TRAINING ACTIVITIES OF 1984

C O N T E N T

APPENDIX TABLE CONTENT

List of trainees who have been trained by Suphan Buri Experiment and Training Center in 1984.

Training Center for Agriculture Development in Suphan Buri

Background of the Project.

Experiment Station and Training Center Project for Agriculture Development in Suphan Buri irrigated area used to be under Technical Division. At present, it is under Farming System Research Institute, Tambol Rua-Yai, Amphur Muang, Changwat Suphan Buri. This project is established by cooperation between Thai and Japanese government to support Agriculture Development Project in Thailand irrigated area. The purpose of this Center is to support techniques and to train the official who work in Irrigated Agriculture Development Project, especially in irrigated area of Chao Phya and Mae Klong River.

There are 3 sub-projects in Irrigated Agriculture Development Project which were the cooperation between Thai and Japanese governments, those were signed on April 8th, 1977. It is a 5 year project (1977-1982) and it is extended for 3 years until 1985 as follow :

1. Chao Phya Pilot Project of Agriculture Land Reform Office starts to do in area 3,000 rai.

2. Mae Klong Pilot Project of Royal Irrigated Department starts to do in area 2,400 rai for No.1 and 3,000 rai for No.2 .

3. Experiment Station and Training Center for Agriculture Development in Suphan Buri irrigated area was established for training and technical supporting to officials and technicians who concerned with irrigated agriculture development project, donated value of 8,000,000 ฿ for building construction.

Project Objective

1. To train technicians and extension officers in charge of the project area on new technologies of crops production and management for achievment of the project goal.

2. To develop cropping system which adaptable to farmer's resources and increasing on yield and income of the farmers in the project area.

3. To promote the production system into group of cooperative form for selling of their products and buying of goods.

4. To transfer technologies to the farmers in the project area by mean of direct and indirect contract passed through extension officers.

5. To solve the problems in crop production techniques and crop managements in the project area. If it so complicated one, the problem should be taken to solve in the station by means of multidisplinary research.

Center activities from establishment

The Center was started of training activities since the completion of the main building in June of 1978. The officially opening ceremony of the Center was held on March 10th, 1979 presided by Minister of Agriculture and Cooperative Ministry.

The first batch of training was done for 2 weeks course in July 1979, since then, the Center trained Thai government officers and leader farmers in various courses in each year, up to the end of 1984 Thai budget year the total of 2,854 government officers have been trained by the Center in long term course (4 months) 6 times 182 in numbers, and 1-4 weeks courses 28 times 735 in numbers, special courses 26 times 1,028 in numbers and provided for technical meeting and seminar 21 times 909 in numbers for participants.

Training Activities in fiscal year of 1984

In the fiscal year of 1984, Suphan Buri Training Center carried on the different training courses for 14 courses with 375 trainees and 123 participants in 4 seminars. Total, there are 498 trainees who had been trained by this Center in this fiscal year, as the details follow :

1. Long term training course (4 months)	Participant
(1) Rice cultivation technique in irrigated area Sep. 5th-9th, Oct. 10th-14th, Nov. 7th-11th, Dec. 19th-23rd, 1983.	19
(2) Integrated farming in irrigated area Mar. 19th - Apr. 12th, 1984.	27
(3) Rice cultivation technique and integrated farming in irrigated area Sep. 10th-21st, Dec. 11th-25th, 1984.	30
(4) Farm training Every week for contact farmers at Suphan Buri key-site	35
Total	111

2. Short course (1-3 weeks)	Participant
(1) Volunteer for Suphan Buri Livestock Development Program Nov. 14th - 18th, 1983.	45
(2) Computer programing and utilization Jan. 23rd - 27th, 1984.	12
(3) Computer programing and utilization Feb. 6th - 10th, 1984.	8
(4) Rain-fed rice improvement project group I Feb. 27th - Mar. 2nd, 1984.	40
(5) Irrigated water management for rice cultivation Mar. 12th - 16th, 1984.	33
(6) Rain-fed rice improvement project group II Apr. 23rd - 27th, 1984.	33
(7) Modern farming in irrigated area Jun. 25th - 29th, 1984.	26
Total	197

3. Special course (1-5 days)	Participant
(1) Student training Oct. 10th - 14th, 1983.	19
(2) Fertilization technique in paddy field Mar. 28th, 1984.	24
(3) Rice pest and its control Jun. 20th, 1984.	24
Total	67

4. Technical meeting and seminar	Participant
(1) Seminar on Farming System Research Group Mar. 7th - 9th, 1984.	61
(2) Working committee of Suphan Buri key-site May 8th - 9th, 1984.	20
(3) Working committee of Suphan Buri key-site Jul. 18th, 1984.	17
(4) Contact farmers of Suphan Buri key-site Aug. 17th, 1984.	25
Seminar total	123
Grand total	498

Suphan Buri Training Center

Training activities in fiscal year 1983

Each agencies and the number of trainees

No.	Agency	Long term course	Short course (1-4 weeks)							Special course			Total
			1	2	3	4	5	6	7	1	2	3	
1.	Royal Irrigation Department	10		2			13						24
2.	Agricultural Land Reform Office	3											3
3.	Department of Agriculture	22		8	8			2					40
4.	Department of Agricultural Cooperative Promotion	3					8						11
5.	Office of Agricultural Economics	2											2
6.	Department of Public Welfare	3											3
7.	Office of Undersecretary of State	1											1
8.	Department of Community Development	2											2
9.	Department of Agricultural Extension					40	12	31			24	24	131
10.	Kasetsart University (Kamphengsane)			3									3
11.	Agricultural students									19			19
12.	Farmer institute	65	45						26				136
	Total	111	45	12	8	40	33	33	26	19	24	24	375

Curricula schedule of training in fiscal year 1984

No.	Subject name	Hour
	1. Curriculum "Rice cultivation techniques in irrigated area"	
	Trainee : Technicians and agricultural officers	
	1st period (September 5th-9th, 1983)	
1.	Orientation	3
2.	Land preparation techniques	6
3.	Seed preparation, seed coating with Calcium peroxide	6
4.	Nursery box preparation, basal dressing	6
5.	Transplanting by different types of machine	6
6.	Germinated direct sowing and row seeder machine utilization	6
	2nd period (October 10th-14th, 1983)	
7.	Fertilizer knowledge and fertilizer application techniques	6
8.	Fertilizer broadcasting and pot experiment preparation	6
9.	Agricultural machines knowledge	6
10.	Agricultural machines maintenance	6
11.	Type of sprayer and utilization techniques	6
	3rd period (November 11th-17th, 1983)	
12.	Rice disease and its control	6
13.	Weed in paddy field and its control	6
14.	Rice insect and its control	6
15.	Rice pest and its control	6
16.	Method of collecting sample for yield components analysis	6
	4th period (December 19th-23rd, 1983)	
17.	Harvesting, threshing and cleaning	6
18.	Data analysis of yield components	6
19.	Yield evaluation	6
20.	Conclusion of experimental result	6
21.	Evaluation, certificate and closing ceremony	6
	Total	123

No.	Subject name	Hour

5th period (January 8th-15th, 1984)

Trainees went for study tour at southern, Thailand as follow :

- Huptapong Project, Petchaburi
- Marine Fishery Research Center, Phuket
- Kor Hong Rubber Research Center, Songkhla
- King's Project at Dinpru Pikulthong, Narathiwat
- Sawee Horiculture Research Center, Chumporn

2. Curriculum "Integrated Farming in Irrigated Area"

Duration : March 19th - April 12th, 1984.

Trainee : Technicians and agricultural officers

No.	Subject name	Hour
1.	Registration, opening ceremony, agricultural ecology	3
2.	Principle of integrated farming	3
3.	Cropping system in integrated farming	3
4.	Water requirement of crops	3
5.	Rice varieties and cultivation techniques	3
6.	Rice cultivation techniques for high yield	3
7.	Orchard cultivation techniques and suitable orchard in integrated farming	3
8.	Orchard propagation techniques	3
9.	Vegetables cultivation techniques by ridge type	6
10.	Super sweet and baby corn cultivation techniques	3
11.	Soy bean and mung bean cultivation techniques	3
12.	Vegetable insect and its control	3
13.	Orchard disease and its control	3
14.	Rice insect and its control	3
15.	Orchard insect and its control	3
16.	Rice disease and its control	3
17.	Weed in paddy fields and its control	3
18.	Plant pest and its control	3
19.	Sprayer utilization techniques	3
20.	Observation tour at farmers' farm	8
21.	Fish raising in integrated farming	6
22.	Observation to fish-farming in Suphan Buri province	3
23.	Observation to lobster farms in Suphan Buri province	3
24.	Native chickens raising techniques	3
25.	Duck raising for egg production farms	3
26.	Backyard hog raising	3
27.	Survey on crop cultivation techniques and data collecting at Amphoe Damnoen Sadok, Ratchaburi (report making by one crop per group)	18

No.	Subject name	Hour
28.	Report presenting	3
29.	Mushroom cultivation	3
30.	Preservation techniques of farm products	3
31.	Bio-gas and compost making	6
32.	Farm management and farm account distribution	3
33.	Method of establishment agricultural cooperative	3
34.	Evaluation (test)	3
35.	Closing ceremony and certificate	1
	Total	132

3. Curriculum "Rice cultivation techniques and integrated farming in irrigated area"

Duration : September 10th-21st, December 10th-25th, 1984.

Trainee : Young farmers

No.	Subject name	Hour
1.	Orientation, seed preparation	6
2.	Land preparation	6
3.	Nursery box making for transplanting machine and basal dressing	6
4.	Principle of farm machineries, transplanting machine practising and field preparation for transplanting machine	6
5.	Transplanting by machine and sowing	6
6.	Observation tour at Amphoe Bang plama key-site, Suphan Buri Province	10
7.	Rice insect and its control, Rice disease and its control	6
8.	Weed in paddy field and its control, Rice pest and its control	6
9.	Fertilizer knowledge and rice fertilizer utilization techniques, Fish raising in integrated farming	6
10.	Poultry and pig raising in integrated farming	6
11.	Orchard cultivation techniques and suitable orchard in integrated farming, orchard propagation techniques	6
12.	Principle and method of collecting sample for yield and yield components, the practising of data collecting for yield and yield components	6
13.	Study tour on agricultural development projects in the north	50
14.	Harvest and threshing	6
15.	Data and yield components analysis	6
16.	Data and yield components analysis	6
17.	Evaluation	6
18.	Observation tour on 10 trainees' house at 10 Amphoes of Suphan Buri Province	16
19.	Training and experiment conclusion	6
20.	Evaluation and certificate	6
	Total	178

4. Curriculum "Volunteer for Suphan Buri Livestock Development Program"

Duration : November 14th-18th, 1983.

Trainee : Volunteer in the area of Suphan Buri Province

No.	Subject name	Hour
1.	Opening ceremony, orientation	1
2.	Administration and extension activities for livestock promotion in region 7th	3
3.	The important epidemics diseases and Act of Animal Diseases Control in 1956	4
4.	Introduction to Veternary science and instrument utilization	4
5.	Report making of animal epidemic diseases spreading	4
6.	Disease curing instrument utilization and control techniques for big animal	4
7.	Law of livestock	4
8.	Catching techniques for small animal and poultry, artificial insemination and poultry sterilization	4
9.	Animal epidemic diseases curing and control	4
10.	Principle of animal breeding, husbandry, feeding and feedstuffs preservation	4
11.	Medicine for animal and utilization	3
12.	Closing ceremony	1
	Total	80

Footnote Group meeting, cinema and recreation at night

5. Curriculum " Computer programing and utilization"

(5 days)

No.	Subject name	Hour
1.	Computer knowledge	1.5
2.	Computer system	1.5
3.	Language and symbol of computer programing	3
4.	Simple computer programing practising	12
5.	Computer programing and data supply for agricultural experiment analysis	12
	Total	30

6. Curriculum "Rain-fed rice cultivation project"

Duration : February 27th - March 2nd, 1984. Group I

April 23rd-27th, 1984. Group II

No.	Subject name	Hour
1.	Registration, project outline and orientation.	4
2.	Test before training	1
3.	Opening ceremony	1
4.	Weather	2
5.	Rice knowledge	2
6.	Rice varieties and propagation	2
7.	Soil and fertilizer	2
8.	Rice diseases and insects	2
9.	Weed in paddy field	2
10.	Rice pest	2
11.	Rain-fed rice cultivation	3
12.	Practical test	1
13.	Lecture test	1
14.	Debate and problem answer	1
15.	Evaluation, certificate and closing ceremony	2
	Total	28

7. Curriculum " Irrigated water management for rice cultivation"

Duration : March 12th-16th, 1984.

No.	Subject name	Hour
1.	Registration, opening ceremony and special lecture on irrigated management in each country, problem and obstacle	3
2.	Water management for rice cultivation	3
3.	Water meter utilization and maintenance of the water distribution system in the field	3
4.	Water used-farmers' group and role of Agriculture Cooperative promotion department in irrigated area	3
5.	Rice variety and cultivation	3
6.	Method of yield increasing of rice	3
7.	Agricultural extension in irrigated area	3
8.	Observation tour at land reform project	3
9.	Farmer approaching	3
10.	Certificate and closing ceremony	3
	Total	30

Footnote Recreation, group meeting and cinema at night

8. Curriculum "Modern farming in irrigated area"

(3 days)

No.	Subject name	Hour
1.	Modern germinated broadcasting rice cultivation	3
2.	Rice disease and its control	1.5
3.	Rice pest and its control	1.5
4.	Rice cultivation techniques and fertilizer utilization	3
5.	Weed in paddy field	1.5
6.	Rice insect	3
7.	Mushroom cultivation	3
8.	Orchard propagation, marcotting, budding and layering demonstration	3
	Total	18

List of durable articles and construction donated from Japanese government

Suphan Buri Experiment Station and Training Center Project

1984

Sent from Japan		Number	Price (¥)
Agricultural machinery			1,463,615
1.	Rice combine HL 1800	52	133,877
2.	Rice combine HD 400	47	106,960
3.	Cutter machine CO 411 D	5	25,764
4.	Binder YB 602 L	45	155,953
5.	Tractor L 2201	37	222,648
6.	Tiller K 120	17	112,836
7.	Tiller KC 450 F	20	31,254
8.	Tiller KC 650	11	26,880
9.	Interculture KW	11	75,782
10.	Transplanter PF 250-90	28	52,245
11.	Transplanter YP 8000	47	128,297
12.	Transplanter YP 40	23	159,524
13.	Direct sowing machine YPS 60 A	57	231,595
	Total	400	1,463,615

List of durable articles and construction donated from Japanese government

Suphan Buri Experiment Station and Training Center Project

1984

Bought in Thailand	Number	Price (฿)
Agricultural machinery and vehicle		90,700
1. 22 HP Tractor attachment	1 set	40,700
2. Battery	6 sets	10,000
3. Tire	22 sets.	40,000
Stationery		55,000
1. Offset spare part	1 set	20,000
2. Auto typewriter spare part	1 set	10,000
3. Computer consumption	1 set	5,000
4. Copy machine consumption	1 set	10,000
5. Video consumption	1 set	10,000
Publishment		
1. Activities report of Center	200 copies	60,000
	Total	205,700

43rd group

Curriculum "Rice Cultivation Technique in Irrigated area

Duration: September 5th-9th, October 10th-14th, November 7th-11th
December 19th-23rd, 1983.

