Nuwakot.

Budget heads.	1986/87	1987/88	1988/89	1989/90	1990/91/.	Total
6.Repair	-	10000	15000	150000	200000	375000
7.1.Office ewuipments	-	10000	10000	10000	10000	40000
7.3.2.Fuel (other purpose)	-	30000	30000	40000	50000	150000
7.5.1.Expendable goods	360000	10000	15000	15000	15000	410000
10.1. Furniture	-	50000	30000	20000	-	100000
12.1. Building construction.	-	1500000	400000	1500000	-	3400000
12.2. Other construction.						
a. Materials	800000	-	-	-	-	800000
b. Labour	-	50000	50000	50000	50000	200000
Total	1160000	1660000	545000	1785000	325000	5475000

Long term training at Kirtipur Centre. (JT/JTA)

No.of Trainees.	Fiscal Year	1987/88	1988/89	1989/90	1990/91	1991/92
July 15th	8 trainees of JT/JTA (1st group)	General Course Division Course Grape-3 Citrus-3 Agri Maci-2				
Jan 15	8 trainees of JT/JTA (2nd group)	General Course	Division Course			
July 15	8 trainees of JT/JTA (3rd group)		General Course	Division Course		
Jan 15	8 trainees of JT/JTA (4th group)		General Course	Division Course		
July 15	8 trainees of JT/JTA (5 th group)			General Course	Division Course	
Jan 15	8 trainees of JT/JTA (6th group)			D.C.	D.C.	
July 15	8 trainees of JT/JTA (7th group)				D.C.	D.C.
Jan 15th	8 trainees of JT/JTA (8th group)				D.C.	D.C.
Total No: of trainees.	64 trainees.					

Development Programme (Area in hectare)

	District.	1986	1987	1988	1989	1990	Total
Junar	Sindhuli	110	300	400	500	-	1310
	Ramechap	100	280	350	460	-	1190
Grape	Banke	15	15	15	15	15	75
	Bardiya	10	10	10	10	10	50
Chestnut	Nuwakot	5	10	15	15	15	60
	Kathmandu	5	5	5	5	5	25
Winegrape	Mustang	3	3	3	3	3	25*
	Manang	2	2	2	2	2	10*

*Not taken into account while calculating subsidy.

Financial out lay for Jumar Production

Programme for 1987.

Area: 580 ha.

1.	100% Subsidy for transportation	Rs. 87000.00
2.	50% Subsidy on plant cost	Rs. 507384.00
3.	50% Subsidy on plant protection chemicals.	Rs. 130384.00
4.	50% Subsidy on chemical fertilizers	Rs. 174000.00
5.	50% Subsidy on horticulture implements.	Rs. 440800.00
6.	100% Revenue exemption for 6 yrs.	Rs. 34800.00
7.	75% Subsidy on irrigation development	Rs. 1740000.00
8.	Interest subsidy for 6 yrs @ 7.5% on production loan @ Rs 500/per ropani.	Rs. 3117500.00
9.	Fencing @ 5000/ha	Rs. 1450000.00
		Rs. 7681868.00

Financial out lay for Junar production

for 1988.

Area: 750ha.

1.	100% Subsidy for transportation	Rs. 112500.00
2.	50% Subsidy on plant cost.	Rs. 656100.00
3.	50% Subsidy on plant protection chemicals.	Rs. 168600.00
4.	50% Subsidy on chemical fertilizers.	Rs. 225000.00
5.	50% Subsidy on horticulture implements	Rs. 570000.00
6.	100% Revenue exemption for 6 yrs.	Rs. 45000.00
7.	75% Subsidy on irrigation development	Rs. 2250000.00
8.	Interest subsidy for 6 yrs @ 7.5% on production loan @ Rs 500/per ropani	Rs. 4031250.00
9.	Fencing @ 5000/ha.	Rs. 1875000.00
		Rs. 9933450.00

Financial out lay for Junar production

for 1989.

Area:960 ha.

1.	100% Subsidy for transportation	Rs. 144000.00
2.	50% Subsidy on plant cost	Rs. 839808.00
3.	50% Subsidy on plant protection chemicals.	Rs. 215808.00
4.	50% Subsidy on chemical fertilizers.	Rs. 288000.00
5.	50% Subsidy on horticulture implements.	Rs. 729600.00
6.	100% Revenue exemption for 6 yrs.	Rs. 57600.00
7.	75% Subsidy on irrigation development	Rs. 2880000.00
8.	Interest subsidy for 6 yrs @ 7.5% on production loan @ Rs 500/per ropani.	Rs. 5160000.00
9.	Fencing @ 5000/ha.	Rs. 2400000.00
		Rs.12714816.00

Financial out - lay for Junar Production Programme for 5 Years.
(1986 - 1990)

	Year Subsidy.	1987	1988	1989	Total
1.	Transportation	87,000	1,12,500	1,44,000	3,43,500
2,	Plant Cost.	5,07,384	6,56,100	8,39,808	20,03,292
3.	Plant protection chemicals.	1,30,384	1,68,800	2,15,808	5,14,792
4.	Chemical Fertilizers.	1,74,000	2,25,000	2,88,000	6,87,000
5.	Horticulture Implements.	4,40,800	5,70,000	7,29,600	17,40,400
6.	Revenue Exemptions.	34,800	45,000	57,600	1,37,400
7.	Irrigation Development.	17,40,000	22,50,000	28,80,000	68,70,000
8.	Production Loan.	31,17,500	40,31,250	51,60,000	123,08,750
9.	Fencing.	14,50,000	18,75,000	24,00,000	57,25,000
		76,81,868	99,33,450	127,14,816	303,30,134

GRAPE

		1987	1988	1989	1990	Total
1.	Transportation of fruit saplings and others.	7,200	7,200	7,200	7,200	28,800
2.	Plant Material.	20,000	20,000	20,000	20,000	80,000
3.	Plant protection measure.	40,000	40,000	40,000	40,000	1,60,000
4.	Fertilizer & Manures.	40,000	40,000	40,000	40,000	1,60,000
5.	Hort. Implements.	1,00,000	1,00,000	1,00,000	1,00,000	4,00,000
6.	Exemption of land revenue for 3 years.	2,000	2,000	2,000	2,000	8,000
7.	Irrigation facilities.	4,00,000	4,00,000	4,00,000	4,00,000	16,00,000
8.	Production loan @ 5,000.	3,80,000	3,80,000	3,80,000	3,80,000	15,20,000
9.	Fencing	12,00,000	12,00,000	12,00,000	12,00,000	48,00,000
10.	Trellis.	4,80,000	4,80,000	4,80,000	4,80,000	19,20,000
		26,69,200	26,69,200	26,69,200	26,69,200	106,76,800

CHESTNUT

		1987	1988	1989	1990	Total
1.	Transportation.	9,000	12,000	12,000	12,000	45,000
2.	Planting Material.	11,470	15,294	15,294	15,294	57,352
3.	Plant protection	7,057	9,410	9,410	9,410	35,287
4.	Fertilizer.	17,646	23,528	23,528	23,528	88,230
5.	Hort. Implements.	17,646	23,528	23,528	23,528	88,230
6.	Exemption of land revenue (3 yrs).	1,050	1,412	1,412	1,412	5,296
7.	Irrigation facilities.	17,646	23,528	23,528	23,528	88,230
8.	Production loan @ 500 per Hectare with 5% interest.	45,000	60,000	60,000	60,000	2,25,000
9.	Fencing.	35,292	47,056	47,056	47,056	1,76,460
		1,61,817	2,15,756	2,15,756	2,15,756	8,09,085

SUBSIDY AT A GLANCE

	Item.	1987/88				1988/89				1989/90				1990/91				Grand Total (2,3;4,5,)
		Junar.	Grape.	Chestnut.	Total.	Junar.	Grape.	Chestnut.	Total.	Junar	Grape	Chestnut	Total.(4)	Junar	Grape	Chestnut	Total.(5)	
1.	Transportation of fruit saplings and materials.	87,000	7,200	9,000	1,03,200.	1,12,500.	7,200	12,000.	1.31.700	1,11,000	7,200	12,000	1,63,230	-	7,200	12,000	19,200.	4.17,300
2.	Cost of fruit saplings.	5,07,384	20,000	11,470	5,38,854.	6,56,100.	20,000	15,294	6,91,394	8,39,808	20,000	15,294	8,75,102	-	20,000	15,294	35,294	21,40,644
3.	Plant protection.	1,30,384	40,000	7,057	1,77,441.	1,68,600	40,000	9,410.	2,18,010	2,15,808	40,000	9,410	2,65,218	-	40,000	9,410	49,410	7,10,079
4.	Chemical Fertilizer.	1,74,000	40,000	17,646	2,31,646	2,25,000	40,000	23,528	2,88,528	2,88,000	40,000	23,528	3,51,528	-	40,000	23,528	63,528	9,35,230
5.	Hort.Implements.	4,40,800	1,00,000	17,646	5,58,446	5,70,000.	1,00,000	23,528	6,93,528	7,29,600	1,00,000	23,528	8,53,128	-	1,00,000	23,528	1,23,528	22,28,630
6.	Revenue Exemption.	34,800	2,000	1,060	37,860	45,000.	2,000	1,412	48,412	57,600	2,000	1.412	61,012	-	2,000	1,412	3,412	1.50,696
7.	Irrigation Development.	17,40,000	4,00,000	17,646	21,57,646	22,50,000	4,00,000	23,528	26,73,528	28,80,000	4,00,000	23,528	33,03,528	-	4,00,000	23,528	4,23,528	85,58,230
8.	Production Loan	31,17,500	3,80,000	45,000	35,42,500	40,31,250	3,80,000	47,056	31,22,056	51,60,000	3,80,000	60,000	56,00,000	-	3,80,000	60,000	4,40,000	140,53,750
9.	Fencing	14,50,000	12,00,000	35,292	26,85,292	18,75,000	12,00,000	--	4,80,000	124,00,000	12,00,000	47,056	36,47,056	-	12,00,000	47,056	12,47,056	107,01,460
10.	Trellis	----	4,80,000	--	4,80,000	----	4,80,000	--	4,80,000	---	4,80,000	--	4,80,000	-	4,80,000	--	4,80,000	19,20,000
		76,81,868	26,69,200	1,61,817	105,12,885	99,33,450	26,69,200	215,756	128,18,406	127,14,816	26,69,200	2,15,756	155,99,772	-	26,69,200	2,15,756	28,84,956	418,16,019

Programme for 1986/87.

