportation of infected cassava cuttings and the spreading of tobacco whitefly, a disease vector. Outbreak area was 8,947.84 ha (55,294 rai) which is equal to 0.57% of 1,547,648.96 ha (9,672,806 rai) of the total cassava cultivated area.

Disease spreading was reported in 15 provinces; Ubon Ratchathani, Sisaket, Surin, Buriram, Nakhon Ratchasima, Prachinburi, Chachoengsao, Chonburi, Kanchanaburi, Sa Kaeo, Rayong, Nakhon Sawan, Lopburi, Khon Kaen and Maha Sarakham.

Finally, all diseased plants which were grown on 2,097.76 ha (13,111 rai) were removed and destroyed according to the outbreak control measures.

Pest and disease management

FCRI

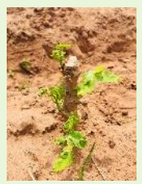
1. Control of cassava mosaic disease (continue)

The cassava mosaic disease's outbreak control project

This project was launched by Ministry of Agriculture and Cooperatives (MOAC) under the cabinet resolution on September 17th, 2019 and the budget for Department of Agricultural Extension (DOAE) of 248 million Baht was approved.

Prevention and control measures

- Destroy all parts of infected cassava plants
- The compensation for affected farmers is not more than 3,000 Baht per rai and the wage for diseased cassava plants destruction in the outbreak area is at 2,100 Baht per rai (1 rai = 0.16 ha)



Currently, the handbooks according to this project which was performed by DOAE and DOA have already been done, however, it's on the process of inquiry for budget approval from Bureau of the Budget accordingly.

Pest and disease management

FCRI

2. Control of fall armyworm in maize

DOA is monitoring this fall armyworm according the recommendations from The FAO and the following measures have been performed:

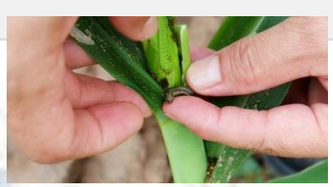
- Short-term measures: information awareness of pests, recommendations for emergency pest control, pest monitoring hotline
- Long-term measures: researches on pest control methods such as biological control, chemicals, cultural control (intercropping and crop rotation), mechanical pest control, and the appropriate recommendations for control of fall armyworm in maize in Thailand

Progress of Thailand

Thailand's fall armyworm in maize monitoring and warning systems is appreciated to become a pioneer of this mission with rapid action. There is a further collaboration between Thailand and other foreign countries in studies, researches and workshop.

Progress of Department of Agriculture

Currently, the active surveillance for fall armyworm in maize in the cultivated area of maize has been continuously conducted with a further collaboration between DOA and DOAE. Moreover, the spreading fall armyworm preventing technology and the workshop has been instructed to the farmers

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