1. Botany & Weed Science Division

1. Mrs. Duangchan Pookiewsak
2. Mr. Noparat Yodchan

2. Office of Agricultural Economics

3. Mr. Suwim Pecharij
4. Mr. Kriengsak Rodmek

3. Rice Research Institute

5. Mr. Somnuek Noo-niem
6. Mr. Somboon Thong-sen
7. Mrs. Thanomchit Rij-montree

4. Royal Irrigation Department

8. Mr. Wichai Sang-krod
9. Mr. Wichan Chan-pen
10. Mr. Apichai Wattanayomanaporn
11. Mr. Somhuan Kaminthakul
12. Mr. Thananchai Chernghom

5. Farming System Research Institute

13. Mr. Chitti Suwansang
14. Mr. Krit Poomkacha
15. Mrs. Laddawan Opanuraksatham
16. Mr. Chalit Sedthabutra
17. Mr. Thanoo Chan-urai
18. Miss Somporn Suriyan

6. Agricultural land Reform Office

19. Miss Wanida Tarnthawil

****

44th group

Student Training Course

Duration : October 10th-14th, 1983.

1. Pitsanulok Agricultural Campus

1. Mr. Amnaj Yodma
2. Mr. Sa-ard Klaikaew
3. Mr. Boonsong Nilset

2. Kamphaengphet Agricultural College

4. Mr. Somyod Dee-pao
5. Mr. Poo Yanat
6. Mr. Somchai Sarnrasri
7. Miss Lantom Pongkak

3. Suphan Buri Agricultural College

8. Mr. Charnchai Sompiyaporn
9. Mr. Songsak Bajjapipith
10. Mr. Banchob Plabplathong
11. Mr. Pralom Poonkhamlang
12. Mr. Prayard Chaisanta
13. Mr. Pakdee U-yanan
14. Miss Jamlongluk Suksabye

4. Chumporn Agricultural College

15. Mr. Dusit Khaithong
16. Mr. Manoon Nakworapong
17. Mr. Charnwit Chanok
18. Miss Somhaung Pimolrak
19. Miss Sunanta Nuch-it

****

45th group

Curriculum " Volunteer for Suphan Buri Livestock Development Program"

Duration : November 14th-18th, 1983.

1. Amphoe U-thong

1.	Mr. Pramote	Lanalaos
2.	Mr. Tongchai	Chomchuen
3.	Mr. Samart	Thipsangwan
4.	Mr. Chan	Sua-dam
5.	Mr. Prachan	Phurisa
6.	Mr. Somkiat	Jongjaroen
7.	Mr. Kuan	Sornsengdang

2. Amphoe Samchuk

8.	Mr. Wittaya	Soisangwan
9.	Mr. Sompong	Songsuwan
10.	Mr. Sucheep	Khamhom
11.	Mr. Niyom	Tangsopa
12.	Mr. Choochart	Sadokbua
13.	Mr. Winai	Jumpit
14.	Mr. Prachuab	Rayathong
15.	Mr. Pinit	Kerdsiri
16.	Mr. Amnat	Hong-to
17.	Mr. Rangsan	Malithong

3. Amphoe Muang

18.	Mr. Wichit	Hengjaroen
19.	Mr. Somkit	Thongsomrit
20.	Mr. Pongsak	Sooksomjit
21.	Mr. Boontham	Rawagsom
22.	Mr. Somyod	Srisook

4. Amphoe Songpeenong

23.	Mr. Surin	Chukarn
24.	Mr. Somsak	Sonthiwat
25.	Mr. Amnat	Laksuwan
26.	Mr. Boon-oua	Bongkhaoyoi
27.	Mr. Thong-moa	Insomboon

5. Amphoe Donjadee

28. Mr. Somsong Pipatkulchai
29. Mr. Theerasak Changpasook
30. Mr. Santi Janthorn
31. Mr. Siriwat Khamdee
32. Mr. Wisan Jaroensri

6. Amphoe Derm-bang-nang-buad

33. Mr. Chamnon Karnpakdee
34. Mr. Sanit Srisuwan
35. Mr. Banchob Sriprasert
36. Mr. Weera Lueng-arun

7. Amphoe Danchang

37. Mr. Paen Norasing
38. Mr. Sawat Thammasorn
39. Mr. Prathuan Norasing
40. Mr. Aree Pa-kong

8. Amphoe Bang plama

41. Mr. Boonchert Manee-in
42. Mr. Wachira Hual-butta
43. Mr. Wattana Srikham

9. Amphoe Sriprajan

44. Mr. Thawat Pensri
45. Mr. Aron Plongnoiwong

****

46th group

Curriculum "Computer programing and utilization"

Duration : January 23rd-27th, 1984.

1. Field Crops Research Institute
   1. Mrs. Juri Thiprak
   2. Mrs. Thaneenart Sombatsiri
   3. Mr. Surapong Jaroenrat

2. Botany and Weed Science Division
   4. Mr. Somchai Khomwilai
   5. Miss Siriporn Sengsontiporn

3. Farming System Research Institute
   6. Mrs. Archana Siripat

4. Royal Irrigation Department
   7. Mr. Sirichai Saksirigosol

5. Kasetsart University, Khamphengsane Campus
   8. Mrs. Nopporn Sayampol
   9. Mr. Chooochai Chumpong
   10. Miss Thodsaporn Khrongboon

6. Agricultural Chemistry Division
   11. Miss Patcharee Boonyodom

7. Rubber Division
   12. Mr. Anak Khu-nalasiri

****

47th group

Curriculum " Computer programing and utilization"

Duration : February 6th-10th, 1984.

1. Soil Science Division

   1. Miss Jarunee Nakranard
   2. Dr. Chayoong Narm-muang

2. Nakornrajsema Silk Worm Research Center

   3. Mr. Peerapong Chao-settakul
   4. Mrs. Suthathip Hong-thongdeng

3. Rice Research Institute

   5. Mr. Ampol Asawasopolkul

4. Agricultural Chemistry Division

   6. Miss Juraporn Lertborawong

5. Agricultural Toxic Substances Division

   7. Mr. Surapol Wisetsarn

6. Plant Pathalogy and Microbiology Division

   8. Miss Chutimarn Panitsakpattana

****

48th group

Curriculum " Rain-fed rice improvement project" Group I

Duration : February 27th - March 2nd, 1984.

1. Saraburi Province

1.	Mr. Sunthorn	Srisa-ard
2.	Mr. Thongsuk	Tachanon
3.	Mr. Surapol	Khlenpaiboon
4.	Mr. Sommit	Poonsawat
5.	Mr. Thinnagorn	Poothina
6.	Mr. Pichit	Dasri
7.	Mr. Woonwoot	Are-sasujarit
8.	Mr. Somneuk	Wattana

2. Chanthaburi Province

9.	Mr. Prawit	Phumkhacha
10.	Mr. Chao	Parnkhao
11.	Mr. Khongrit	Wisuttiwat
12.	Mr. Wijit	Narin

3. Chonburi Province

13.	Mr. Mana	Pitpratheep
14.	Mr. Thawat	Poothongkham
15.	Mr. Chua	Sahaya
16.	Mr. Paiboon	Rattanamanee
17.	Mr. Padong	Kullawachai
18.	Mr. Sanchai	Nakapong
19.	Mr. Suwat	Iemla-or

4. Chachoengsao Province

20.	Mr. Witoon	Srisoonthorn
21.	Mr. Prayard	Yongpruksa
22.	Mr. Preecha	Simpanit
23.	Mr. Apichart	Khanjanaopart
24.	Mr. Samrit	Chaowanakit

5. Rayong Province

25.	Mr. Prasert	Jaroen-daoy-siri
26.	Mr. Weera	Itsarangkul Na Ayutthaya
27.	Mr. Sa-bye	Waw-sak

6. Nakhon Nayok Province

28.	Mrs. Narinee	Pinitpolnikhon
29.	Mr. Surin	Susom

7. Trat Province

30.	Mr. U-dom	Chamnanchang
31.	Mr. Niroj	Prathomwong

8. Prachineburi Province

32.	Mr. Kharin	Lairithising
33.	Mr. Khitti	Sutsok
34.	Mr. Harn	Jang-e-jang
35.	Mr. Prasarn	Thatsanathep
36.	Mr. Satit	Punasiri
37.	Mr. Boonma	Rakbancha
38.	Mr. Parinya	Hru-wanthana

9. Kabinburi Province

39.	Mr. Yoong	Janjamla

****

49th group

Curriculum " Seminar on farming system research group"

Duration : March 7th-9th, 1984.

1. Sakon Nakhon Rice Experiment Station

   1. Mr. Sanae Sirirat
   2. Mrs. Chantanee Hengsawat

2. Phrae Rice Experiment Station

   3. Mr. Boonchum Bambard

3. Agricultural Chemistry Division

   4. Mrs. Jiraporn Launpreeda
   5. Mr. Sawang Kardkhaw

4. Phitsanulok Province

   6. Mrs. Arasa Yongyuthwichai

5. Ubon Ratchathani Province

   7. Mr. Ruengchai Khongsri

6. Plant Pathalogy and Microbiology Division

   8. Mr. Jarat Chuenram

7. Agricultural Engineering Division

   9. Mr. Boonsom Suwannarak

8. Research Planning Division

   10. Miss Nida Sainamthip
   11. Mrs. Rungtawan Butsaprawait

9. Plant Pathology and Microbiology Division

12. Mr. Montri Iemwimongsa

10. Chainat Rice Experiment Station

13. Miss Chuanchuen Diaw-wilai

14. Mr. Pongsak Rattawaraha

11. Department of Agriculture

15. Mr. Somphot Suwannawong

12. Botany and Weed Science Division

16. Mr. Somchai Khomwilai

17. Mr. Chaiyod Supattanakul

13. Entomology and Zoology Division

18. Mr. Wichien Bamrungkul

14. Farming System Research Institute

19. Mr. Damkheng Chandrapanya
20. Mr. Ak-nguan Chuwisitkul
21. Mr. Chalerm Sookpong
22. Mr. Chalit Settabood
23. Mrs. Weena Sujaritpanit
24. Mr. Boonrawd Thongdonphum
25. Mr. Prajong Sudto
26. Mr. Waree Chaithep
27. Mr. Nichai Thaipanit
28. Mr. Rasamee Kirithavip
29. Mr. Suphachai Banglieng
30. Mr. Banjong Harnjit
31. Mr. Vichien Sasiprapa
32. Mr. Archana Siripat
33. Mr. Chalermkiat Saisoong
34. Mr. Krit Poomkacha
35. Mr. Pornsak Iemwijit
36. Mr. Pairoj Suwanjinda
37. Mr. Pakhon U-thaipan
38. Mr. Witsanu Boonying
39. Miss Chamnong Nartsomboon
40. Mr. Preecha Jampangern
41. Mr. Wicharn Worthong
42. Mr. Prawait Saengphet
43. Mr. Nattawoot Pasayawan
44. Miss Waraporn Manakkhong
45. Miss Pramjai Thongthip
46. Mrs. Parnpakha Sadokboau
47. Mrs. Pattaranee Juthanon
48. Mr. Morerakhot Aksornsawat
49. Mr. Manat Leechawangwong
50. Mr. Somporn Itsaranurak
51. Miss Panee Poramaraparakard
52. Mr. Chirtchart Smitobol
53. Mr. Samnieng Wiriyasiri
54. Mr. Patt Wiboonjaroenpol
55. Mr. Prawit Tabtimorn
56. Mr. Suppawat Inthalarb
57. Mr. Jaruwat Phumithi
58. Mr. Wiset Chaiyanuwat
59. Mr. Panat Wannacheu
60. Mr. Poonsawat Arj-lakha
61. Mr. Pornlert U-phattana

****

50th group

Curriculum "Integrated water management for rice cultivation"

Duration : March 12th-16th, 1984.

1. Royal Irrigation Department

1.	Mr. Weera	Kaewkadikij
2.	Mr. Manob	Khamcheun
3.	Mr. Somboon	Prampree
4.	Mr. Nattapong	Khrutha
5.	Mr. Serm	Sau-joy
6.	Mr. Prasong	Thitawan
7.	Mr. Suwan	Duangpan
8.	Mr. Chamnan	Phloyphet
9.	Mr. Prajoab	Soybang
10.	Mr. Surachai	Ritreungrung
11.	Mr. Salak	Khongpia
12.	Mr. Somkiat	Yodmanee
13.	Mr. Somchai	Klosuwanna

2. Department of Agriculture Extension

14.	Mrs. Nungnuch	Klannuch	20.	Mr. Chamnan	Thanyajaroen
15.	Mr. Thawat	Baoukaew	21.	Mr. Sunthorn	Pinkasorn
16.	Mr. Prasart	Khamchuen	22.	Mr. Chalit	Lakpasomwong
17.	Mr. Chompoo	Thongkhow	23.	Mr. Wijit	Khongsong
18.	Mr. Chamnan	Khamchuen	24.	Mr. Khunawoot	Larkkrod
19.	Mr. Suwit	Santisareewong	25.	Mr. Pratheep	Maneedit

3. Department of Agricultural Cooperative Promotion

26.	Mr. Mongkol	Kuang-kham	30.	Mr. Pornthep	Niamboonnarm
27.	Mr. Chaowalit	Boonpan	31.	Mr. Manote	Wanabood
28.	Mr. Theerapong	Hapa	32.	Mr. Kittisak	Armpanseng
29.	Mr. Sanya	Pengjard	33.	Mr. Wisit	Lakmanee

****

51st group

Curriculum "Integrated farming in irrigated area"

Duration : March 19th - April 12th, 1984.