	Banke/Bardia	Sindhuli	Nuwakot	Kathmandu	Total
1. Demo. farm & Service centre.					
a) Demo. Farm.	15,16,000-	2,40,000-	1,80,000-	3,95,000-	2,33,000-
b) Farm house and Service centre.	4,84,000-	13,60,000-	6,20,000-	4,05,000-	28,69,000-
2. Nursery plants.	3,66,000-	17,000-	1,80,000-	4,76,000-	10,39,000-
3. Training.	39,000-	42,000-	4,000-	-	85,000-
4, Constructs.	2,00,000-	19,00,000-	-	3,50,000-	24,50,000-
5. Recurring	1,00,000-	1,00,000-	-	6,00,000-	8,00,000-
6. Wages.	1,20,000-	60,000-	-	1,50,000-	3,30,000-
	28,25,000-	37,19,000-	9,84,000-	23,76,000-	99,04,000-

Grape Programme in Banke and Bardiya.

Unit: Rs.

S.No.	Description	Budget for Banke.	Budget for Bardiya.	Total
1.	Establishment of Demo.Farm.			
1.1.	Demo.Farm.			
(a)	Land preparation	3,000-	3,000-	6,000-
(b)	Trellising: Tower or Terrace	2,40,000-	2,40,000-	4,80,000-
	Kniffin.	1,50,000-	1,50,000-	3,00,000-
(c)	Nursery plants	60,000-	60,000-	1,20,000-
(d)	Fence	96,000-	96,000-	1,92,000-
(e)	Wind breaker.	10,680-	10,680-	21,360-
(f)	Irrigation Development	1,74,000-	1,74,000-	3,48,000-
(g)	Manures and Fertilizers.	17,000-	17,000-	34,000-
(h)	Farm Equipments and tools.	5,000-	5,000-	10,000-
(i)	Other Miscellaneous	2,320-	2,320-	4,640-
		7,58,000-	7,58,000-	15,16,000-
1.2.	Farm House and Road.			
(a)	Farm Road Development	50,000-	50,000-	1,00,000-
(b)	Farm House with store, toilet.	1,92,000-	1,92,000-	3,84,000-
	[illegible]	2,42,000-	2,42,000-	4,84,000-
	Sub - Total:	10,00,000-	10,00,000-	20,00,000-
2.	Nursery plants and seeds.			
(a)	Vines from Japan.			
(i)	Nepalgunj Sub - Centre, 2.7 h.	1,62,000-	-	1,62,000-
(ii)	For distribution to the surrounding farmers.	60,000-	60,000-	1,20,000-
(iii)	Nursery (for [illegible] filling in future) 1.2 h.	72,000-	-	72,000-
(b)	Vines from India.			
	Nepalgunj Sub - Centre, 2.0 h.	12,000-	-	12,000-
	Sub - Total:	3,06,000-	60,000-	3,66,000-
3.	Training.			
(a)	Training in Kirtipur.	9,750-	9,750-	19,500-
(b)	Training in Nepalgunj.	9,750-	9,750-	19,500-
	Sub - Total:	19,500-	19,500-	39,000-

S.No.	Description	Budget for Banke.	Budget for Bardiya.	Total
4.	Construction.			
(a)	Store house in Sub -Centre.	1,00,000-	-	1,00,000-
(b)	Laboratory in Sub - Centre.	1,00,000-	-	1,00,000-
	Sub - Total:	2,00,000-	-	2,00,000-
5.	Recurring Costs.			
(a)	Fuel for tractors, power-tillers, pumps, generators, wireless set.	75,000-	25,000-	1,00,000-
	Sub - Total:	75,000-	25,000-	1,00,000-
6.	Wages for Labours.			
(a)	Plantation of vines	10,000-	-	10,000-
(b)	Weeding in vineyards.	20,000-	-	20,000-
(c)	Manuring in Vineyards.	15,000-	-	15,000-
(d)	Applying Irrigation.	10,000-	-	10,000-
(e)	Plant protection measures.	5,000-	-	5,000-
(f)	Training & Pruning of vines,	35,000-	-	35,000-
(g)	Watchmen.	15,000-	-	15,000-
(h)	Miscellaneous.	10,000-	-	10,000-
		1,20,000-	-	1,20,000-
	GRAND TOTAL:	17,20,500-	11,04,500-	28,25,000-

Junar Programme in Sindhuli, Ramechhap.

1. Establishment of Demonstration Farm.

(a) Demonstration farm.

Description	Sindhuli	Ramechhap	Total
(i) Nursery plants	2,500-	2,500-	5,000-
(ii) Manures & Fertilizers	10,000-	10,000-	20,000-
(iii) Tools & Implements	7,500-	7,500-	15,000-
(iv) Irrigation development	50,000-	50,000-	1,00,000-
(v) Fencing	50,000-	50,000-	1,00,000-
	1,20,000-	1,20,000-	2,40,000-
(b)(i) Demo. Farm house (2)	2,50,000-	2,50,000-	5,00,000-
(ii) Service centres (4)	4,30,000-	4,30,000-	8,60,000-
	6,80,000-	6,80,000-	13,60,000-
Sub - Total:	8,00,000-	8,00,000-	16,00,000-

2. Nursery plants

(a) Sindhuli.		2,240-	-	2,240-
(b) Sindhuli farm.		7,840-	-	7,840-
(c) Ramechhap.		-	1,920-	1,920-
(d) Kirtipur.	*5,000-	-	-	5,000-
	5,000-	10,080-	1,920-	17,000-

3. Training

(a) Kirtipur.

(i) Daily allowance for trainees. Rs.20 x 20 persons x 7 days x 2 times.		2,750-	2,750-	5,500-

Description	Sindhuli	Dhaka	Total
(ii) Travelling allowance			
Rs.200 x 20 persons x 2 times.	4,000-	4,000-	8,000-
(b) Sindhuli			
(i) Daily allowance for trainees			
Rs.20 x 25 persons x 7 x 6 times.	10,500-	10,500-	21,000-
(ii). Travelling allowance			
Rs 20 x 25 persons x 6 times.	3,750-	3,750-	7,500-
Sub - Total:	21,000-	21,000-	42,000-
4. Construction			
(a) Construction of a bridge at Sindhuli (a permanent bridge in cement). Length 60 m, width 4m, and height 1.5 m (from dry season water level) foundation depth 2m.	10,00,000-	-	10,00,000-
(b). Construction of green house. at Sindhuli (floor space: 180 m^2)	9,00,000-	-	9,00,000-
(i) Foundation Rs.1,50,000.(Local)			
(ii) Green house Rs.7,50,000. (Convertable foreign currency.)			
Sub - Total:	19,00,000-	-	19,00,000-
5. Recurring Cost.			
Fuel cost.	1,00,000-	-	1,00,000-
(a) Pick up (30,000.)			
(b) Motor bike (20,000.)			
(c) Generator set (40,000.)			
(d) Wireless set (10,000.)			
Sub - Total:	1,00,000-	-	1,00,000-

	Sindhuli	Ramechhap	Total
6. Wages for workers (10persons)	60,000-	-	60,000-
(a) Pit digging.			
(b) Land clearance.			
(c) Planting.			
(d) Weeding.			
(e) Spraying of fungicids/insecticids.			
Sub - Total:	60,000-	-	60,000-
TOTAL:	28,96,080-	8,22,920-	37,19,000-

Chestnut programme in Nuwakot.

1. Establishment of Demonstration Farm.

(a) Demonstration farm.	Amount (NRS)
(i) Nursery plants	60,000-
(ii) Land preparation	5,000-
(iii) Manures & Fertilizers.	10,000-
(iv) Tools & implements	5,000-
(v) Irrigation development.	50,000-
(vi) Fencing	50,000-
Sub - Total.	18,00,000-
b. (i) Service Centres (2)	3,20,000-
(ii) Demonstration farm house.	30,00,00 -
Sub - Total.	6,20,000-
Sub - Total.	Rs. 8,00,000-

2 2. Nursery plants.

(a) Nuwakot.	80,000-
(b) Kakani farm.	1,00,000-
Sub - Total:	Rs. 1,80,000-

3. Training.

(a) Kirtipur.	
Daily allowance for trainees.	2,800-
Rs. 20 x 10 person x 7 days x 2 times.	
(b) Travelling expenses.	
Rs. 60 x 10 person x 2 time.	1,200-
Sub - Total:	Rs. 4,000-
Grand Total :	Rs. 9,84,000-

Mild temperate fruits programme in Kathmandu.

1. Establishment of Demonstration Farm:

Description	Amount (NRS)
(i)Nursery plants	60,000-
(ii)Manures & Fertilizers.	10,000-
(iii)Tools & Implements	25,000-
(iv)Land preparation	10,000-
(v)Irrigation development	1,00,000-
(vi)Fencing	90,000-
(vii)Trellis	1,00,000-
	Rs.3,95,000-
(b)(a)Demonstration Farm house.	2,50,000-
(b)Service Centre (1)	1,55,000-
	Rs.4,05,000-
Sub - Total:	Rs.8,00,000-

2. Nursery. plants.

(a)Kathmandu	60,000-
(b)Kirtipur centre	2,66,000-
(c)Surrounding Farmers.	1,50,000-
Sub - Total:	Rs.4,76,000-

3. Constructions.

(a)Repair of existing potato store house for store.	50,000-
(b)Construction of garage for vehicles, tractors.	1,50,000-

Description	Amount (NRS)
(c) Construction of a store house for agricultural machineries.	1,50,000-
Sub - Total:	RS. 3,50,000-
4. Recurring cost.	
(a) Fuel cost.	4,00,000-
(b) Pick up	
Jeep	
Motor bike	
Tractor	
Truck	
Wireless set	
(b) Stationery	50,000-
(c) Expendable goods	1,50,000-
Sub - Total:	Rs. 6,00,000-
5. Wages for workers.	1,50,000-
(i) Land clearance	
(ii) Pit digging	
(iii) Planting	
(iv) Weeding	
(v) Spraying of fungicids/insecticides	
Sub - Total:	Rs. 1,50,000-
GRAND TOTAL.	Rs. 23,76,000

1. In case of the establishment of Demonstration Farms in Banke and Bardiya. The breakdown of expenditures has been worked out as follows:

(a) The total amount for civil constructions including Farm House, Farm Road Development, Trellising, Fencing, comes Rs.9,02,000- as detailed below:

Farm House	Rs. 1,92,000-
Farm Road Development	Rs. 50,000-
Trellising (Terrace & Kniffin)	Rs. 3,90,000-
Irrigation Development	Rs. 1,74,000-
Fencing	Rs. 96,000-
	Rs. 9,02,000-

Cultivation of grape as compared to that of other fruit crops is very expensive & requires maximum care from the very beginning, therefore is out of the reach of the very poor farmers.

Out of the total amount allocated for Demo.Farm & Service Centre, the Trellising,Fence & Irrigation account for Rs.6,60,000- whereas Farm House & Farm Road development comes to Rs.2,42,000-.

As already stated Grape Cultivation is very expensive as compared to other fruit crops. In the same way, if cultivation is done in right manner it is more paying too. Well cultivated one hectare of vineyards yields as much as 15 tons,which at its current market price costs Rs.3,00,000-. Therefore,considering the nature of crop initial investment of Rs.6,60,000- on fixed assets like trellising,irrigation and fencing of 2 hectares of vineyards cannot be taken as expensive.

2. Demonstration farm house will be constructed near the demonstration field. The farm house will be constructed either on the donated land by the farmer or panchayat (govt.land). Up to the Project period, the demonstration farm house will serve as on the spot training venue,store and residence for technicians JT/JTA who will be involved.After the termination of the project, the Project envisages to convert these demonstration farm houses as (i) Storage for fruits collection or (ii) can be used as service centres.The demonstration farm house will directly under the Project till Project period, thereafter it can be shifted to ADO office.

3. Service Centres will be constructed near the particular fruit growing areas. However, these Service centres can be used for other purposes too according to the unified approach of HMG's Service Centre concept.

Criteria for the selection of farmer for Demonstration Farm.

1. The Project experts and A.D.O.'s should select & recommend the site and farmer for the Demonstration Farm to the Project for approval.
2. The Demonstration Farm's (land) area should not be more than 2 hectres.
3. The site and farmers should be choosen on the availablity of irrigation and other physical facilities.
4. The land should be as near as possible by the roadside.
5. The Demonstration Farm should be situated near the centre of fruit growing areas.
6. Land having wide terrace for junar and upland for grapes should be selected and should be in a block.
7. Priority will be given to the farmer who has experience in particular fruit cultivation and the one interested in learning improved technology of fruit cultivation.
8. Farmer is required to give suitable land on lease free of cost till the Project period will be given priority.
9. Farmer eager to cooperate the Project in different ascepts will also be given due priority.

FORM OF AGREEMENT.

With the objective of establishing Demonstration Farm, His Majesty's Government , Horticulture Development Project (here after called in "Project")and Mr/ Mrs/Miss (here after called "Land Owner") son of Mr. grandson of Mr. agree on that Project will acquire Land Owner's of land bordered by inthe east, south, in the west and in the north, on lease upto the termination of the Project.Both Project as well as the Land Owner will abide by the terms and conditions specified below upto theend of agreement period.

Terms and Conditions.

1. The land will remain under the possession of the Project for seven years and if necessery will be renewed with the consent of both.
2. Under no circumstances the Land Owner will sell, partition , donate,or mortage the land.
3. As per its programme, the Project will construct/ demolish the structures,or plant/uproot the plants.
4. Project will help and support the Land Owner in making available the tools and equipment & agriculture inputs required for Demonstration Farm.
5. The Land Owner will provide labour required for carrying various operations in Demonstration Farm. Moreover, he will be required to work himself in the Demonstration Farm.
6. Demonstration Farm will be used for various trainings and trials & other activities of the Project.
7. Land Owner will be responsible for maintenance & security of the Demonstration Farm.
8. Project will utilize the produce of Demonstration Farm for its research and study purposes and rest of the produce can be utilized by the Land Owner.

9. Land Owner will follow the technical as well as administrative advise of the Project.

10. If the Land Owner will not obey the agreement ,he will be deemed to pay all the incurred expenses.

11. Land Owner will maintain a daily record of the day to day operations carried out in the Demonstration Farm.

Team Leader.	Land Owner.
Horticulture Development Project.	
Kirtipur.	
Witness:	Witness:

Annual Plan of Grape July 1986 - June 1987 Annex I

Main Subject for Technical Development	1986 4	5	6	7	8	9	10	11	12	1987 1	2	3	4	5	6	7	8	9	10	11
1. Selection of suitable varieties																				
a) Field Survey																				
b) Growth and Fruit Quality test																				
2. Selection of proper Rootstocks Growth and Fruit Quality test																				
3. Raising Seedling Technique																				
Different Grafting Techniques																				
4. Introducing the Superior line of European and American cultivars and observation of Growth and Fruit quality test																				
5. Training and Pruning of plants																				
6. Growing Technique of Double Cropping. Breaking at Dormancy, Flowering technique																				
7. Testing of plant growth substances for Early Harvesting.																				
8. Soil Management, Fertilization and Irrigation																				
a) Study of suitable soil management																				
b) Fertilizer application techniques (type, time, vollume etc.)																				
c) Irrigation (Way of Water Saving)																				

	1986									1987									
	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11
9. Diseases and Pests Control Investigation of Outbreaking Situation																				
10. Birds and Beasts Damage Control																				
a) Investigation of Damage Situation																				
b) Study of Control Method																				
11. Improvement of Harvesting and Delivery methods. Studies on adequate time of Harvesting																				

Five years plan of Grape

Main subject for Technical Development	1986		1987			1988			1989			1990		
	7	10	4	7	10	4	7	10	4	7	10	4	7	10
1. Selection of Suitable varieties														
a) Field Survey	—		—	—	—	—	—	—	—	—	—	—	—	—
b) Growth and Fruit quality test	—		—	—	—	—	—	—	—	—	—	—	—	—
2. Selection of Proper Root Stock Growth & Fruit Quality test.			—	—	—	—	—	—	—	—	—	—	—	—
3. Raising Seedling Technique														
a) Various techniques on Grafting			—			—			—					
b) Various techniques on cutting by the use of Mist Propagation.						—			—					
4. Introducing the Superior Line of European and American varieties and also observe the growth and Fruit Quality.			—	—	—	—	—	—	—	—	—	—	—	—
5. Training and Prunning of plants.		—			—			—			—			
6. Growing Technique of Double Cropping.														
Breaking of Dormancy, Flowering technique			—	—	—		—	—		—	—			