1. Department of Public Welfare

1. Mr. Suthee Thinoumchoo
2. Mr. Supat Boonthai
3. Mr. Likit Booncham

2. Office of Undersecretary of State

4. Mr. Wiroj Cholwiriyakul

3. Department of Agricultural Cooperative Promotion

5. Mr. Siamchai Fukthet
6. Mr. Pairoj Pakhasathein
7. Mr. Poonsin Jaithaharn

4. Royal Irrigation Department

8. Mr. Suchin Thongpeuk
9. Mr. Rachan Pantharak
10. Mr. Pairoj Saengjinda
11. Mrs. Ladawan Pathumwit
12. Mr. Sanit Boonchai

5. Department of Community Development

13. Mr. Saha Artanatikul
14. Mr. Theerapong Pasom

6. Department of Agriculture

15. Miss Chuanchuen Diaw-wilai
16. Mr. Akachai Srinimit
17. Mr. Preecha Jampangern

7. Agricultural Land Reform Office

18. Mrs. Sarima Soontharachun
19. Miss Lantom Suthi

8. Suphan Buri Experiment and Training Center

20. Mr. Daycha Tuna
21. Mr. Pairat Duangpiboon
22. Miss Chamnong Nartsomboon
23. Miss Sasithorn Sowan
24. Miss Walaiporn Sasiprapa
25. Miss Napaporn Kantawong
26. Miss Malai Wongsripuek
27. Miss Wattanalai Limthong

****

52nd group

Curriculum "Rain-fed rice improvement project" Group II

Duration : April 23rd-27th, 1984.

1. Chainat Province

1.	Mr. Boonthap	Sansook
2.	Mr. Yongyuth	Tawilkarn

2. Lopburi Province

3.	Mr. Pracham	Aungkabla-oong
4.	Mr. Maitri	Srisawat
5.	Mr. Charnchai	Khamchu
6.	Mr. Choocheep	Jong-u-sook
7.	Mr. Kanok	Rattanapan

3. Singburi Province

8.	Mr. Manob	Pattanajaroen
9.	Mr. Wanlob	Jaroensri

4. Ayutthaya Province

10.	Mr. Kosum	Itsa-ard
11.	Mr. Charn	Waiwong
12.	Mr. Boonlert	Netsukham
13.	Mr. Sommart	Songsorn

5. Ang Thong Province

14.	Mr. Thawat	Setthanan
15.	Mr. Cheewin	Sunthornwipak

6. Prachuab Khiri Khan Province

16.	Mr. Kittisak	Phumirawi
17.	Mr. Nikhom	Saksanit
18.	Mr. Pairoj	Weerapratheep
19.	Mr. Wirat	Pakdeesa-maeo

7. Phetchaburi Province

20.	Mr. Chat	Phumsutat
21.	Mr. Aue	Buangam
22.	Mr. Sukhon	Ji-na
23.	Mr. Samarn	Kaewraya

8. Ratchaburi Province

24.	Mr. Wasan	Jongpanyaprapan
25.	Mr. Pornchai	Sutthachana
26.	Mr. Thanapol	Wannakomol
27.	Mr. Pinan	Krajangthong
28.	Mr. Rabieb	Malakarn

9. Suphan Buri Province

29.	Mr. Wichien	Khun-no
30.	Mr. U-thai	Samrert-ram
31.	Mr. Dirak	Sriphong

10. Rice Research Institute

32.	Mr. Jaru	Sritham
33.	Mr. Manoon	Karnjanapak

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53rd group

Curriculum "Integrated farming in irrigated area"

Duration : June 25th-29th, 1984.

Ayutthaya Province

1.	Mr. Lam	Pothong
2.	Mr. Dee	Wootthisak
3.	Mr. Thot	Rakkhati
4.	Mr. Tong	Sooksumit
5.	Mr. Thongbai	Jaengkasem
6.	Mr. Rot	Jong-oiyporn
7.	Mr. Sawak	Srikaew-in
8.	Mr. Yoi	Jong-oiyporn
9.	Mr. Od	Sutthitham
10.	Mr. Boontham	Phujam
11.	Mr. Nom	Wootthisak
12.	Mr. Thongyord	Tongwichai
13.	Mr. Surachai	Jittrithin
14.	Mr. Pao	Khotchasarn
15.	Mr. Sanguan	Chokkerd
16.	Mr. Amnoiy	Thongphum
17.	Mr. Samak	Kureerak
18.	Mr. Subin	Wongboonmee
19.	Mr. Lamduan	Mukdaduang
20.	Mr. Lee	Mukdaduang
21.	Mr. Yuy	Neng-amporn
22.	Mr. Samang	Pamngam
23.	Mrs. Plang	Jitsutthiyarn
24.	Mrs. Boontham	Thongsookchok
25.	Mrs. Jamroon	Jengkasem
26.	Mrs. Jamreing	Khotchasarn

****

54th group

Curriculum "Rice cultivation techniques and integrated farming in irrigated area"

Duration : September 10th-21st, December 11th-25th, 1984.

1. Suphan Buri Experiment Station and Training Center Project

1.	Mr. Somsak	Maman
2.	Mr. Amnat	Janloi
3.	Mr. Chert	Homsa-ard
4.	Mr. Wisong	Jaizu
5.	Mr. Suchart	Khruakaew
6.	Miss Manee	Karnphakdee
7.	Mr. Sakol	Ounkhonthee
8.	Mr. Arthit	Kanmasang
9.	Mr. Panya	Kaewngern
10.	Mr. Jamlong	U-suwan

2. Mae Klong Project, Kanchanaburi Province

11.	Mr. Sawit	Haolert
12.	Mr. Samai	Banjachart
13.	Mr. Samart	Sookgrom
14.	Mr. Anggoon	Tantiwat
15.	Mr. Panya	Sangsa-ard
16.	Miss Somporn	Promsri
17.	Miss Saichol	Surbkuan
18.	Miss Thiwasri	Posrithong
19.	Miss Samlee	Watthaporn
20.	Miss Budsarin	Kullachaikul

3. Chao Phya Project, Ayutthaya Province

21.	Mr. Somkhana	Wongsong
22.	Miss Saengjan	Boonnak
23.	Mr. Anan	Srithong
24.	Mr. Paen	Rangsiyo
25.	Mr. Samla	Meesomchai
26.	Mr. Thaweep	Sarbnuch
27.	Miss Pornnipa	Banluakate
28.	Miss Supaporn	Meesomchai
29.	Mr. Suthep	Srithong
30.	Mr. Boonsong	Wongsong

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EPILOGUE

Experiment Station and Training Center Project for Agricultural Development in irrigated area, Suphan Buri province is one of the three sub-projects of Irrigated Agriculture Development Project which was aided technically by the Government of Japan. The first period of the project was from 1977-1982, after that the project was extended for another 3 years and it is going to be ended on the 31 March, 1985.

During the past 6 years, more than 3,000 participants & trainees such as officials, students, farmers and young farmers, to fulfill the necessities of technical training and agriculture promotion.

The project was accomplished by the cooperation of Thai & Japanese officials including the committee and the working groups.

The officials of Suphan Buri Experiment Station and Training Center are as follows;

1.	Mr. Vichien Sasiprapa	Agriculture technician 7, Farming System Research Institute
2.	Mrs. Archana Siripat	Economist 5, Farming System Research Institute
3.	Mr. Pairat Duangpiboon	Agriculture technician 5, Farming System Research Institute
4.	Mr. Opart Chantasook	Agriculture technician 5, Farming System Research Institute
5.	Mr. Chalit Settabood	Agriculture technician 6, Farming System Research Institute
6.	Mrs. Laddawan Opanuraktham	Agriculture technician 4, Farming System Research Institute
7.	Mr. Preecha Jampangern	Agriculture technician 3, Farming System Research Institute
8.	Miss Sasithorn Sowan	Scientist 5, Rice Research Institute
9.	Suphan Buri Rice Experiment Station Officers	
10.	Director of Suphan Buri Rice Experiment Station Officers,	advisor
11.	Dr. T. Sugahara	Japanese Expert (JICA), advisor

Vichien Sasiprapa
Making Report of 1984.
February, 1985.

Practical Report

by

Trainees and conducting group

Integrated Farming in Irrigated Area

March 19th - April 12th, 1984.

Suphan Buri Training Center

Technical Division

Department of Agriculture

CONTENT

Shallot

Shallot is a kind of well-known vegetable. It can be cooked as spices. It can be eaten either fresh or cooked. Shallot has many useful substances such as protein, fat, carbohydrate and some other minerals. Old traditional Thai doctors use shallot as a herb. Nowadays shallot is accepted by doctors for it is capable of preventing the nose congestion. Sulphur in shallot is useful for tissue in soft areas such as that of the head. It is believed that shallot helps nourish roots of hair.

In the northern part, shallot is planted in winter season after harvest the first rice crops, also in the northeast region, shallot is planted in irrigated areas after harvest the rice crops. Sisaket province is one of the famous province in growing more high quality of shallot. In the central part, shallot is popularly planted at Amphoe Damnoen Sadok, Ratchaburi Province. Farmers like to grow it in August either as a single crop or as intercrops.

Botanical Characteristic

The scientific name is Allium ascalnieum. It belongs to the Alliaceae family. The common name is shallot or onion. It is an annual crop.

1. Bulb Bulb is consisted of true stem and surrounded by young leaves which are arranged complicatedly in bulbed-shape where moisture and minerals are stored. There is an embryo in the middle of bulb. The sprout will be formed from this part.

2. True stem The true stem is characterized by the small angular figure with dull white. It is at the tree foot which is next to the bulb and it will form roots. There is a lot of tiny nodes and buds on the stem. These nodes and buds generate clusters of bulbs. Each cluster has 2-10 bulbs. Each small bulb is called Bulbil. When bulbil is fully grown, they are called the "Group of bulbs ".

Shallot can be divided into 4 parts :

(1) Leaf It is located at the apex. Its feature is long green tubes. It grows from the middle of the bulbs. The leaves are overlapped in order to form the foot of the stem. This part is in a coned-shape. It is rather hard at the base of the leaves. As the stem grows higher, these leaves become hollow. The new leaves will germinate from the old ones at the average of 1 leaf per week.

(2) Bulb It's characterized by the bulbed-shape which is next below the leaves. The bulb is composed of the overlapping leaves. It will form to bulb when it's 40-45 days old in proper weather.

(3) Stem The width of the stem is expanded but not the height. Roots germinate from this part.

(4) Root The roots are tufted. They grow out of the 3rd section of the stem. The roots grow deep 10-15 cm into the ground and expand about 10-15 cm. The diameter of root is 1-2 mm. The quantity of roots is up to that of the leaves for example size, amount and the growth of leaves. The old roots die when the shallot is older.

Climate and Soil

Shallot grows well in loamy soil with good drainage. It can be grown all year round. The best productive period is during winter season because shallot likes cool weather. It wants sunlight only 8-10 hours/day. However, the harvesting period is longer during the cold season.

Variety and Source (This variety is in market only)

1. The local variety from the north is called "Hom bou" (the local name). Hom bou has an oval slender shape of bulbs. The peel is saffron color. One bulb can be separated into 2-4 sections. There are 5-8 bulbs/hill. The smell of this variety is not so strong. The harvest time is 90 days after planting. For the yield is very low so the farmers don't grow for commercial except for their own consumption.

2."Bang Chang" or "Hom Dang Sisaket"

The bulb is round. The width is, comparatively, not balanced with the height. The outer peeled-color is red-purple. The peel is thicker and more sticky than "Hom bou" and the bulb is bigger too. The size is steady. There are 1-2 sections in a bulb. It smells strong with sweet taste. Yield is higher than local variety.

Most of farmers at Amphoe Damnoen Sadok grow "Ban Lee" variety. It's assumed that this variety is the same variety as "Bang Chang" variety. Ban Lee is the first winner in a variety contest. Farmers buy it from local farm. They buy the seed variety by "Harb" (Harb is the Thai measure system of 60 kg.). The price of shallot is unstable. It depends on the market price. It is range from 200-300 bahts/harb. (3.25-5.00 bahts/kg) to more than 1000 bahts/harb. (16.50 bahts/kg) in some year.

Variety and Plot Preparation

1. Usually, farmers in Damnoen Sadok has grown the shallot directly and don't grow by seedling method. Before planting, the shallot bulbs will be kept 2-6 months for break dormancy. In case of Mr. Wichien, he kept it about 60-100 days before planting.

2. Plot preparation

The size of this farm is 9 rais. He has grown shallot more than 50 years. The plot is raised up into 28 ridges with the length of 60 m and 4 m wide. He turns up and exposed the soil for 1 week by hoe. Then soak and break soil into small particles. Get rid of the weeds. Use fertilizer formula 13-13-21 or formula 15-15-15 at the rate of 16 kg/ridge (48 kg/rai) on basal dressing, then covered by the soil.

Planting

Hire 4 labors for planting one ridge at the wages of 40 bahts/ man day. Before planting, pick dead leaves on the tip and put them in the prepared soil with the spacing of 20x20 cm. Cover the sprouts thinly with the layer of rice straw.

Management

Irrigaiton

In summer season, water becomes the most important problem. Therefore, we must do some kinds of irrigation to prevent draught. But the irrigation is not needed in rainy season.

Daily irrigation is necessary after a few days of planting, during summer season. Irrigation is done one time per day in the morning. But in rainy season it should be irrigated when necessary.

Fertilizer applicaiton

Use fertilizer formula 13-13-21 or 15-15-15. The fertilizing is divided into 3 periods :

1. Soil preparation
2. 25-30 days after planting
3. 40 days after planting period.

If the plants grow well, fertilizer in the 3rd period is not necessary. The over fertilization will cause fungus diseases and the product will be declined as the plants become leafy.

Diseases and insects

1. Weed

Weed is not big problem in the shallot plot.

2. Insect

The important insect often found is Army worm. It causes serious problem occassionally. This matured worm will slough and become moth. The worm lives inside the leaf tube and eat it. It will cause the drooping in leaves and leaf-lodging symptom. Farmers spray insecticides one week after planting and every other day. They must be sprayed about 30 times in one crop. Usually, they use Dildrin, Thamaron, Lannate to control insects. If the worm spreads widely, use U-milin 250 plus another insecticides. Farmers use black light during the night to trap the matured moths and destroy them the following day.