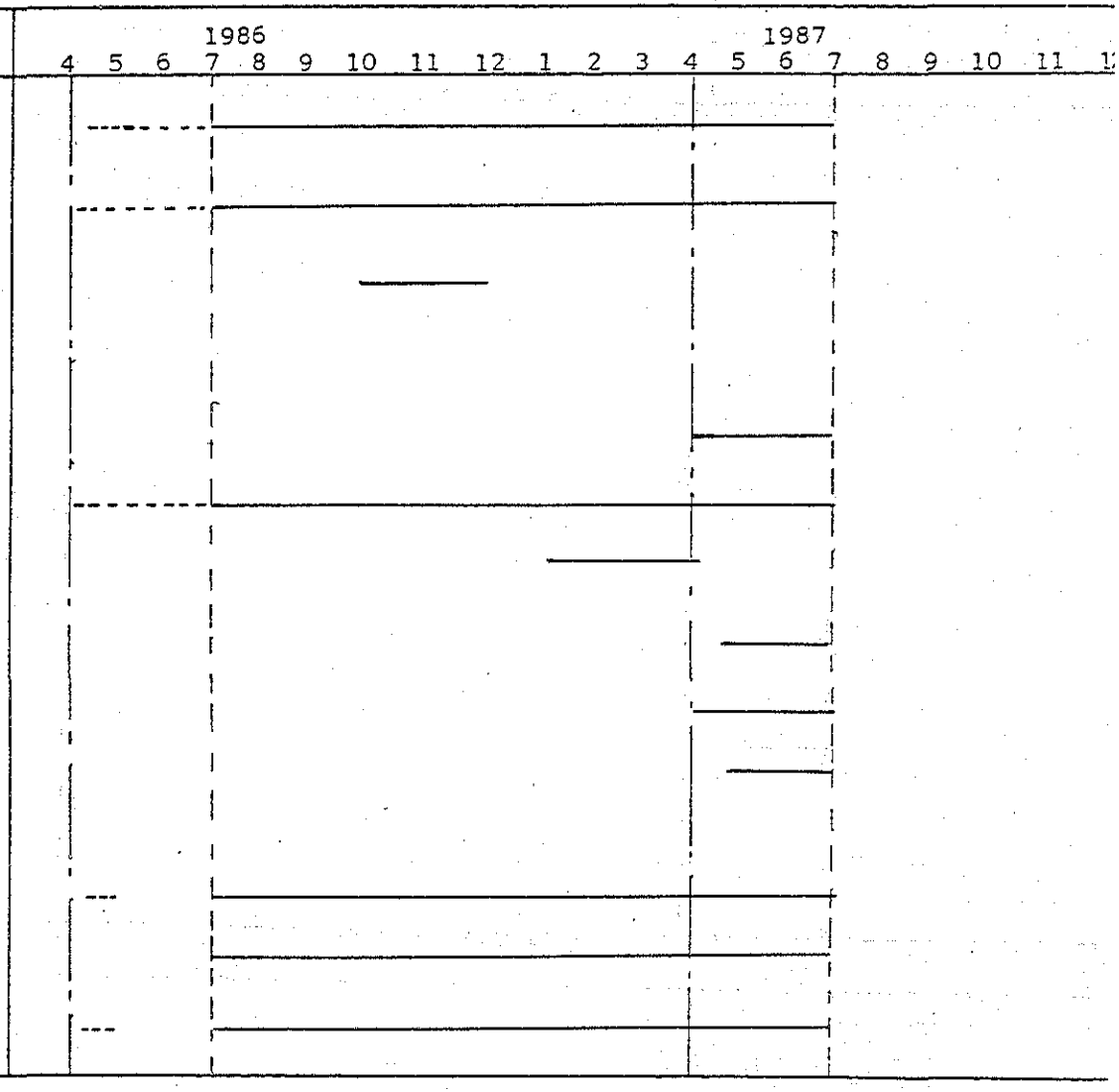
	1986		1987			1988			1989			1990		
	7	10	4	7	10	4	7	10	4	7	10	4	7	10
7. Testing of plant growth substances for Early Harvesting														
a) Test of Plant Growth Substances														
b) Study of facility and Materials														
8. Soil Management, Fertilization and Irrigation														
a) Study of suitable soil management practice														
b) Fertilizer application techniques (type, time, vollume etc.)														
c) Irrigation (Way of water saving)														
9. Diseases and Pest Control														
a) Investigation of outbreaking situation														
b) Establishment of Control Method														
10. Birds and Beasts Damage Control														
a) Investigation of Damage Situation														
b) Establishment of Control Method														

	--- 1986 ---		--- 1987 ---			--- 1988 ---			---1989 ---			--- 1990 ---		
	7	10	4	7	10	4	7	10	4	7	10	4	7	10
11. Improvement of Harvesting and delivery methods														
a) Study of Timely Harvesting														
b) Establishment of Storage way														
c) Establishment of Delivery Technique														
d) Marketing														
12. Study of simple processing method of Fruits														
a) Study of existing methods in Nepal														
b) To find out simple way of processing fruits (Juice & Dry Fruits)														

Annual Plan for Citrus

Annex II

1986, 4 - 1987,7.

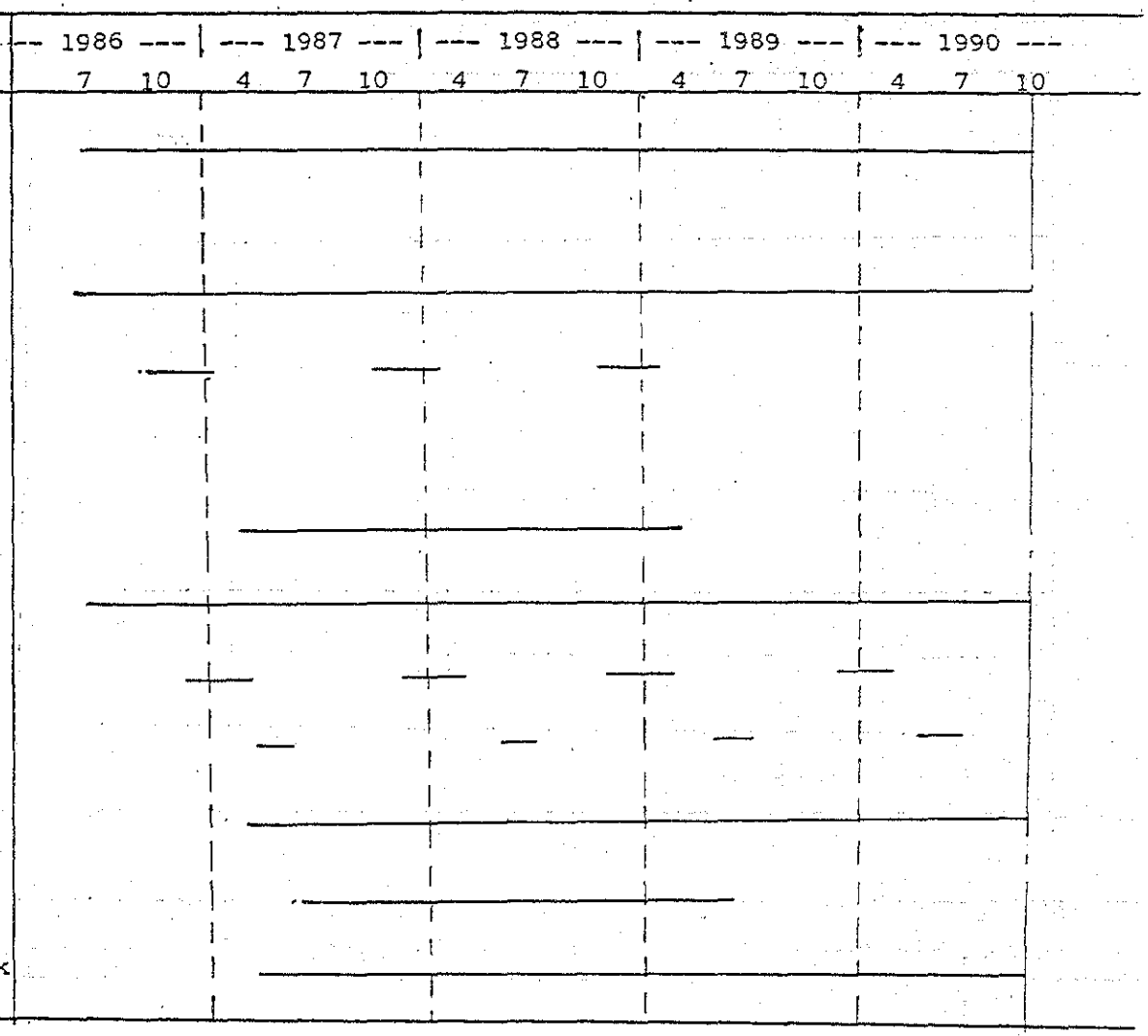


1. Citrus Field Preparation and management at Kirtipur Centre
2. Introduction of new varieties in net-house.
3. Selection of suitable varieties in local Citrus.
4. Propagation techniques of Citrus trees;
   a) Research for proper grafting time and grafting method.
   b) Selection of suitable Root-stock.
5. Pruning and training techniques of Citrus tree
6. Technology for the protection of biennial bearing.
7. Fertilization, Soil and Nutrition.
8. Selection of suitable wind break trees.
9. Control of plant pests and diseases;
   - Survey and research of greening disease
   - Survey and research of main virus.
   - Survey and control of other plant pests and diseases

Annual Plan for Citrus

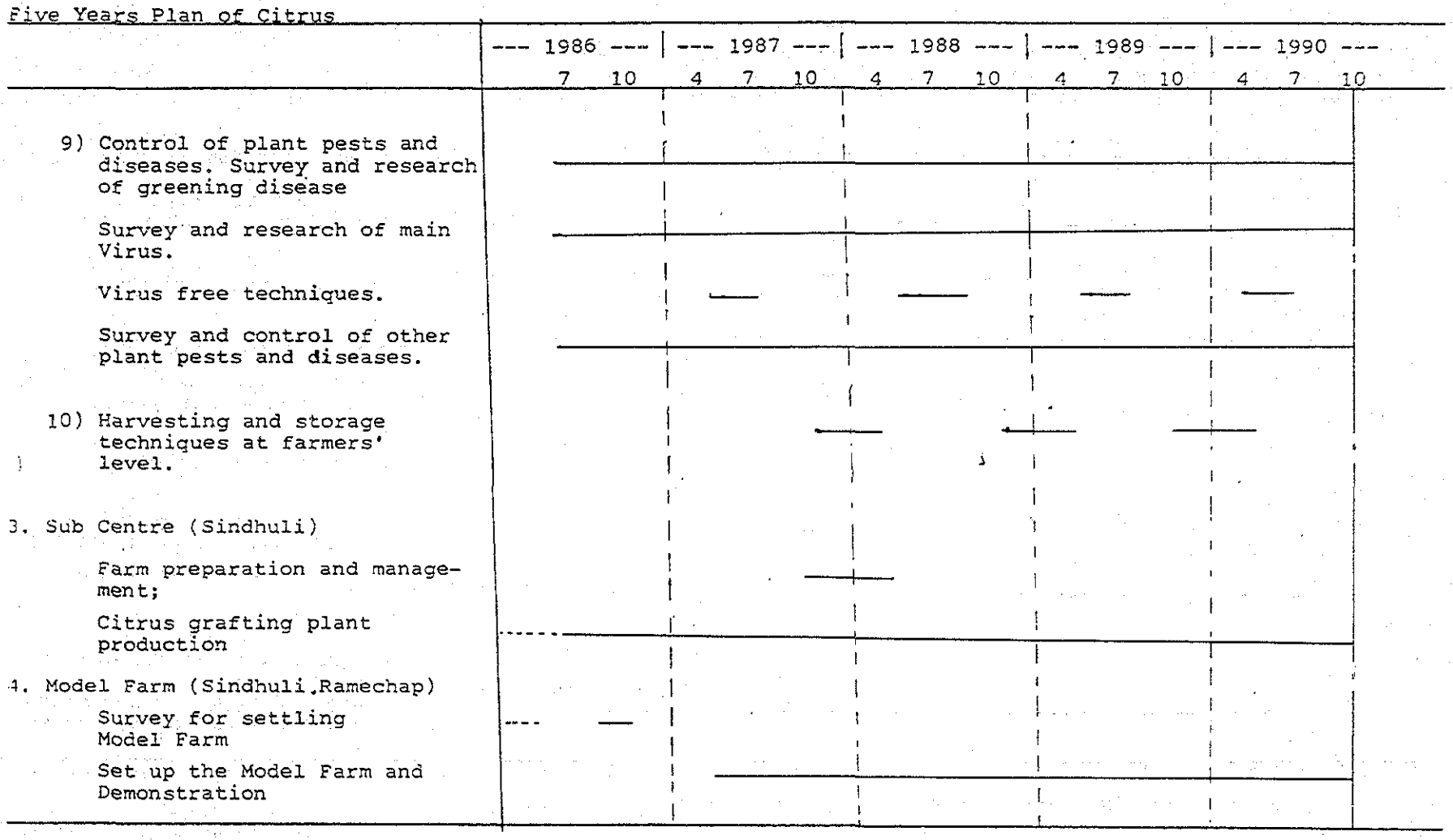
1986, 4 - 1987, 7.	1986												1987									
	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
10. Model Farm (Sindhuli, Rame chap)																					
Survey for Setting Model Farm		---					———														
Set up the Model Farm and start Demonstration												———	———	———	———						

Five Years Plan of Citrus

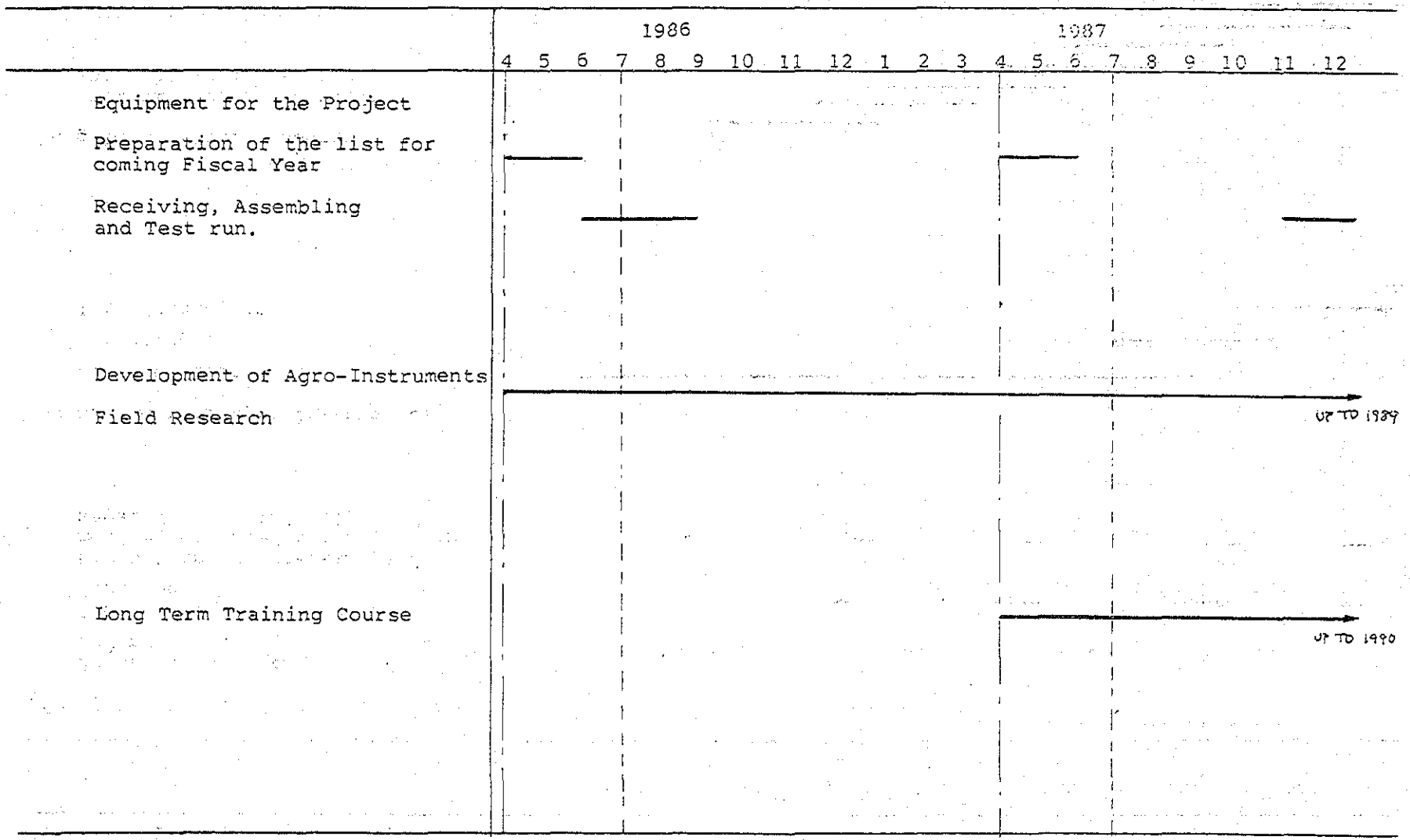


1. Citrus field preparation and management at Kirtipur Centre
2. Development of Citrus cultivation technology:
   1) Introduction of new varieties in net house
   2) Selection of Suitable varieties in local varieties.
   3) Propagation techniques of Citrus trees,
      Research for proper grafting time and grafting method
      Selection of suitable Root stock.
   4) Pruning and training techniques of fruit tree.
   5) Technology for the protection of bienniol bearing
   6) Fertilization, Soil and Nutrition.
   7) Inter-crop trial in Citrus Orchard.
   8) Selection of Suitable wind break trees.