3. Disease

Fungus is always found in shallot plant. It causes Leaf-spot and Leaf-lodging symptom. Leaves will be spotted and broken. The color is similar to that of the burnt leaf by hot water. Farmers spray fungicide such as Antacal, Lonacal, Cupravit etc. at 3 weeks after planting, after that spray every 1 week during rainys season, in case of other seasons spray every 2 weeks.

Harvesting

The harvest period is about 60 days after planting as usual. But in winter season, the harvest period is longer than this. That is 70 days after planting in winter season and about 40 days after planting in summer season. In the other way, it can be noticed by the color of leaf of matured plant which is yellowish and the tuber is enlarge and expose from the soil surface.

The method of harvest

The farmers hire labors to help in harvesting time. Labors are divided into 2 groups : one is for pulling shallots, the other is for carrying them to shade place. Most of pulling-out labors are females. Their wages are 40 bahts/man day and 100 bahts/man day for carrying ones, most of them are males.

They use bamboo stick with sharp end to dig and pull out the clump, shaking soil out and make a bundle. They carry the bundles to store or shade place or sell to the wholesaler. Yield is usually high in August, harvesting about 1,000-1,200 kg of dried bulbs per rai.

Marketing

The wholesaler comes to the plot for negotiation on price. The price is around 5-10 bahts/kg. The lowest price, as we have seen, is 1.00-1.50 bahts/kg. The highest price is 15 bahts/kg. The wholesaler monopolizes the purchase because the giving credits to farmers in the purchase of fertilizer and insecticide. The wholesaler will check the bills when the product is sold to him and re-sold again at Pakklong Talard Market. However, they say that shallot price is getting lower because of the shallot from the northern and Sisaket provinces are in the central markets.

Chili

Chili at present seems to be one of the economic cash crops, not only growing for domestic consumption but also for exporting to some other countries such as Ceylon, Malaysia and Arabic countries.

Chili fruit is used as spices in cooking different dishes for almost of every meals of Asian people and also Latin Americans. Chili fruit can be used as vegetable and spices from green to red-mature and dry one. Chili fruit now is used as raw material to produce kinds of chili sauce which are popular among Thai people as same as Catsup of European or American.

Large acreages of chili planting are in Petchaburi, Kanchanaburi, Prachuab Kirikan, Chiangmai, Ratchaburi at Amphoe Damnoen Sadok and many provinces in the northeastern region of Thailand.

Botanical Characteristic

Chili belongs to Solanaceae family including four important vegetables : potato, tomato, chili and eggplant. Chili plant is self pollination but 7-36 % is still cross pollination. Non-uniformity of chili plant types are always observed.

Climate

Chili requires warm weather and plenty of sunshine. Chili can stand under drought and hot weather condition but it doesn't like high temperature with high air humidity in rainy season. If the soil is poor in drainage, it will cause yellow leaf symptom.

Soil

Chili likes sandy loam soil with good drainage and pH of soil is around 6.0-6.8 . If the soil is acidic, the growth will be declined. It is the cause of Fusarium wilt which can spread out very quickly. Chili may develop the symptom of Damping off, Root rot and Wilt too.

This disease is controlled by mixing lime in the soil. If the soil lack of Calcium, Chili may develop the symptom of the top leaf curl.

Variety and Source

"Hoey Sri-ton" is a popular variety. It is released by Department of Agriculture. Its stem is stout and up right in V shape. The limbs grow from its stem about 3-5 branches. Each branch will gernerate another branches. Leaf is smooth and quite small, the plant height when 4-5 months old is about 150 cm. The bush shape is 80 cm wide. The fruit is up right. Fresh fruit is green but the ripening one is red, the length of fruit is 4 cm long. The taste is very hot both in fresh and dry fruits. The preserved fruit is dark red and glossy.

At Amphoe Damnoen Sadok, Hoey Sri-ton is not popular. Almost of farmers use the local variety which obtain from neighbor farmers. They use black seed variety which obtain it from the neighboring farm. The stem is 120 cm height with dense leaves, big fruits. If the plants are productive, farmers prefer to sell them fresh. Because dry chili is shrinkaged and unwanted in market. On the other hand, the red seed variety is popular when selling them dry.

Plot preparation

The method of land preparation depends on the land condition and water level. In case of Amphoe Damnoen Sadok area, the land condition is ridge-beded and clayey soil so the farmers cultivate by hoe while the soil is still damp. After that, flood the water into the field and keep it about 1 month and drain out. 1 week after drain out the water, they break up the soil by hoe again.

Planting

In case of Mr. Wichai Siritheinthai, the planting is done directly for row land method with the spacing of 75 cm. The seed rate is about 1.7 liters/rai. Thinning is done after planting for a period of 1 month, the spacing is about 15 cm.

Management

Irrigation

Watering by boat fixed with pump every day after early planting. 15 days after germination or the sprout is 5 cm high, watering every 2 days. If it is not adequate rain some supplementary watering is needed.

Fertilizing

It is divided into 3 periods :-

First application is done when the chili is 20, 32 and 44 days old. Use fertilizer formula 20-20-0, 22-22-0 and 20-20-0 respectively at the same rate of 20 kg/rai.

Second application is done when the chili is 50 days old. Use fertilizer formula 15-15-15 at the rate of 60 kg/rai.

Third application is done after second dressing, use fertilizer formula 22-22-0 at the rate of 20 kg/rai every 20 days until the investment and benefit are not reasonable.

Weed control

Hand weeding is more popular than herbicides in this area because the ridge-beded has a little weed.

Supplementary

Use Gozatim hormone spraying at flowering stage and every 2 weeks.

Diseases and insects

Insects

1. Thrip

Thrip is a tiny insect which sucks the juice from young leaves, apex and flowering buds. It can also stop the growth immediately. Leaves become wrapt and the edge of the leaves will roll up. Thrips spread widely during February-April which is the hot season. Protect by spraying Lannate at the rate of 30-40 cc./ 20 liters of water, every 3 days.

2. White mite

White mite, its size is very small and can be found either beneath young leaves or buds of flowers. It sucks the juice of plants. So the treetops and leaves turn distorted and ruffled. The edge of the leaves turn down. White mite spreads during flowering period. Use Lannate or Aldrin for controlling.

3. Aphid

Spreading a little and it is not so importance.

Diseases

1. Fusarium wilt

Fusarium wilt is caused by fungus. Leaves turn shrinkaged and yellow and fall finally. The disease breaks up during the flowering to the harvest period.

Use Sapron plus insecticides which eliminate Thrips and white mites, for controlling this disease at the rate of 30-40 cc./ 20 liters of water. Spraying every 3 days.

2. Wilt, Rottening and Anthracnose

Use Sapron for controlling these diseases.

Harvest

1. The harvest starts when chili is about 110 days old after planting. When chili fruit peel is glossy and dark-green or red, it indicates that the chili is mature enough to be harvested but the stage of harvest depends on market requirement too.

2. The harvest period is 5 months. Farmers can harvest the chili for 15 times at every 10 days interval.

3. The harvest method, use labors to pick up and keep chili in baskets. Then expose them under a roof for one night or sell immediately to wholesaler. The selling place is at Pakklong Talard Market. The wage for a labor in harvesting of chili is 35 bahts/day. They can harvest 45 kg of chili fruits/manday.

4. Selection for seed, the selection starts in the 3rd harvest. Cut off the chili and expose good seed in the dry open air for 2 months. Finally pack them in a cloth bag.

Marketing

1. The marketing system

Take the chili on a truck to Pakklong Talard Market. The charge for transportation is 20 bahts/basket. The weight of each basket is about 90-95 kg.

2. The common market is Pakklong Talard Market in Bangkok. The selling prices are 3-5 bahts/kg or 10-15 bahts/kg, depending on the demand.

-This farmer expects to harvest the chili for ten more times. The weight is 2,800 kg. The total weight is 4,300 kg/ 3 rais.

-The product is 1,400 kg/rai.

-The period of the highest price is not stable. Mostly the good price is during hot season. Last year the average price was 3-30 bahts/kg during the season.

-The market prefers plump chili. So the price is up to the quality of the chili.

Super sweet corn

Super sweet corn is a well-known crop and have been planted for a long time. It can be planted all year round and rotated with another cash -crops such as sweet potato, peanut, etc. Not only can make many kind of dishes sweet but also eat as vegetable. It is a good profitable short duration crops which can be sold within 65-70 days after planting with an income of 3,200-3,600 bahts per rai (1,600 m^2) at Damnoen Sadok district, Ratchaburi province.

General characteristic

" Wacoal" is a name for a variety of super sweet grown in Damnoen Sadok. The stem is yellow-green, the leaves are moderately green with yellow tassle. The period from planting until silk-stage is around 50 days. The color of silk is yellow-green. There are 1-2 ears on each stalk. The color of ear is as green as the stem. The tip of the corn is wrapted up so tightly that we can see like spike. The seeds are bright yellow shrinkaged and dented. Super sweet corn harvested at 65-70 days of age are sweet and not sticky.

Climate

This variety can be planted all year round. The suitable time is the month of October to January which the weather is mild and cool, if grow ing during summer, high temperature will causes of early mature and not so tasty.

Variety and source

" Wacoal " is the most popular variety at Damnoen Sadok. This variety was taken from Mr. Sawang Thaloengkhaphan instructor of Kasetsart University. This variety looks very much like special super sweet corn. Mr. Yord Khankhaset is the first one who took this variety to plant in this district.

Plot preparation

This variety is planted rotated with another cash-crops on ridge type plot. Before planting the farmer usually submerged his plot for a few days to control of weeds. After drying up the land, do not left the land for a long time otherwise it comes up with weed competitions.

Planting

The spacing between holes is 50 cm and 75 cm between rows. Before planting, the corn seed must be coated with Apron 35 to prevent downy mildew fungus with the rate of 1-2 g/kg of seed. Use the seed 9-10 seeds/hole. Because the farmer doesn't test on seed germination, many seeds are used for making sure that they can germinate in every hole. The seed won't germinated or germinate slowly if it is placed too depth from soil surface. Cover the seed with a thin layer of soil after dropping seeds in hole.

Management

Irrigation

- Watering by bucket or using boat fixed with water pump, but pumping method will make the corn stalk of 45 days fall down or broken because of too height.

- 3 consecutive days of irrigation is needed after the planting.

- 3 days interval of irrigation is necessary when seed germinate.

- After 15 days of planting thinning out the extra seedlings and kept as 2 plants per hole. Then use supplementary and Urea fertilizer to stimulate the plant growth. Watering is needed after fertilization every 5 days.

- 45 days corn, farmer counts it the very important period. The irrigation must be every other day to prevent the lack of water. According to this rule the plant will be productive, the farmer will get a big-long-plump -massive corn.

Fertilizer application

Fertilizing can be divided for 3 times by dressing between corn stalks at the amount of 120 kg/rai.

First application is done when the corns are 15 days old, they use Amoniam Nitrate 24-0-0 and hormone called " Yordgoo " at the rate of 20 kg/rai, weeding is necessary in every time before fertilizing has been done and then watering after fertilizer application.

Second application is done when the corns are 30 days old. Farmers use fertilizer formula 24-0-0 mixing with fertilizer formula 13-13-21 with ratio of 1:1 at the rate of 20 kg/rai of the mixing fertilizer.

Third application is done when the corns are 45 days old. If it is the ear setting period, farmers have to use hormone for helping of ear setting. Besides, the fertilizer application for the sake of corn will be big and plump. The hormone is named B-comb 10-20-30 that is foliage fertilizer and the soil application fertilizer form is the same formula and amount as the second dressing one.

Diseases and insects

Downy mildew

Farmers call it Stripe disease. The disease is found when the corn is 3-4 weeks old. The disease makes the leaves turn white stripe and yellow. Farmers can destroy the disease by up rooting and destroy the infested plants. Nowadays the disease can be neither prevented nor eliminated by chemical treatment.

Army worm

This worm destroys the corn leaves at 10-30 days old by bitting the leaves. The chemical control by spraying Azodrin in the rate of 2-3 tea spoons/20 liters of water.

Corn stem borer

Farmers call it corn borer. The worm punctuate into the corn stem. The period of this worm damage is found in 1 month old corn until the ear setting period. The worm destroys the corn and breaks corns' nodes Farmers spray chemical since the corn is 1 month old then spray the chemical every 7 days and stop spraying at 7 days before harvesting of ear.

Harvest

The period of harvest is 65-70 days. We can observe the corn silk becomes dry up and turns dark brown. It is a suitable time to harvest.

Marketing

Farmers can sell their products as a whole-sale. Traders will buy the corns at the farms and have them cut off, after price setting. If farmers want to have good price for their corns, they must grow them on November and harvest in early of January. The price is 1.5-2.00 bahts/ear. If farmers grow corns in the area of 2.5 rai, the total income is 8,000-9,000 bahts.

Usually, the farmers do not test seed viability. It causes the waste of seed and high expenses in growing. Therefore, farmers should have been advised to test the percentage of seed germination before planting. The price and marketing are not major problems for farmers because dealers come by and make contracts at farm site. Super sweet corn takes short time for growing but it brings quite a good income to the farmers. If they can count the corn ear by ear, they will be able to calculate the price of the corn per ear. This is the benefit for the farmers themselves.

Guava

Thai people eat guava fruit as raw snack food but the ripening one is also delicious and suitable for elderly persons. Ripening guava fruit is soft and sweet. In foreign country ripening guava fruit is crunched to serve as guava juice. Guava is grown everywhere of Thailand. Guava grows fast and easily in any types of soil. It can stand under drought condition very well. Guava is the common name. The Botanical name is Psidium guajava Linn. It belongs to the family of Myrtaceae. Thais call guava in different names depending on the region such as :

"Ma Koiy" for Northern
"Fahrang" for Central
"Mak Sida" for Northeastern and
"Ya muh" for Southern people.

Botanical characteristic

Guava is a medium size fruit tree. The height is 2-10 meters. Its branches stretch and the limbs are often seen at the tree foot. The bark is brownish-red and smooth and can be strip into thin sheet. Leaf is 5-15 cm long and 2.0-6.5 cm wide. The leaf shape is ovate lanceolate. The flower is Dioecious which have both stigma and stamen in the same flower. Bunch of the flower produces from the bud located above the leaf peduncle. There is a single flower or two and three flowers on the bunch. If it a single flower, there are 4-5 petals. Shape of the fruit is quite round and gradually narrower to a calyx. The fruit is 5-12 cm long and its diameter is about 5-7 cm. The raw fruit is dark-green and its peel is not smooth. The ripening fruit is pale green. Its taste is sweet but a little sour, the flesh is crisp. When it ripes the color of flesh at the core is from creame up to pink. Stones are small and solid. They are yellow brown. The stone is 0.2-0.3 cm wide. The outer cover of the stone is white and solf. Guava can bare the fruit up to 40 years but the productive period is above 15-25 years, the yield of guava is reduced according to the increasing age of the guava after 25 years.