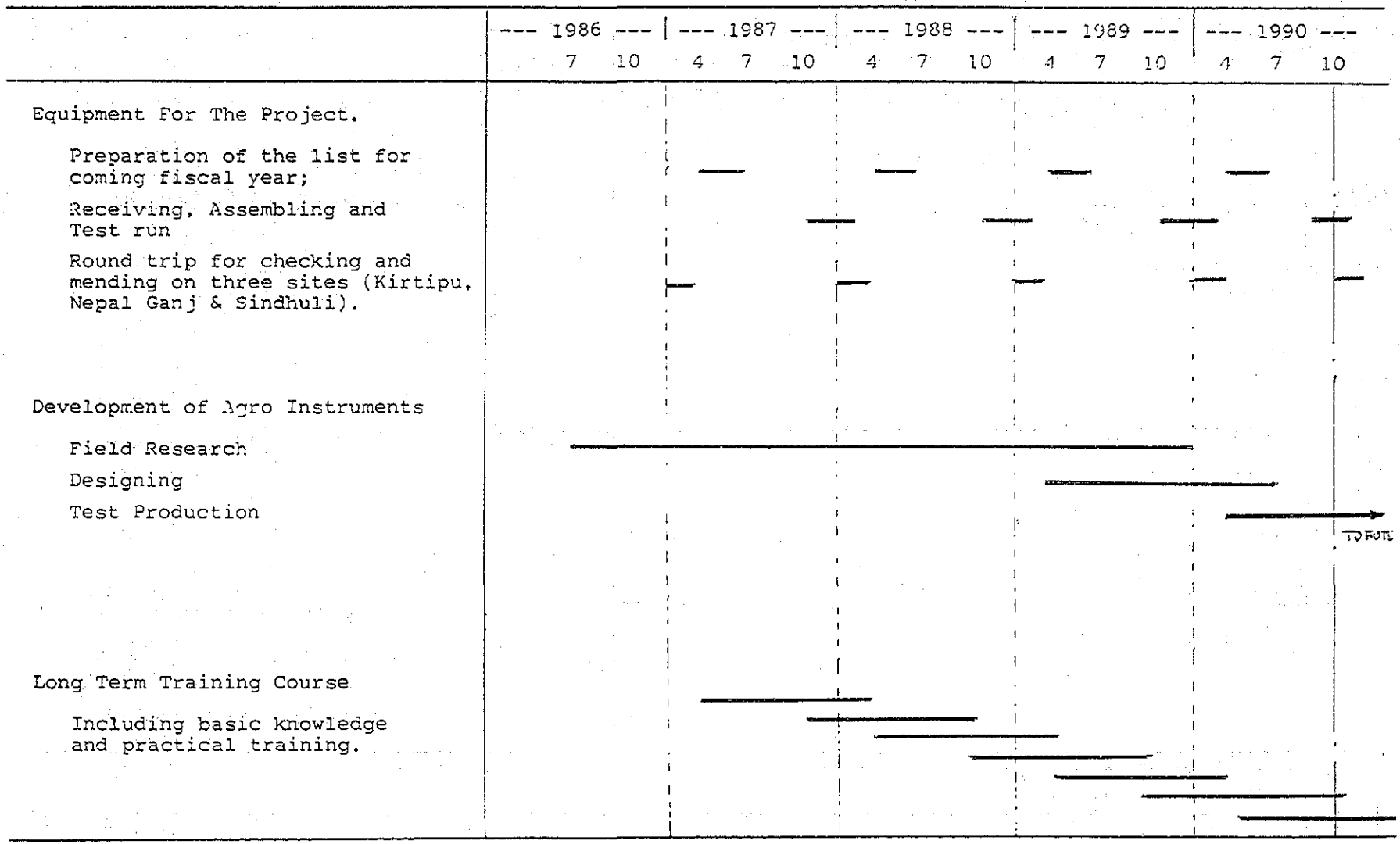
Five Years Plan of Citrus

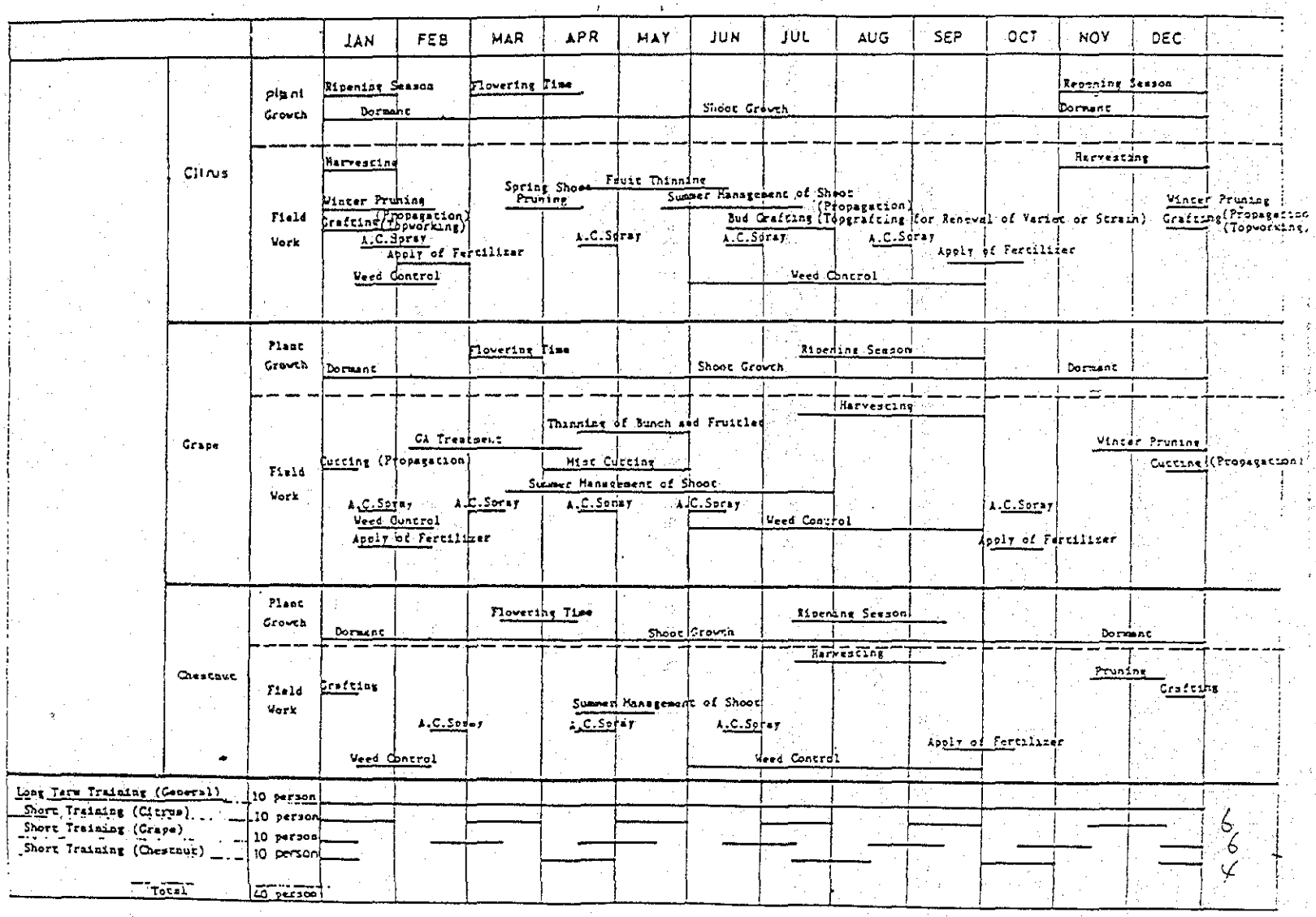


Annual Plan of Agro Machinary July 1986 - June 1987 Annex III



Five years Plan for Agro Machinery




JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
Citrus
Plant Growth
Ripening Season
Dormant
Flowering Time
Shoot Growth
Reopening Season
Dormant
Field Work
Harvesting
Winter Pruning
Grafting (Propagation) (Topworking)
A.C.Spray
Apply of Fertilizer
Weed Control
Spring Shoot Pruning
Fruit Thinning
Summer Management of Shoot
Bud Grafting (Topgrafting for Renewal of Variet or Strain)
Harvesting
Winter Pruning
Grafting (Propagation) (Topworking)
Grape
Plant Growth
Dormant
Flowering Time
Shoot Growth
Ripening Season
Dormant
Field Work
Harvesting
Thinning of Bunch and Fruitlet
GA Treatment
Cutting (Propagation)
Mist Cutting
Summer Management of Shoot
A.C.Spray
Weed Control
Apply of Fertilizer
Winter Pruning
Cutting (Propagation)
Chestnut
Plant Growth
Dormant
Flowering Time
Shoot Growth
Ripening Season
Dormant
Field Work
Harvesting
Pruning
Grafting
Summer Management of Shoot
A.C.Spray
Weed Control
Apply of Fertilizer
Long Term Training (General) 10 person
Short Training (Citrus) 10 person
Short Training (Grape) 10 person
Short Training (Chestnut) 10 person
Total 40 person
6
6
4

Chestnut Research Programme

1. Pruning & training technology.

2. Soil management.

3. Pathology & Entomological research specially annual chemical spray methods.

4. Varietal trials (Japan, China, Italian test planting.)

5. Survey of suitable areas for chestnut cultivation in Nepal.

短期専門家報告書

害虫　桜井　精　専門家

病害　今田　準　専門家

報　告　書

専門家氏名	桜　井　　精
派　遣　国	ネ　パ　ー　ル
指導科目	害　　虫
派遣期間	昭和61年9月16日～11月16日
任国配属機関	農　業　省 ネパール園芸開発計画
本邦所属先	新潟県園芸試験場

ネパール果樹園芸開発プロジェクトの要請により，ネパール国内でカンキツ（ジュナール），ブドウ，クリについて害虫の調査を行った。ブドウ及びクリは既に収穫が終わっており，これらの果実を加害する害虫については調査出来なかったので，再度，開花期から収穫期に調査を行う必要がある。

調　査　結　果

I　各樹種共通

いずれの試験場あるいは農場においても，害虫の生活史，年間の発生消長，年次変動などに関する調査研究が殆ど行なわれておらず，これらについての記録も殆ど見当たらない。害虫の最大の弱点は殆どの場合「孵化期」にあるので，この時期を把握することが大切である。これは農薬による防除を考える場合に特に重要である。調査は枝，葉あるいは果実における寄生数を定期的に数える他に，フェロモン，誘引剤または誘蛾燈など各種トラップを使用する。

また，害虫の分類同定に関する研究体制が不備である。従事する研究者は勿論のこと，基礎となる標本の収集や文献の整備が不足しており，殆どの場合にネパール国内で正確な種名の決定が出来ない。分類同定専門の機関を整備する必要がある。

II　カンキツ（ジュナール）

1. ミカンコハモグリ　（ミカンハモグリガ）

Phyllocnistis citrella Stainton

Sindhuli, Kirtipur, Madanpur, Pokhara など各地で多く見られた。発芽間もない若葉に寄生し葉を奇形にする。

新梢伸長期に PMP，硫酸ニコチン，ミカントップ（ジメトエートとフェンバレレートの混合剤）を散布する。性フェロモンの研究が進み，多量に合成出来るようになれば，これによる防除も可能と思われる。

2. ミカンコミバエ

Dacus dorsalis Hendel

マンゴー，グァバなどでの被害は多いが，カンキツ類には殆ど被害が見られないようである。しかし，Kirtipur や Sindhulimadi では10～11月でも少数ながら発生が見られることから，被害を受ける可能性があるので，実態調査が必要である。

本種の分布と発生時期について詳細な調査を行った後に，誘引剤（メチルオイゲノールと殺虫剤の混合剤）による広域な大量誘殺法が長期的に見て最も効率的な防除法と考えられる。

3. ミカンキジラミ

かんきつグリーニング病の媒介虫であり，Tarai の低地から1,500 m 位まで分布してい

るようである。Pokhara での調査によると成虫は5～7月に多いが，低密度ながら通年発生が見られるようである。しかし，本種の分布，発生時期，寄種植物などについて，さらに詳細に調査する必要がある。

成虫発生期にエストックスやメタシストックスなどの浸透性殺虫剤を散布することにより防除可能と思われる。

4. カメムシ類

Madanpur で加害中の成幼虫が確認された。また，Mugling でも販売果にカメムシによるものと思われる被害果が見られた。加害種は数種類あると思われるので，加害種の確認，分布及び加害時期などについての調査が必要である。

防除にはスミチオン，エルサン，ディプテレックスなどの散布が有功である。ただし，これらの薬剤は直接虫体にかかった場合には殺虫力は強いが，残効が短いので新たに飛来した虫には効果が低い。

5. カミキリムシ類

Sindhulimadi の試験場及び Bijayachhap で被害枝が見られた。改害を受けると枝が枯れるので被害は大きく，現地でも問題としていた。加害種の確認，分布，発生時期などの調査が必要である。

防除はかなり難しいが，成虫発生期（産卵最盛期）にエルサン，スプラサイド，スミチオンなどを散布する。

6. バッタ類

Sindhuli 郡 Bijayachhap で新梢を加害中のバッタ2種が見られた。加害されると被害枝は枯れるので被害は大きい。小型の1種は付近にある他の樹木や草本にも見られ，寄生範囲は広いようである。大型の1種は1匹しか見られなかったが，普及員の話では山地の林内に多いという。

スミチオン，バイジット，オフナック，デナポンなどの散布が有効と思われるが，寄生範囲が広いので防除は難しいと思われる。

7. カイガラムシ類

Kirtipur, Pokhara, Bijayachhap などで数種類の寄生が見られた。さらに，寄生種の確認，分布，発生経過などの調査が必要である。

幼虫の孵化分散期に殺虫剤を散布すれば防除は容易である。孵化分散期は種類により，また地域により異なるので，地域毎に観察が必要である。ジメトエート，スプラサイド，カルホスなどの効果が高い。

8. 果実吸ガ類

Sindhulimadi, Bijayachhap, Pokhara などでの誘蛾燈調査で数種類が確認された。被害を受ける可能性があるので，実態調査が必要である。

被害が多い場合には夜中に（日没1時間後から24時頃まで）吸汁中の成虫を捕殺する。また，燈火照明でも被害を回避出来る。

9. その他

Sindhulimadi の試験場で，アゲハやイラガの幼虫による葉の食害が見られ，新梢にアブラムシの寄生が見られた。また，不時開花に摂食中のハナムグリが見られた。

いずれも発生を認めたら殺虫剤を散布すれば防除は容易である。鱗翅目幼虫にはディプテレックス，カルホスなどの効果が高く，アブラムシにはエストックス，メタシストックス，ジメトエートなどの浸透性殺虫剤の効果が高い。ハナムグリの防除はやや難しいが，被害が多いようなら開花中にスミチオン，ディプテレックス，デナポンなどを散布する。

Ⅲ ブドウ

1. コガネムシ類

Nepalganj のデモファーム予定地でコガネムシによると思われる葉の食害痕が見られた。加害種の確認と発生時期などの調査が必要である。

防除には発生を見たらスミチオン，ディプテレックス，デナポンなどを散布する。ただし，カメムシと同様に新たに飛来した虫には効果がないので，7～10日間隔で数回散布する必要がある。

2. チャノキイロアザミウマ（？）

Nepalganj の試験場で取り残しの房にアザミウマの被害痕が見られた。また，新梢先端の若い葉には本種の寄生も見られた。日本では粗皮下や芽の中で成虫で越冬するが，ネパールの生態は明らかでない。

オルトラン，バダン，パーマチオンなどを開花期から数回散布する。

3. 果実吸ガ類

Napalganj における誘蛾燈調査で数種類が確認された。被害を受ける可能性があるので実態調査が必要である。

被害が多い場合には夜中に（日没1時間後から24時頃まで）吸汁中の成虫を捕殺する。また，燈火照明でも被害を回避出来る。

Ⅳ クリ

1. クリシギゾウムシ（？）

Sindhuli 郡 Chapauli での聞き取りでは，収穫果の大部分から本種と思われる幼虫が出てきたとのことである。また，Kakani 農場の中国栗にシギゾウムシ幼虫の寄生が見られた。日本では8～9月に成虫が発生し，イガを通して果実に卵を産み付ける。重要害虫なので，分布や発生経過などの調査が必要である。

被害の回避には収穫した果実をメチルブロマイド（50g／1㎥，2時間）で燻蒸する。尚，成虫発生期にスミチオンまたはパーマチオンを散布しても被害を軽減出来るものと思われる。

2. ネスジキノカワガ（？）

モモノゴマダラノメイガ同様の加害をする。Kakani農場の中国栗に本種の加害が見られた。分布，発生経過などの調査が必要である。日本では蛹で越冬し，年に4回発生する。

産卵最盛期にエルサン，ビニフェート，ディプテレックスなどを散布する。

尚，モモノゴマダラノメイガは日本から中国，東南アジアにかけて広く分布するので，併せて実態調査をする必要がある。

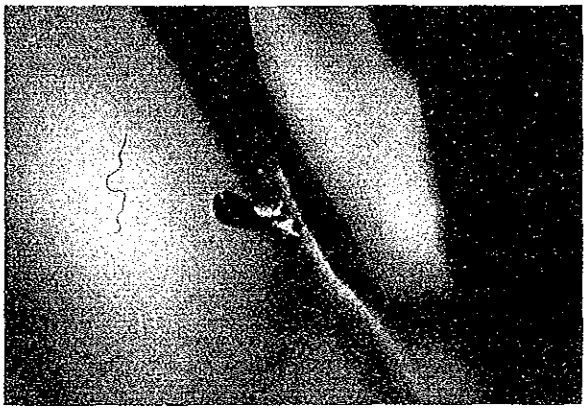
3. ハナムグリ類

中国栗に加害中のものがKakani農場で見られた。イガとともに若い果実を食害する。7～8月にも発生するならば，日本栗でも被害を受けるものと思われる。2種類見られたので，加害種の確認と分布，発生経過などの調査が必要である。尚，日本ではこの類による被害は観察されていない。

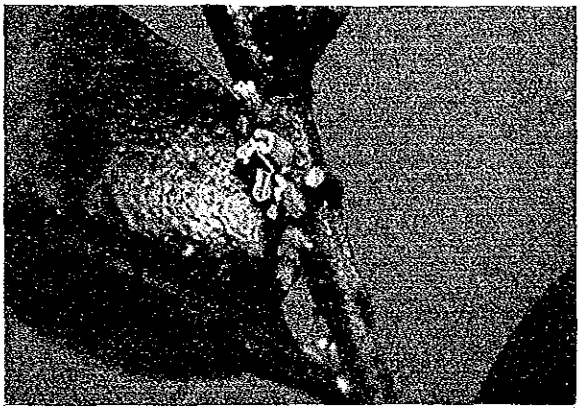
発生期にスミチオンまたはパーマチオンを散布すれば防除出来るものと思われる。

グリーニング病

グリーニング病



ミカンキジラミ成虫

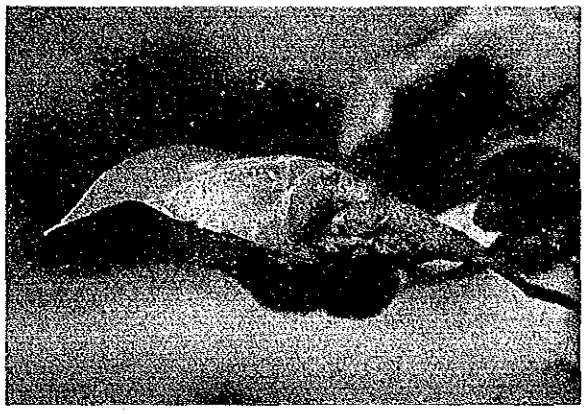


ミカンキジラミ幼虫

Citrus psylla (Diaphorina citri Kuwayama)