Climate

Guava can stand under drought condition very well. On the other hand it can grow better and more productive in rainy area than in dry area. However if it rains too much and the percentage of moist is too high the yield will be reduced. Besides the moist will cause diseases and insects damage. The best location for planting guava must be milder cool and the rain quantity must not less than 40 inches/year. It doesn't matter in the area which is quite dry but well irrigated, Guava can be grown. Accordingly it proves to be one of the good potential cash crops in every parts of Thailand.

Soil

Guava is suitable with almost every types of soil but the best soil is the loamy soil with a lot of humus. Guava needs a lot of water but the place must not be boggy and can stand under the flood condition for some period of time. The soil pH must be 6.5-7.0 therefore the planting area must have to do in soil improvement and soil conditioning.

Guava doesn't like clayey soil however, if it needs to plant guava in this type of soil, it has to improve the problems of poor drainage. Naturally, clayey soil turns to be hard like stone and fragile when lacking of water. The method to improve this problem is the raising of ridge to prevent flooding and to make a good drainage. As the result of this method, soil on the ridge will become perforated. The ridge should be 6 m wide. The ditch should be 1.50 m wide and 1 m deep and 75 cm at the bottom. After raising up the ridge the water level should be less than 75 cm, measuring from the top of the ridge.

Variety and source

1. Klomsalee

This variety came from Tambol Luksam. It's cost 70 bahts/ branch. All 1750 branches were grown on the plot of 14 rais. There are 125 guava trees on each rai. The space between each plant is 2.50 m. The distance between each row is 3 m. Klomsalee is the major variety of guava planted on this farm. After 1984, Mr. Tawee propagated this variety and enlarged the farm to grow guava trees 12 rais more.

2. Bangkok apple

This variety came from Mr. Sawang Thaloengkhaphan, instructor of Kasetsart University. It cost 3,000 bahts/branch. Purchashing only 1 branch and propagated by himself right now, at present the branch has multiplied to 7-8 more guava trees.

The propagation of guava

Layerage This method is the most popular use in propagation of guava tree by taking off bark and wrapping the branch with mud soil and covering the mud soil with the coconut fabric. In 45 days the root will come out and can be planted.

The age of Layerage The branch can be cut off within 45 days. You don't need to keep it in polythene bag because the branch can be grown as soon as it is cut off. But the planting time must be in January. The moist must be adequate so as to make the growth prosperous. Besides this, farmer has grown sweet potato so that its vines will cover the tree foot in the early period. The covered tree foot will keep the soil become moist.

Plot preparation

The size of the plot

Built up ridges on the plot. Each ridge tries to raise up as high as possible to prevent flooding and to make it good for drainage. The ridge must be 3.50 m wide. The ditch must be 1.5 m wide and 1 m deep. Water level has to be 75-80 cm beneath the top of the ridge.

Soil preparation

Use power tiller to plough the land. Expose the soil in the sun for 8-10 days after ploughing. Then break the soil into particles once more so as to prepare the planting hole.

Hole digging

Dig a hole of 8 inches wide, 8 inches long and 15 inches deep. Dig up the soil from the hole bottom and pile up around the hole.

Planting

1. Growing on the ridge After digging the hole as a given distance, it can use Layerage of guava to plant directly.

2. Planting guava mixed with other crops Many farmers use to plant sweet potato along with guava tree. As the result of doing this the soil in this will be moisturized. Besides this method can prevent the burning of the tree foot.

The space must be 2.50 m between the trees. Grow the tree right in the middle of the ridge.

Cover the bottom of the hole with cow manure. The ratio is 1 bucket/3 holes, don't use lime. Later on mixed the soil with the fertilizer and cover with soil before planting.

Planting Unwrap the coconut leaves from Layerage. Then put it into the hole, pile up the soil 2-3 inches high cover the tree foot and press a little bit tight of soil around that Layerage.

Management

Irrigation

Use boat fixed with water pump and spray water on both side. Adjust the water pipe and aim the water jet to fall near the tree foot on boht side of the bank. Spray the water every 2 days.

Fertilizer application

Mostly use manure, chemical fertilizer. If seldom, use the formula 15-15-15 in the rate of 25 kg/rai or 200g/tree. Use this kind of fertilizer every month. Besides hormone can be used as supplementary fertilizer through the leaves.

Diseases and insects

The important disease is Anthracnose. The method to solve this problem is by spraying Kerzeth M a fungicide products of Dupont USA. This disease occurs when the fruit is almost ripen. The important insect often found is Oriental fruit flies which lay the eggs under the fruit skin. After hatching, the worm will puncture to the inside of the guava. The sloving method is using insect traps to reduce the damage. Sometime use black light fixed up to the upper part of a tray which content diesel oil. When the insects play with light, they will fall down and drown in the oil. Besides, Red worms and Mites can also damage the fruit. Use Sumicidrin and Midophos 600 spray every 5 days as of reccommendation dose.

Weed control

Grow sweet potato and sweet basil to cover the soil and the foot of the tree. This method can reduce weed and can sell of sweet potato and sweet basil. By this planting technique, it can bring some more income to the farmer. There is no trouble of the weed in the ridge because the farmer has to walk and push the boat for irrigation for every 2 days. Therefore, weeds don't have a chance to grow up.

Harvest

The beginning of the harvest age : Guava produce its fruit 8 months after planting.

The method to observe the ripening fruit is to investigate the color of guava fruit turning to be a little white color.

The harvest period : Count from the first time to the last time of fruitting period which take about 4 months to harvest.

The way to harvest is by hiring workmen to help in harvesting. It can be harvested in every 5 days. It can harvest 140 baskets of guava in each time for 14 rais. Each basket contents 30 kg of guava, so the total amount of guava is 4,200 kg. The tool use in harvest is scissors. The wage is 80 bahts for all male workmen in a day.

Marketing

Marketing system The regular dealers come from Pakklong Talard Market to buy the product. Farmers will inform him about the harvest day. The dealer will arrange a truck to load the goods at Damnoen Sadok harbor according to the appointed date. The farm owner will harvest the crops and transport them by boat to the Damnoen Sadok Market.

Price The price which the regular dealer buys is 3 bahts/kg or sometimes higher than this depending on the season.

The highest price for guava is during January-March. So farmers need to control a guava to produce the fruit according to the aforesaid period. The way to control is to cut off the tops and trimming the tree. The flower will bloom after cutting the tops. Each branch is composed 6 flowers averagely. When the guava prices declines farmer will control it by stopping cutting off the tops or stopping trimming. In this way, the fruitting period can be delayed for sometime.

Summary ----- Note and suggestion

From the interview of farmers at Damnoen Sadok we found that guava orchard is quite good earning crops. They succeed in growing guava by their own experience even some techniques use are not go along with theory. Besides, it is noticeable that farmers in Damnoen Sadok have not have any marketing problem. We should study the farmers' marketing system profoundly.

In any case,it is to be worried that farmers use insecticide too frequently (5 days/time). This frequency is dangerous to health. There must be some chemical left in the guava highly because of the condense and strong of chemical using.

Footnote ----Mr. Tawee Damroengkiat is the farmer from Damnoen Sadok, Ratchaburi province. He has grown the guava since 1982 and planned to extend in some acreages. He is quite a successful farmer, judging from experiences. His method in working on his farm is practicabled and can be a good sample.

Sweet potato

Sweet potato is a very high adaptative crop for planting in Thailand. It can be grown easily and produces a good yield of tuber. It can be either cooked as foods or deserts. The sweet potato vine can be fed to animal such as hog for supplementary feeder. In some foreign countries, people use sweet potato tuber to produce a kind of whisky. In Philippines the people use to eat sweet potato tuber instead of rice for every meals in some island which there is shortage of rice. In China people used to cook sweet potato mixing with rice for higher palatability and good taste. All the people in Asia accepted sweet potato as a good friend during famine time.

Sweet potato can be grown in all regions of Thailand. Central plain is the part which can produce the highest yield and the lowest one is in the North. After 1969-1972, planted areas of sweet potato are decreased year by year due to sweet potatos need a high consumable labor crop during harvesting time. The average of yield is about 1-3 tons/rai.

Botanical characteristic

The botanical name of sweet potato is Ipomoea batatas. It belongs to the Convalvulaceae family. It is called "Huang-gua" by Chinese and "Potato" by European.

Sweet potato is a tuber plant and its vine creeps on soil surface. Its leaf is long and oval with heart shape or zigzag at the edge of the leaf, all these appearances depend on variety. The sweet potato's flower has horn shape. The peel seed is smooth with corners. Normally sweet potato will have flower when grown in tropical area, that's good for variety improvement. After planting for 3 weeks the root will come out and it can be harvested when 90-150 days old. The harvesting time depends on variety. After the sweet potato has completely formed tuber under the ground at some certain days, the vegetative growth of the vine become declined and leaves dropped, it can stand at that condition with the proper moist of soil, the vine can be recovered and can produce new tuber again. In general we can say that sweet potato can be harvested when it is 1 year old.

Climate

Sweet potato is a quite prosperous crop in the semi-tropical climate which the average temperature is 21-29°C. It can't endure with the temperature lower than 10°C. The dormanted-periods of the tuber are from 2-3 weeks until many months. It won't grow till the temperature is over 15°C. Sweet potato is a drought tolerance crop. It will be less productive in dry area but it becomes higher productive crops when the rain fall is quite enough.

Soil

Sweet potato is prosperous in fertile soil. The proper type of the soil is the sandy loam soil or the clayey loam soil. The pH should be around 6.5-6.7.

The soil preparation is to plow and crush into small particle 2 or 3 times in order to eliminate of weed and let the soil to dry up.

Variety and source

Farmer use to grow the variety name "O-Kud" or the other name is "Man Kaset". This variety has a narrow leaves. It can be grown in almost any type of soil. Shorter in growth duration. The tuber is red and the flesh of the tuber is red pink. It is sweet when eating in fresh and had a big demand in the markets.

The farmers bought this variety from local farms in Tambol Donpai, Amphoe Damnoen Sadok, Ratchaburi province. Usually one seeded-piece of sweet potato will be 40 cm long from the top of the vine and cost about 5.0-5.50 bahts/100 seeded-pieces.

Plot preparation

- The width of the ridge is 4 m, the length is up to the plot long.

- Use 2 teeth-hoe dig into the soil 30 cm deep, expose the soil for 10 days to dry up and eliminate the weed.

- The farmer will use compost or lime to adjust the soil pH in the case of some poor growth conditions are occured from the last crops, by applying chicken dung at soil preparation time.

Planting

Use hand-hoe or sharpened pieces of bamboo dig holes. Then bury the seeded-pieces about 4-5 inches deep, at spacing of 50x50 cm press by foot and watering. The root will come out about 3 days after planting.

Management

Irrigation

After planting sweet potato, we have to irrigate every day for 1 week. Then change the interval of irrigation to be once in every 2-3 days. About 40 days after planting the plant will start to form the tubers. Irrigation should be stopped for 1 week to let the starch translocation to tuber. After the tuber is completely formed, water it every 3-4 days until the harvest time. Turn over the vines for every month is necessary in defending of the forming of new tuber at every node of sweet potato. If the farmer doesn't practice this, it will cause of small tuber and lower in yield.

Fertilizer application

First application is done when the plant is 1 month old. Use fertilizer formula 26-0-0 at the rate of 30 kg/rai by sprinkle the fertilizer and water it.

Second application is done when it is 100 days old. Use fertilizer formula 13-13-21. The ration is 35 kg/rai, water it. Then use hormone MBI every 7 days after the tuber has formed. The ration is 50 cc/20 liters of water.

Diseases and insects

Insects

1. Thrips

The symptoms, leaf is floded up and twisted. The insect sucks the moist and leaf peduncles turn spotty and fragile. The apexs become withered. Use Sulphur dust to apply about 850 g/rai in counter measure of Thrip.

2. Army worms

The worm destroys the leaves of sweet potato by bitting and it causes holes on the leaves. Use insecticide named "Thamaron" spray it at the rate of 30-40 cc/20 liters of water.

3. Sweet potato weevils

It eats the tuber peel and its flesh. It reduces the quality of tuber as the tuber taste turns bitter. Use insecticide named "Therra" at the rate of 30-40 cc/20 liters of water, spray it every 10 days.

Diseases

1. Tuber rot

It is caused by fungus or over-irrigation. Fungus causes damage the tuber wound. The wound will turn black. The flesh becomes soft and rotten.

Prevention from this disease is to adjust the soil moisture by reducing the amount, enlarging the time of irrigation and burning the vines or tubers damaged by disease.

2. Leaf spot

Brown spot appears at the middle of the leaves and on the edges. But the damage is not serious. So there is no need to prevent and eliminate. The unhealthy leaves will fall down and the disease will not spread to another leaves.

Weed control

The popular weeds in sweet potato plots are Baipai and Namnom ratchasri but not so severe problems. Farmers use to pull out by hand.

Harvesting

The harvest start about 150 days after planting. It will be harvested when observing that the tuber turns red with good weight. The suitable time to harvest is around 120-150 days after planting depending on the market price.

Harvesting of sweet potato had been done by using 2 teeth-hoe to dig up of the tuber. During harvesting time some labors need to be hired for helping at the wage of 70 bahts/workman/day.

Marketing

The selling of sweet potato to the market can be divided into 2 systems :

1. Selling to the local trader which are very simply ways because the local trader will come to take the farm products at the farm sites. But the price is quite low.

2. The farmers have to sell their products at the central market in Pakklong Talard Market in Bangkok. It can gain the higher price but it is not convenient for the farmer. The price of sweet potato tuber is 1.50 bahts/kg at the lowest but it will higher up to 5 bahts/kg after the month of April.

Yard long bean

Yard long bean belongs to the family of Leguminosae. It can be grown all year round in every regions of Thailand. Cool and warm weather are suitable for its growth. It can be either eaten as raw vegetable or cooked. It grows easily, fast and suitable for kitchen garden or grows it as economic crops which bring back good income and reduce the family food expenditure. Leaves and vines can be used to make compost for soil fertility improvement.

Climate

Yard long bean can be grown the whole year but the best period for planting and obtaining a high yield should be during the cool and rainy season. During these seasons the weather is cool and warm, the moisture is proper. , if the farmers plant in dry season the pod will not be plump and there are a lot of diseases and insects which caused more expenses and careness in preventing from pest damage and it is quite low in yield.

Soil

Yard long bean grows well on clayey loam soil or loamy soil with good drainage. It is possible to grow in sandy soil but the yield is not good. Some manure or compost have to be applied.

Variety and source

The variety of yard long bean planted in Damnoen Sadok district is brought from Mr. Sawang Thaloengkhaphan, instructor of Kasetsart University at price of 100 bahts/liter.

Plot preparation

The farmer doesn't grow only yard long bean alone but also grows chili, potato, parsley and taro as intercrop on the same plot of land. The farmer uses 2 teeth hoe exposing the soil and dry up for 7 days after that break the soil into small particle by normal hoe and it is ready for planting. The farmer doesn't apply compost or even lime to adjust soil acidity, the reason is to waste of time and expense.

Planting

Before planting, the yard long bean seed must be coated with Apron 35 and Antigro to prevent fungus disease at the rate of 1-2 table spoons/ liter of seed. Then dig hole and place the 4-6 seed 1 wrist under soil surface and watering. The sprouts will emerge in 5 days after that any weak sprouts must be taken out and left 2-3 seedling/hole. Stake-supporter is needed for yard long bean for creeping. We can make it by using small bamboo of 2.00-2.50 meters long, put it up in each hole with lean single.

Spacing : Because of planting many crops in the same plot, farmers need to leave extraordinary spaces between each hole. The distance between plants is 75 cm and 1.50 m between rows.

Management

Irrigation

The quantity of water must be proper according to season. Every other day in cool season if it rains a lot, there is no need to irrigate. If is doesn't rain, farmers need to water the crops every 2-3 days. During the summer time it needs to water almost every day. The farmers usually use water pump boat instead of bucket.

Fertilizer application

It can be divided into 3 periods as follows :

First period Use Amoniam Sulphate 21-0-0. The best dose is ½ table spoon/hole by spreading surround the stem without covering the fertilizer. The fertilization must be applied at 14 days after the germination. At the same time any weak sprout must be eliminated. There must be 2-3 remainded plants in each hole. The irrigation is needed as usual.

Second period Use the fertilizer formula 15-15-15 or 13-13-21 after the yard long bean plant has grown up 21 days after germination. The proper dose is 1 table spoon/hole without covering the fertilizer. Watering is necessary after fertilizer application.

Third period Use the fertilizer formula 15-15-15 or 13-13-21 for top dressing at 42 days after planting at the same dose of the second dressing.

The fertilizer quantity applied to yard long bean can't be calculated because it needs to fertilize another plants simultaneously.

Diseases and insects

Pod borer

This worm punctuates into the pod and eats young seed inside. This will stop the growth of the pod. The worm severely occurs during Febuary to March.

Bean fly

This insect destroys the seedling, stem and pedicle during the flowering season of the yard long bean plant. It will cause the falling of leaves and withering of the vines, finally the vines will die.

Nematodes

It damages the root system of the yard long bean. The root turns twisted and swallen until it will not be able to absorb the mineral, therefore the growth of yard long bean will be declined and stunted.

Prevention and elimination

1. Black light method The black light can reduce mature insects by using black light in the night time to induce the insects to come and trap them by using water fill in the bowl and place under the block light trap. Farmers can destroy the insects in the following day.

2. Chemical control Spraying Lanate, Azodrin, Dieldrin and Ribcord for every 3-4 days, some time have to spray insecticide more frequencies than this in the case of severe damage.

Harvest

The harvest of the yard long bean, farmers can use the family labor in harvesting. The yard long bean can be harvested at about 50 days after planting. During November-December farmers can harvest yard long bean fresh pod about 120 kg/rai each time and harvest on the every other days for a period of 2 months. The farmers don't keep the seed to plant in next season due to waste of time and land.

Marketing

Farmers will bring the yard long bean pod with other vegetables to sell at Pakklong Talard Market or Suphan Lane in Bangkok by themseleves. The yard long bean pod is sold at the price of 7-10 bahts/kg. During April to June the price is up to 22-25 bahts/kg. This farmer has a farm of 9 rais. He divides his plot into 25 ridges. The size of each ridge is 4x72 m. There are various crops on the same ridge such as chili, potato, yard long bean, bitter cucumber, peanut, taro and parsley. He has organized his farm like this for 20 years. There are 5 members in his family, 4 females and 1 male.

Papaya

Papaya (Carica papaya Linn) is a local fruit which is popular to all classes of people. Papaya is believed to have in central America. In Thailand, papaya can be grown in all regions. It is called by different names i.e.

"Malagor" for Central people
"Logor" for Southern,
"Ma Koiy Tet" for Northern, and
"Bug Hung" for Northeastern people.

Papaya can be grown in every season of the year. It is accepted to be a kind of vegetable in some cases. Raw fruit can be used in cooking such as curry, papays salad (tamsommalagor). Especially in the northeastern region, papaya salad is daily eaten by people. Production of papaya is not enough for local consumption in northeastern region due to poor soil, light texture and windy wind So, the large amount of papaya have to be bought from the other provinces, mostly from the Central plain and Eastern provinces especially from Amphoe Damnoen Sadok, Ratchaburi province. Besides of this, there are from Nakorn Phathom, Phetchaboon and Nakorn Ratchasima provinces. The main consumer market for papaya from Amphoe Damnoen Sadok is the provinces of Khon Kean, Udon Thani, Roi-Et and Kalasin.

Botanical Characteristic

Stem Papaya belongs to the type of soft woodened-plant and succulent. Papaya has no core like any other plants. The young papaya is very susceptible to strong wind. When the papaya plant becomes old more than one year or over, the tissue becomes more sticky and harder. The stem is hollow except the area where the joints are connected.

Leaf The leaf is wide and size is about 25-75 cm in diameter with oval shape. Leaf peduncle is about half inch in diameter and 1 meter long.

Root The system of the roots can be divided into 3 types :

1. Tap root
2. Branch root

Flower Papaya's flower develops from the bud at the stem above the leaf peduncle. It has both dioicious and monoecious plant. Male flower can not produce any fruit, the female flower plant can produce fruit in round-shape with plenty of seed but for the homosexual flower, it can produce long-shaped fruit with less seed and high quality of flesh and it is needed by the market for ripening papaya.

General condition for growing papaya

Temperature Papaya is a tropical fruit tree. It can also endure with low temperature at some extent The growth rate and the productiveness are declined when the temperature is low.The low temperature will effect on the papaya's taste which caused reduction in the sweetness.

In Thailand, temperature is not much problem in growing papaya than water logged or heavy rain fall and poor drainaged soil. So the selection of planting season is not the main problem in the regions where water is adequate. However, in some regions such as northeast, the selection of the appropriate time and season of planting is quite important.

Wind Papaya is succulent plant. The tissue is soft and fragile. The leaf is wide and the leaf peduncle is long. The regular windy wind is a cause which destroys its stem and also the fruits. But the most important thing is that any stem with abundant of fruit which is grown on sandy soil can be fallen down easier than the one which is grown in clayey soil. Therefore, the wind-break-trees are necessary to plant along with the papaya in order to cut off the strong wind. For the large acreage of papaya planting, it needs to use bamboo pole to support and protect the papaya stem from strong wind and preventing from its falling down due to heavy rain and loosen-soil.

Water The high productive papaya can be obtained from the plant which has adequate moisture supply. Papaya is a very high water consumptive plant. Water stress especially in summer season will cause of low number of fruit setting and slow-down of plant growth and low yield. Even papaya is high consumptive plant, but it can not persist in the flooding or submerged condition or water logged for few hours due to the rottening of root system.

Soil Papaya can grow in almost any kinds of soil, but the layer of soil should be deep and has good drainage. The soil of the loamy type with a little portion of sand or loamy clay type with high in organic matter context is preferable. Compost or manure application can improve the undesirable condition such as over or less water holding capacity and also soil drainage ability.

In the area which the layer of soil is shallow and the lower layer is a hard pan and sticky, that areas are not suitable to grow papaya because it effects on the expansion of the roots. A healthy papaya plant must have perfect and strong roots system which can absorb minerals from certain distance. The pH of soil which is suitable in growing papaya is around 6.0-6.5 .

Papaya sprout needs much more moisture than the older because the growth of the branches and leaves is lower in the old one and it has the root system which expands further for distance. However, watering should be done regularly. If we don't provide water for a long period, the growth of papaya will stunt immidately and the stem will produce more of either female flower or male flower which cause of setting of round shape fruit which are not disired by consumers as ripening fruit type.

Variety and Source

Papayas are sold as raw fruit so the variety is Kaek-nuan because it is more productive than Kaek-dam and it is better to collect the fruit when they are raw (green mature).

Source and the selection of seed variety

The seeds are available from the dealers who buy papaya in villages and they will select the ripened fruits which have long shape at the price of 5 bahts/fruit, then cut off both end at 2 inches apart and collect the seed on the center part to be grown by cleaning it in water, drying it indoor and keeping it for some periods of time before planting season start.

Plot preparation

The standard ridge type of plot is 3-4 m wide, the length is up to the plot long.

Soil preparation

Turn up the soil with 2 teeth-hoe and expose it for the period of 20 days. Submerge the plots for the period of 7 days and drain out. Dry the plots under sunlight 3-5 days, then dig a hole with the size 30 centimeters in diameter and 10 centimeters in depth in the case of direct seeding method.

Planting

The farmers used to grow the papaya on the both sides of the plot edges along the ditch. The spacing between row is 2.5-3.0 m and 1.5 m between each plant.

Planting method

Break the ground into small particle by hand-hoe, then level and make hole, put 10-15 seeds/hole and thinly cover the seeds with soil and cover the hole with dry rice straw.

There are 2 ways of papaya cultivation i.e.

The first method is growing papaya by transplanting; the second method is growing papaya with seed directly.

According to Mr. Wichien Wongrattana's opinion, the second method can produce stronger papaya plant than the transplanting one, because the roots are not effected by seedling pull out. Direct seeding method can save the time and labor in transplanting seedling, but it uses a large quantity of seeds.

Season

The planting time starts in September because Mr. Wichien has estimated the period of the fruit harvesting when price is high during April-July.

Management

Irrigation

After planting we have to irrigate every day till the seed sprouted out from soil surface. But in rainy season, the amount of water is abundant. So the water must be drained out of ridges and ditches in order to prevent the rotten of stems and roots which is caused by the flood and water logged.

Thinning

The seedling have be thinned out at 2 weeks after planting, remain 4-5 plants/hole and after 1 month , they must be thinned out again until there is 2 or 3 plants/hole. After 3-4 months the papaya plant will start to flower. The farmer will make final thinning and left only 1 plant/hole of homosexual type.

Fertilizer

When papaya seedling is 25-30 days old up to the beginning to bear the first flower, use fertilizer formula 20-20-0 for 3 times. The dose is 2 tablespoons/hole at 1 month interval. After first flower initiation, we should apply fertilizer formula 15-15-15 every 3 months interval for about 4 times after that we have to re-plant again. In addition to, some farmers use to applied hormone or trace element such as MBI, Ecolia, Betoga to promote flower development and fruit setting by spraying them before flowering stage.

Diseases and insects

Diseases

Major disease for papaya is the damping off at seedling stage and the rotten root which is caused by too much rain and flood over the ridges. The counter measure in controlling is to drain out excessed water.

Insects

Major insects are Berab, Thrip, Red mite, Red spider and White fly.

The insect control can be done by spraying of V-80, M-77 and Lannate when the papaya is 20 days old after germinating and spraying every 10 days when the papay is still young. When the papaya bear fruits, use Omo insecticide as substitute.

Weed

Weed can be eliminated by labors. The period of weed control is 20-30 days each time but 15 days in rainy season and have been done only at younger stage. When the papaya tree produces fruits, the leaves will cover the land area which will have no problem any more.

Harvest

Papaya's started to flower at 3-4 months old. We can make first harvest of the fruits when the papaya is 6 months old. The most productive period is 7-8 months old (for the raw eating papaya fruit). After that, it is possible to harvest at every 20 days. If we have good price, 15 days interval for harvesting green papaya is also possible. If the price is low the harvesting season can be left until 1 month or more. It depends on market The good size of the raw eating is 1 kg/fruit.

Papaya harvesting

The middle man buys papaya and hires the workers to harvest. Harvesting of papaya will be done by female workers and male workers will carry to the trucks.

Marketing

The purchase of green papaya at Amphoe Damnoen Sadok is through the local wholesaler who makes order or contact farmers and make appointment of collecting time and load to ten wheel truck to the market destination, mostly to the northeastern provinces. But for the ripening papaya, it will be brought to fruit center market in Bangkok also by local wholesaler.

The person who indicates the price of green papaya is the merchant who owns the truck. Usually the price of green papaya is good in April but it becomes lower when some local cucumber is available in the market when it rains in May and June which the people can turn to use that kind of cucumber instead of green papaya for "Somtam" or papaya salad. That is the cause of lower price of papaya.

Summary

The success of farming depends on marketing. In Amphoe Damnoen Sadok, there are a lot of farmers who are specialized in planting. So, the selection of kinds of plant, time of planting and price expecting before planting are techniques which the succeessful farmers like Mr. Wichien Wongrattana has always done. He dicided to grow papaya after shallot when he observed that the shallot's price is falling down and there are too many farmers growing shallot and he succeeded.

Sikan

Sikan is a kind of orchard. It can be served as the sweet. It is the same family of lemon, wood apple, orange and pomelo. Sikan grows well under the tropical with moisture areas. It's suitable as an economic crop for Thailand.

Sikan is a sweet orange. Its peel is hard and it can be stored for a long time. Sikan makes much incomes to farmers because it grows easily, high productive and its cost is good. But, nowadays it is not so popular among farmers. So it should be promoted widely for planting.

Variety and Source

The botanical name is Citrus sinensis Linn Osback. In English it's called "Sikan" and "Change" by Chinese.

There are 2 varieties of sikan in Thailand, that is the smooth peel and the rough peel. Both of them are much planted at Amphoe Watplange at the province of Ratchaburi, Amphoe Nakornchaisri and Sampran, Nakorn Pathom province. Sikan likes sandy clay loam soil and clay loam soil with a bit of acid or alkaline.

Induce reproduciton

There are 3 ways :

Seed This method is not popular because sikan fruit has a little seeds and it takes long time for the productive period.

Budding The plant can grow well under this method. But the product is unwanted by the markets. Because the size of fruit is too big, the peel is too stick and its taste is not good.

Layerage It is the most popular method. The best quality layer is about 60-70 days old.

Plot preparation

At Amphoe Damnoen Sadok, the farmers grow sikan by ridge type because the soil is clayey soil so, it is not good for drainage. The size of the ridge is 4 meters wide, the length is up to the lenght of plot.

Before planting, farmers use 2 teeth-hoe digging the soil with the depth about 25-30 cm. Expose the land for a period of 10-15 days. Then, break the soil into small particle again. Broadcast lime all over the plot with the rate of 1 kg/5 m^2.

Farmers eliminate weeds and diseases by submerging the plot for a period of 7-10 days, then drainage and expose the soil for a period of 3-5 days.

Planting

In 2-3 years of early planting, sikan can be grown by single plant or mixed with another crops. This farmer grows sikan and grape in the same ridge. The grape plants will be cut off when sikan is 3 years old. Farmers like to grow with the space of 5½ x 5 meters. Before planting, they lay the fertilizer at the bottom of the hole by bat dung incorporated with soil at the rate of ½ kg/mound. Chemical fertilizer is not used for laying the bottom of the hole because saline will cause the root rotting.

Management

Irrigation

The young plants should be irrigated every 3 days, except in the rainy day. In summer, the plants must be watering the day after day. Watering should be done around the stem about 2-3 bails/plant. Don't let the holes boggy, it will cause of root rotting.

Fertilizer

Before planting, lay the bottom of the hole with the bat dung. When the plant is 1-3 years old, use chemical fertilizer formula 16-16-16 with the rate of 2 table spoons/plant. The spacing of fertilizer application is 3 months/time. Use powder bone at the rate of 3.84 kg/m^2 in every year.

Disease and insect

Aphid It damages the fruit by sucking juice from the fruit and cause stunted symptom. Use Savin 85 at the rate of 25 g/20 liters of water.

Stink bug It damages when the fruit is 6-7 months old by sucking juice from the fruit. Use Carbamate at the rate of 25 g/20 liters of water.

Oriental fly This insect damages the fruit when it is 8 months old. It causes fruit rotting and fall down finally. Spray Carbamate at the rate of 25 g/20 liters of water.

Weed control There is a little weeds on the plot, such as Baipai and Namnom ratchasri grass. Farmers hire women labor for elimination with the wage of 35 bahts/day/woman.

Harvesting

The harvest begins when sikan is 4 years old (planting by layerage). The most productiveness period is when it is over 5 years old.

Farmers gather their neighbors or hire labors to help at harvest time. Labors are divided into 2 groups : one is for gathering, selection and packing, another is for carrying.

Marketing

The standard size of sikan fruit needed by market is about 4-5 fruits/kg. The period of the highest price is January.

Sikan is much popular among Chinese. So, the marketing for sikan are both internal and external. The important external markets are Hong Kong, Singapore and Malasia.

Taro

Taro is a tuber plant. Most people use the tuber for cooking both as food and desert. Taro planted in Thailand is not so popular because the demand and the price in the market will be limited by factors of the planting area in the next season. For example in the year 1968, all the production of taro in Thailand was 65,395 tons but in the year 1981 the production was increased to 85,116 tons. It doesn't increase much for the past 13 years. If the price is good , it will stimulate the farmer's interest in growing taro. In the near future taro tends to be one of the important crop because the demand both internal market as well as that of the external is increasing.

Botanical characteristic

" Taro " is the common name in English. The botanical name is Colocasia esculenta or C. antiquorum. It belongs to the family of Aracea. There are 200 varieties of taro in the world but only 4 varieties are planting in Thailand. :

1. Peuk Hom

This variety has a big tuber. It weighs 2-3 kg. A few smaller tubers are attached to the bigger one. The spathe is big and green and there is aromatic smell when it boiled.

2. Peuk Marg

The tuber is yellow and smaller than Peuk Hom but the other characteristics is the same.

3. Peuk Mai or Hainan variety

This variety has long slender tuber and small.

4. Peuk Ta Dang

This variety can be defined by observing of a lot of smaller tubers attached to the big tuber. The spathe and vein are red.

Taro is a perennial crop, it can be survived over one year. Under good environment it can be 1-2 m high. Taro's tuber grows under the ground. It is composed of a big tuber and 6-20 smaller tubers connected around. The smaller tubers have different sizes and various shapes. Leaf is big with heart shape. Sizes and colors are varied due to varieties. Leaf peduncles are long and stick. The total number of leaves is 16. There are 2-5 bunches of flowers hidden in a leaf axils. The bunch has a 15-30 cm long style. The flowers bloom continuously. Female flowers are rare. Male flower has 2-3 stylets. The green fruit has thin peel with a few seed.

Climate

Taro is prosperous on the high, low and medium height of land with the tropical moist. It can grow in the semi tropical area where the temperature is not too much low. Plane on the river bank is suitable for taro planting. The required temperature is 21-27°C and rain fall requirement is 1750-2500 mm/year. If the rain fall is not enough some supplementary irrigation is needed.

Soil

Taro can be grown in many types of soil. But it prefers deep and loamy soil with good drainage. The soil must be high fertile. The required pH is 5.5-6.5

Variety and source

The variety that is used on Mr. Somboonsin's farm is the native variety of Damnoen Sadok. It is called Peuk Marg. This variety has existed in this local for a long time. The variety has been grown until now. Taro is an amphibious plant. It can be grown both under moist or wet conditions. The on land planting is the growing of taro on ridges or moist land. Wet planting is growing of taro in the shallow water. The purchase of taro seed-tubers can either be by hundred or by kilogram according to the agreement. If it is sold by hundred, it will cost 20-30 bahts/hundred of taro seed-tuber. If it is sold by weight, it will cost 5 bahts/kg.

Raising of taro seedling

1. Selection of taro seed-tuber.

The oval shape tuber is the best in using for propagation but if shortage of seed-tubers, even the small and round tuber can be used also. After selection young taro seed-tuber for propagation, keep it in a shelter place with good ventilation. Wait until the young plant has passed the dormancy period which it takes about 2 months. Too long keeping of the taro seed-tubers may caused of some damage by fungus disease or rottening.

2. Seedling method.

Make nursery bed under shade of tree or some protection of strong sun light. Prepare the soil and crush it. Then mix it up in 3-4 inches deep of carbon husk. Submerge the young taro in water for 1 night then placed them on nursery bed. The space between the taro must be 1-2 inches. Finally covering with carbon husk.

3. Irrigation.

Water them in the morning and in the evening, 2 times a day.

4. Disease and insect control.

Army worm is the only important enemy of the taro seedling. It eats the young taro's leaves. Use Folodol E 605 to get rid of it.

5. Seedling age.

The age of seedling is not fixed. But the height of the seedling is the only indicator. Transplant the seedling when it reaches to 25 cm in height and 3-4 leaves age.

6. Transplanting.

If the seedling is not very strout, remove it by pulling. In case of big seedling, dig it up with a spade and wash the ash away.

Plot preparation

- The size of the ridge is 2-3 m wide. The length is indefinite. Expose the soil in the sun until it turns dry, mixe up with hog manure in case of the on land planting method.

- There is no need for land preparation in case of water planting method. Farmers can grow taro right now after harvesting of the former one but it should not be planted at the same hole as the former planting.

- The proper period is during October-December. So that we can harvest the taro in dry season. Taro can be sold at a very high price in this season.

Planting

There are 2 ways of growing taro in the district of Damnoen Sadok :

1. Ridge planting (on land planting)

Use a space of 50 cm between the plants and 75 cm between the rows. There are 3-5 rows on each ridge depending on the furrow size.

2. Planting beside the furrow with other crops

Use a space of 50 cm between the plants. Grow taro on each ridge bank.

After digging hole according to the requirement, take the seedling which has been cleaned up, put it into the hole, cover it with the soil about 1 inch. Be careful not to cover it too deeply because it will cause of slow recover after transplanting. There is no placing fertilizer at the bottom of the hole.

Management

Irrigation

Water only the ridge taro every 2 days until it begins to mature. Then the watering is every 3 or 4 days. The machine used in this kind of irrigation is a boat fixed with water pump.

Fertilizer application

First application is done when the plant is 15 days old, counting after the planting date. Use fertilizer formula 20-20-0 at the rate of 1 table spoon/plant. (use broadcasting method with the on land taro by broadcast fertilizer between rows)

Second application is done when the taro is 45 days old. Use fertilizer formula 20-20-0 at the rate of 1 table spoon/plant. There is no using of supplementary fertilizer to stimulate the growth. The farmer explained that the size of the taro depends on the size of the plant and fertilizer (K). More over the growth stimulation is up to man power and the fertilizer purchasing power.

(There is no fertilization after second application on 45 days old until harvesting at 6 months old because the fertilization during this period will cause the tuber's form in abnormal shape. The fertilization will make the growth prosperous-the root turns plump after fertilizing and bent later on.)

Diseases and insects

1. Leaf spot (Frog's eye leaf spot)

The disease can be characterized by dark brown spot on the leaves. It spreads to the peduncle of leaf and cuase of rottening. The disease can spread to the tuber and cause the Tuber rot. (Farmer magazine Vol. October 29, 1983.) The spread is in rainy season in this farm Use Ridomil 25 the dose is 50-100 g/20 liters of water.

2. Army worm

The mature insect laid the eggs on the leaves. When the worm hatches out, it will eat the leaves. Spraying of Folidol E 605 on the leaves, it can protect them from this worm. The farmer suggested that any kind of insecticide can kill this worm. The dose is according to the company direction. If it doesn't work, we should add up one time of the chemical more.

Piling - The piling of the soil at the plant fruit is needed because it will give bigger tubers. The piling must be done for 2 times. The first time must be done with the first fertilization. The second time is done when the taro begins to bury itself in the ground. Use the mud from the furrow to cover the tuber.

Weed control

There is no weed in the ridge of this farmer. (But if the taro is grown on plantation like in Petchaburi Province, the weed control is very important. The weed control is useful for it can help cutting off the young taro shoot and help piling up the taro foot at the same time.)

The cutting up of the young taro shoot is not popular in Damnoen Sadok because it doesn't effect with the size of the original tuber.

Harvest

The harvest begins when taro is 6 months old. But the best time is when it is 5 months old but the tuber is shorter. It depends upon the farmer's decision and the market forecasting. If the taro is at least over than 6 months old, the lower part of the tuber will turn sticky and can be wrinkle. The matured taro can be observed by the reduction of the leaves that the neck of the plant becomes smaller (neck : the part that near the soil), or the stem becomes short. If any of these symptom appears, it indicates the suitable time of the harvest period.

Wages

From day to day, it costs 100 bahts/day. But the wholesale by ridge method is not certain. It is up to the length of the ridge and the density of planting.

The variety maintenance

It's not a practice among farmers in Damnoen Sadok to keep the variety as they grown the same variety. So the farmers buy the variety among themseleves.

Marketing

The marketing system

Farmers sell their products to the local dealer. The local dealer sell them to manufacturer (mostly to the bakery manufactory). Sometimes they can sell the products to the central market. The whole dealer in the market sells the products to the merchants. Then the products will reach to consumers.

Market place

The farms' owners can bring the sample of their products to Damnoen Sadok market or sell as green price and the dealers dig them up.

Prices

The price is up to the tuber sizes. The tuber can be divided into 3 grades :

1. Big tuber — weigh above 450 g
2. Medium tuber — weigh under 450 g
3. Young tuber — lower than 100 g

The medium size tuber costs half price of the big tuber. The young tuber can cost either half price of the medium or a little bit more than half if the medium tuber or the young tuber is in good quality and the size is even. The highest price of the tuber can be obtained at a little bit pre-Chinese new year. That is in February. The highest price record which appears until now is in February 1983, it costs 20 bahts/kg.

Final Report of Experiment and Training Activities

Suphan Buri Experiment and Training Center

1. Location

Suphan Buri Experiment and Training Center is located about 120 km from Bangkok and belongs to the Tumbol Ruayai, Amphoe Muang, Suphan Buri province.

2. Outline

The Suphan Buri Experiment and Training Center under the Department of Agriculture, is one of the 3 sub-projects. The project aims at contributing to the promotion of land consolidation, the improvement and extension of agricultural production technology, the development and strengthening of farmer's income.

The main building of Suphan Buri Experiment and Training Center was granted by the Japanese government. The official opening ceremony of this Center was held on March 10th, 1979.

The purpose of the Suphan Buri Training Center project is to train the related government officials and to carry on the research works for solving the problem in irrigated and pilot project area.

The training program is planned by the working committee which was set up by the Department of Agriculture.

The joint sub-projects co-ordination committee also was set up at the ministrial level.

Suphan Buri Experiment and Training Center has its responsible on :

(1) Training

For the officers in charge from different government agencies such as : Royal Irrigation Department, Agricultural Land Reform Office, Department of Agriculture Extension, Department of Agriculture Co-operative Promotion, Accelerated Rural Development Office, Department of Community Development, Department of Public Welfare and Agricultural Economic Office, etc.

(2) Research

To carry on the research works for the purpose of solving the problems involving in the project areas in the field of cropping system, land and water utilization, farm mechanization etc.

(3) Technical co-operation

To support for technical advices to Chao Phya and Mae Klong Pilot Project and the organization concerned agriculture.

3. Construction work

(1)	Training Center Office	1978	100%
	(Granted Aid by the Japanese government, cost 120,000,000 yen)		
(2)	Dormitory	1980	100%
	(Thai government budget)		
(3)	Expert house	1980	100%
	(Thai government budget)		
	(Cost 2,200,000 baht including a dormitory)		

4. Training activities

The first batch of 40 trainees was started in two weeks training course on "Rice cultivation technique in irrigated area" from July 16th, 1979. Since then different courses of training has been done by the Center up to the end of March 1985 are five long term courses, 53 times weeks course, 14 times special course and 16 times seminar etc. The number of trainees are 2401 and 680 of participant for seminar.

Long term and weeks training course

No.	Curriculum	Duration	Participant
1st	Rice cultivation technique in irrigated area	Jul16-27	40
2nd	Cropping system in irrigated area	Dec17-28	39
3rd	Integrated farming in irrigated area	Jan14-25	32
4th	Experimental design and computer result analysis	Feb 5-6	15
5th	Modern agriculture in irrigated area	Mar18-20	46
6th	Rice cultivation technique in irrigated area	Apr14-25	40
7th	Rice cultivation technique in irrigated area	May12-23	33
8th	Computer programing and utilizing	Jun16-17	12
9th	Advance of computer programing and utilizing	Jul23-24	9
10th	Cropping system data analysis	Oct 6-10	10
11th	Cropping system data analysis	Oct20-24	10
12th	Experimental design and computer analysis	Nov19-20	29
13th	Integrated farming in irrigated area	Dec15-26	45
	1979-1980 Sub total		360
14th	Introduction to computer programing and utilizing	Jan21-22	12
15th	Introduction to computer programing and utilizing	Jan27-28	15
16th	Rice cultivation technique in irrigated area	Mar 9-20	31
17th	Advance of computer programing and utilizing	Apr22-23	11
18th	Advance of computer programing and utilizing	Apr28-29	11
19th	Rice cultivation technique in irrigated area	Jun 8-19	36
20th	* Crop cultivation technique and integrated farming in irrigated area	Aug3-Nov27	33
	1981 Sub total		149
21st	Integrated farming in irrigated area	Jan11-22	19
22nd	Integrated farming in irrigated area	Feb 9-19	27
23rd	Cropping system in irrigated area	Feb22-Mar12	35
24th	Introduction to computer programing and utilizing	Mar22-26	7
25th	Student training course	Mar15-Apr9	14
26th	Cropping system in irrigated area	May10-28	31
27th	Introduction to computer programing and utilizing	Jun12-16	9
28th	* Rice cultivation technique in irrigated area	Jul27-Nov25	19
29th	Student training course	Oct 4-9	32
30th	Modern agriculture in irrigated area	Nov 9-11	51
31st	Integrated farming in irrigated area	Nov16-18	66
32nd	Introduction to computer programing and utilizing	Dec20-24	9
	1982 Sub total		319

No.	Curriculum	Duration	Participant
33rd	Cropping system for the central region	Jan 6-8	61
34th	Introduction to computer programing and utilizing	Jan17-21	11
35th	Introduction to computer programing and utilizing	Jan24-28	8
36th	**Preparation for training in Japan	Feb14-Mar15	10
37th	Key-site selection	Mar 8-11	30
38th	Data analysis and research planning for Suphan Buri key-site	Mar 2-25	50
39th	Seminar on Agriculture Extension Technicians in Western Region	Apr14-15	30
40th	Meeting of working group and farmers of Suphan Buri key-site	Jun10	27
41st	Administration and activities of provincial livestock	Jul18-27	28
42nd	Activities of young farmer for district extension officers	Aug 1-6	42
43rd	**Rice cultivation technique in irrigated area	Sep5-Dec23	19
44th	Student training course	Oct10-14	19
45th	Volunteer for Suphan Buri Livestock Development Program	Nov14-18	45
	1983 Sub total		380
46th	Computer programing and utilization	Jan23-27	12
47th	Computer programing and utilization	Feb 6-10	8
48th	Rain-fed rice improvement project group I	Feb27-Mar2	40
49th	Seminar on Farming system research group	Mar 7-9	61
50th	Irrigated water management for rice cultivation	Mar12-16	33
51st	**Integrated farming in irrigated area	Mar19-Apr12	27
52nd	Rain-fed rice improvement project group II	Apr23-27	33
53rd	Integrated farming in irrigated area	Jun25-29	26
54th	**Rice cultivation technique and integrated farming in irrigated area	Sep10-Dec25	30
55th	Computer programing and utilization NEC machine	Feb 4-8	9
56th	Computer programing and utilization NEC machine	Feb11-15	8
57th	**Integrated farming in irrigated area	Feb11-Mar8	37
58th	Modern germinated broadcasting rice cultivation	Mar18-22	40
	1984-1985 Sub total		364
	Total		1572

* Long term course

** Budgets were supported by Japanese government

Special course

No.	Curriculum	Duration	Participant
1st	Modern germinated broadcasting rice cultivation	Dec 3	97
2nd	Modern germinated broadcasting rice cultivation	Dec 8-9	66
	1980 Sub total		163
3rd	Modern germinated broadcasting rice cultivation	Jan 5-6	68
4th	Modern germinated broadcasting rice cultivation	Jan 7-8	60
5th	Modern germinated broadcasting rice cultivation	Jan12-13	74
6th	Modern germinated broadcasting rice cultivation	Jan14-15	67
7th	Modern germinated broadcasting rice cultivation	Feb12-13	48
	1981 Sub total		317
8th	Modern germinated broadcasting rice cultivation	Mar16-17	60
9th	Modern germinated broadcasting rice cultivation	Mar19	120
10th	Modern agriculture in irrigated area	Jun 2-4	4
11th	Modern agriculture in irrigated area	Nov 9-12	51
12th	Modern agriculture in irrigated area	Nov16-18	66
	1982 Sub total		301
13th	Fertilization technique in paddy field	Mar28	24
14th	Rice pest and its control	Jun20	24
	1984 Sub total		48
	Total		829

Technical meeting and seminar

No.	Curriculum	Duration	Participant
1st	Research coordination and promotion of water in agriculture utilization sub-committee	Oct25-26	45
2nd	Sensitive rice variety selection among Experiment Station in central region	May26-27	35
3rd	Agriculture officials of Modern germinated broadcasting rice cultivation project	Jun 4	45
4th	Modern germinated seed demonstration pilot	Jun 9	50
5th	Department of Agricultural Extension	Oct28-29	71
	1979-1980 Sub total		246
6th	Agricultural Land Reform Office for lawyer	Mar 2-6	40
7th	Technical Division for irrigation	Mar23-27	25
8th	Azolla utilization in paddy field	Dec 8	60
	1981 Sub total		125
9th	Low land rice variety selection for the north	Apr 2-3	42
10th	Low land rice variety selection for the central	May 3-4	30
11th	Annual meeting for Suphan Buri Extension	Sep 9	110
12th	Reinforced teaching for students	Sep18	35
	1982 Sub total		217
13th	Working committee of Suphan Buri key-site	May 7-9	20
14th	Working committee of Suphan Buri key-site	Jul18	17
15th	Contact farmers of Suphan Buri key-site	Aug17	25
16th	Workshop on Research of Cantaloupe in Thailand	Jan10	30
	1984-1985 Sub total		92
	Total		680
	Total trainees = 2401 Seminar etc. = 680 Grand total		3081

5. Experiment Activities

Many experimental works were carried out for several years concerning the technical improvement to increase rice yield including method of planting, fertilizer rate and time of application, spacing, seed rate and calper coating and integrated farming etc.

1979

Exp 1 Experiment of different mat soil & fertilizer for box seedling

Exp 2 Effect on different planting time on growth and yield of RD 7

Exp 3 Comparison of yield of different planting date by transplanter

1980

Exp 1 Effect of under drainage on the growth and yield of rice

Exp 2 Intensive cultivation techniques for increasing rice yield

1981 Dry

Exp 1 Effect of seedling and split application of nitrogen for yield

Exp 2 Effect of different nurseries and space for rice yield

Exp 3 Different density pre-trial on rice

Exp 4 Study on multiple cropping system for paddy field

1981 Wet

Exp 1 Effect of Potassium fertilizer and fertilizer application time on germinated direct broadcasted rice

Exp 2 Effect of seedling densities and nitroenous fertilizer rate on the growth and yield of transplanted rice

Exp 3 Different rates and split application of nitrogen fertilizer on the yield of transplanted rice

Exp 4 The comparison of rice yield on rates and times of nitrogen fertilizer which refers to different cultivation methods

1982 Dry

Exp 1 Effect of different transplanting to rice yield 1981

Exp 2 Density and nitrogen rate trial on transplanting rice

Exp 3 Fundamental test for germinated direct broadcasted rice

4 General discussion of density and nitrogen rate and recommendation of intensive cultivation technique of transplanting rice

5 Recommendation of intensive transplanting cultivation technique of rice

6 Recommendation of intensive transplanting cultivation technique of rice at Chao Phya and Mae Klong Pilot Project areas

1982 Wet

Exp 1 Organic manure, nitrogen rate and density trial of transplanting rice

Exp 2 Experiment of lodging avoidance on germinated direct sowing rice

1983 Dry

Exp 1 Effect of seed rate and nitrogen fertilizer on yield of germinated direct broadcasting rice

Exp 2 Effect of seedling take off for space-line on yield and its yield components for germinated direct broadcasting rice

Exp 3 Different quantities of Calper coating on rice seed for germinated direct broadcasting rice under submerged condition field

Exp 4 Different quantities of Calper coating on rice seed for germinated direct broadcasting rice under general condition field

Exp 5 Effect of weed control and seedling take off on the Calper dust seed coating and non coated seed for germinated direct broadcasting rice

1983 Wet

Exp 1 Effect of different seed rate and nitrogen fertilizer to the growth and yield of germinated broadcasting rice

Exp 2 Effect of seed rates, times and rates of nitrogen application, coated and uncoated seed with Calper (Calcium peroxide) on yield of germinated broadcasting rice

Exp 3 Effect of the rice yield of different methods in cultivation of germinated direct sowing

Exp 4 Comparison of different methods of cultivations on the yield of rice

1984 Dry

Exp 1 Effect of different seed rates and nitrogen fertilization on the growth and yield of germinated broadcasting rice

Exp 2 Effect of seed rates and nitrogen fertilizer guantities for yield on germinated direct sowing rice

Exp 3 Effect of Calper coating quantities of rice seed to the amount of survival seedling in germinated broadcasting rice

Exp 4 Effect of different seed rates in germinated direct sowing

1984-1985

Exp 1 Development of Cantaloupe cultivation technique

The comparison of treatment data in 1980-1984

Outline

The series of the experiments were continuously carried out between 1980 and 1984 at the fields of the Suphan Buri Experiment Station. The yearly and subject-wide experimental results together with the statistical analysis were reported every year.

The following results are compared among these means in every subject through the year. The results from the transplanting were derived from the 60 treatments from 1980 to 1982 and those from direct-sowing were derived from the 110 ones from 1982 to 1984.

The analytical subjects were divided into transplanting direct-sowing, wet and dry season, plant densities, grain yields, nitrogen applications and etc.

The datas are as follow :

1) the paddy yield from the crop-cutting of 8 m^2
2) the yield components data sampling from 50 cm x 50 cm area
3) the number of panicles and spikelets per panicle
4) the percentages of ripened grains defined by specific gravity 1.06
5) the 1,000 grain weights
6) the calculation yield and number of spikelets per m^2

Results

1. Comparison between transplanting and direct-sowing

The crop-cutting yield from the direct-sowing method is 5,474 kg/ha and it from the transplanting is 5,333 kg/ha. The former one exceeds the latter by 140 kg. The opposite way is more common for ordinary farmers' fields.

2. Comparison between dry and wet seasons

As far as the crop-cutting survey result is concerned, the dry season crops show better results than the wet season ones in both of transplanting and direct-sowing. The transplanting and direct-sowing in the dry season are 845 kg and 285 kg respectively bigger than them in the wet season.

According to the yield component of the respective data, in terms of grain quantities, the dry season is bigger than the wet season. Consequently, the grain quantities per unit acreage, which significantly effects the yield, is considered as the most important factor.

The Suphan Buri Experiment Station, defines March to July as the dry season and August to December as the wet season.

3. Comparison between plant densities and sowing rates

In transplanting, the plant density of 25 hills per m^2 (20 cm x 20 cm) gained the most yield. The second most one is 32 hills per m^2.

In direct-sowing, 8 kg of seed per rai (1,600 m^2) gained the most yield. The more amounts tend to get less yields.

These results were obtained from the well-managed field like the Station but it is required that the further research should be made at the farmers' fields.

4. Comparisons among nitrogen application

In transplanting, 18 kg per rai of the nitrogen application gained the most yield, but 24 kg got less. The less amount of the applications than 18 kg tend to correspondly lose the yields.

In direct-sowing, 14 to 16 kg per rai gained the most yield.

The more applications tend to accerelate the lodging and to reduce the percentage of the ripened grains.

The less applications than 14 kg per rai significnatly reduce the yields. If the comparisons between the transplanting and direct-sowing at the same level of application are made, the efficiency of the fertilizer absorption is better for the direct-sowing. Namely, in the transplanting 12 kg gained 5,083 kg per ha of rice grains, 16 kg did 5,279, and 18 kg did 6,257 kg but in the direct-sowing, 10 to 12 kg did 5,545 kg and 14 to 16 kg did 6,256 kg.

Secondly the economical optimum level of the nitrogen application,

The control with 3 plots in both of the dry and wet seasons were allocated and the average yield was 4,089 kg per ha.

The different levels of the application on the condition of the same cost other than the nitrogen fertilizer cost. If the control level is 100, the application of 6 kg, 11 kg, 15 kg and 21 kg per rai are 125, 128, 143 and 101 respectively. Therefore, 15 kg applcation gained the most yield.

5. Correlation between yields and yield components

The correlation matrixes concerning transplanting and direct-sowing respectively. The most correlated factor with the yield is the grain quantity per unit area, i.e. the correlation ratio in transplanting is 0.983 and it in direct-sowing 0.846

These datas analyzed by T value of multiple regressions with the factors related to the yield.

The most significant factors to increase the yield are the number of panicles per m^2 and next is the number of spikelets per panicle in transplanting but at direct-sowing the number of panicles and spikelets of per panicle, the both are equally important.

Conclusion

The above-mentioned analysis may conclude the following items as the instruction for the farming in the Central Zone around Suphan Buri.

In transplanting ;

1) The plant density is 25 hills per m^2 (20 cm x 20 cm)

2) The nitrogen application amount 18 kg per rai is recommended. For basal and top dressing, half is applied respectively, and the top dressing should be applied the panicle initiation stage.

In direct-sowing ;

1) The seed rate is good, 8 kg per rai on experiment but usually 10 to 12 kg should be recommended for farmers.

2) Best quantities 14 to 16 kg per rai of nitrogen is applied. The half for basal is recommended to be applied 15 to 20 days after sowing and for top dressing at the panicle initiation stage. Wherever lodging is an ordinary problem, the application for top dressing is devided into twice, once at the panicle initiation stage and once at the booting stage.

6. Service works

1. Translate, publication and distributed papers for reference data
2. Cooperative to sub-project for experiment data analysis by computer
3. Introduce of new techniques for crops and vegetables
4. Recording video cassette tape for training
5. Seed supplying to sub-projects
6. Offer to computer programing and guidance computer