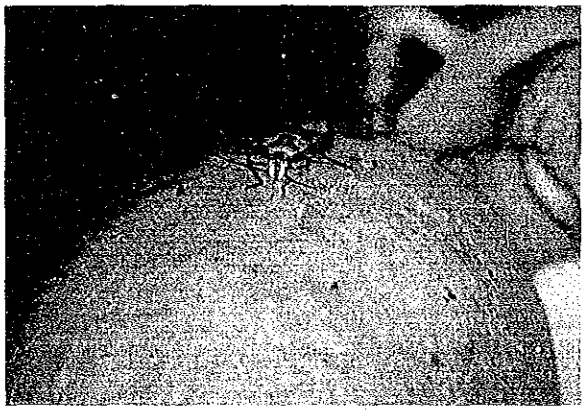
ミカンキジラミ幼虫の分泌物に発生したスス病

ミカンキジラミ幼虫の寄生状況（ゲッキツ）

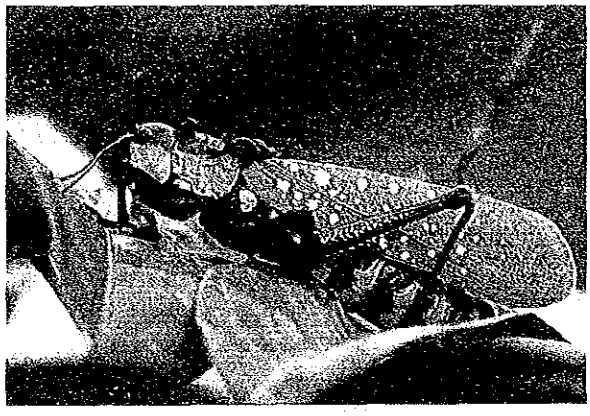


ミカンコハモグリ被害葉

カメムシの１種（成虫）

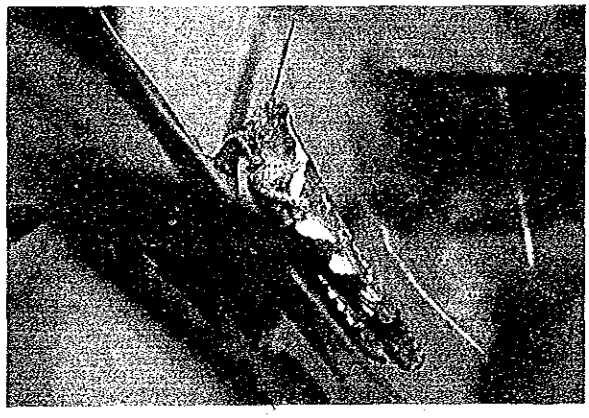


カメムシの１種（幼虫）

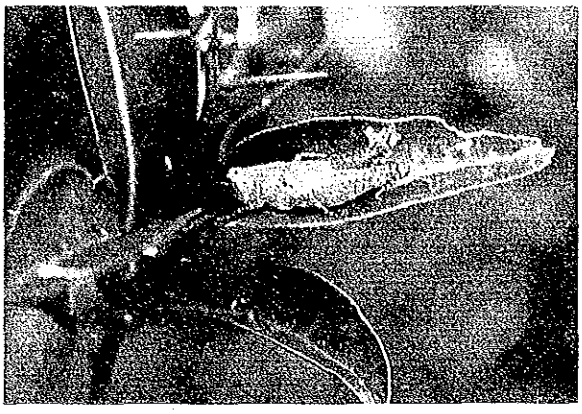


バッタの１種

バッタの食害による枯枝

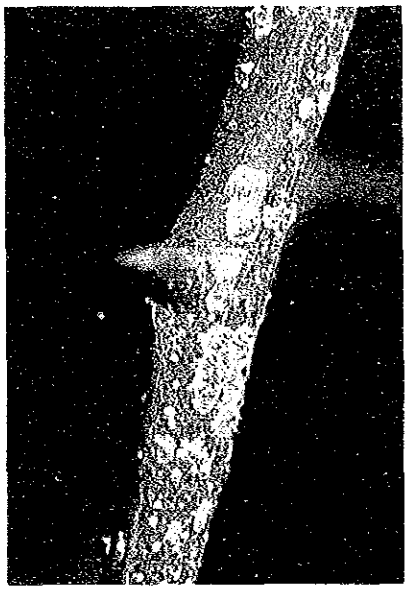


バッタの１種（成虫）

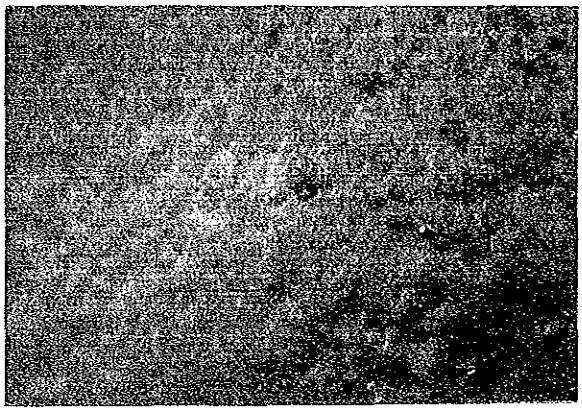


バッタの１種（幼虫）

枝での寄生状況

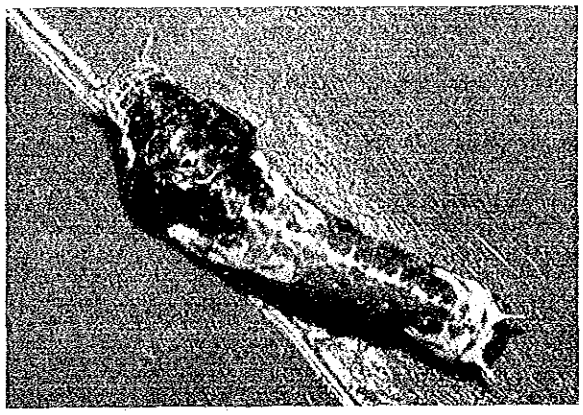


枝での寄生状況

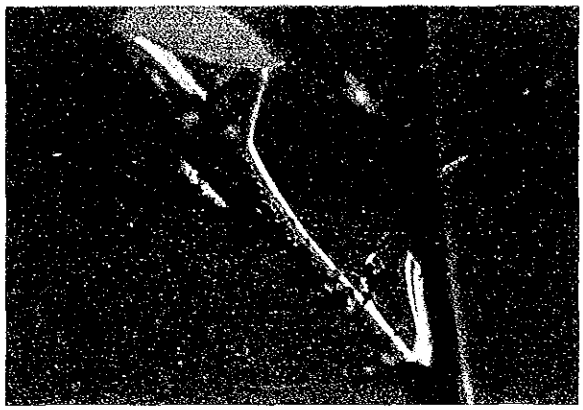


アカマルカイガラムシ（？）：果実での寄生

イラガの１種の幼虫

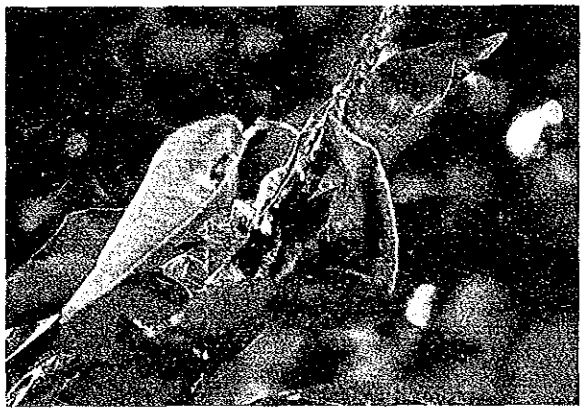


アゲハチョウの１種の幼虫



ミカンクロアブラムシ（？）

ハナムグリの１種

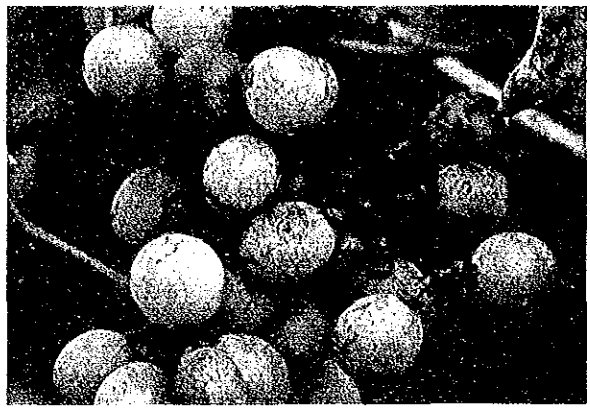


カミキリムシによる枯枝

カミキリムシによる食入部

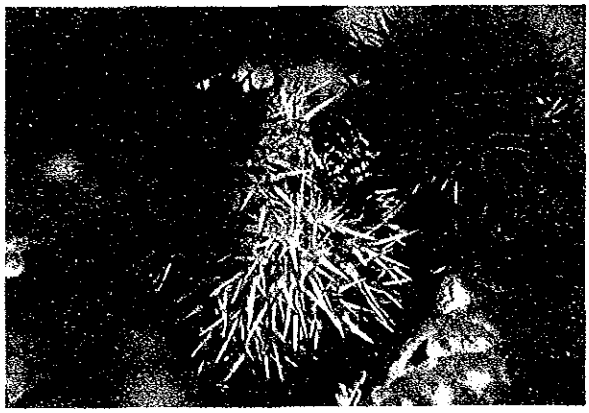
コガネムシの食害葉

コガネムシの食害葉



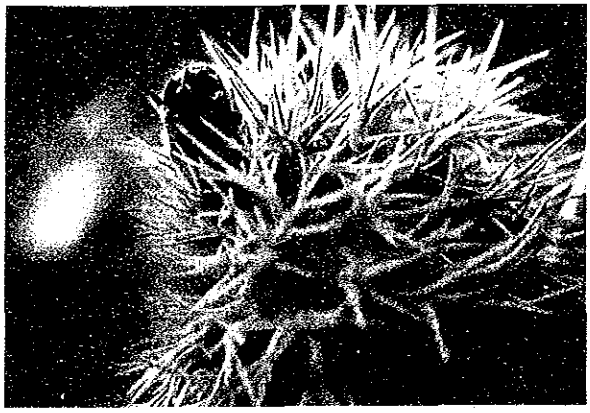
チャノキイロアザミウマによる被害

ハムシの１種の食痕

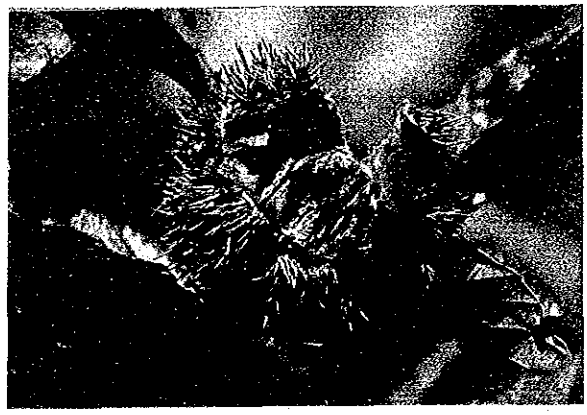


ハナムグリの加害状況

ハナムグリの加害状況



ハナムグリの加害状況



ハナムグリの被害

Insect Pests of Fruits and Nuts in Nepal
(A Report of Investigation)

I have carried out a survey about insect pests of fruits and nuts trees, i.e. citrus(Junar), grapevine and chestnut tree. But I have not been able to see injurious insects attacking grapes and chestnuts, because their harvesting have already finished. Therefore another investigations during the period from blossoming to harvest are necessary to obtain successful results for the project.

The insect pests observed in Nepal and my comments about them are as follows:

I Citrus (Junar)

1 Citrus leafminer (Phyllocnistis citrella Stainton)

This have been observed at Sindhuli, Kirtipur, Madanpur and Pokhara, it is probably common throughout Nepal, but a minor pest ordinarily. The larva attacks young leaf, so the attacked leaf changes to abnormal shape.

Control method is the spraying with phosmet, nicotine sulfate, or fenvalerate during current-shooting period. It is also useful by crushing the larvae in their mines by hand.

In the future the pheromone will be an useful means to control this insect pest.

2 Oriental fruit fly (Dacus dorsalis Hendel)

This is a serious pest of many tropical and subtropical fruits, because it has a wide range of host plants. I have heard about the serious damage in mango and guava, but not in citrus. However, at Kirtipur and Sindhulimadi I have collected several numbers with an attractant trap even in October and November. I think there is a chance that Junar is attacked by this pest, and it is necessary to investigate the distribution and appearance term in detail.

The most useful control method is, I consider, mass-trapping with methyleugenol.

3 Citrus psylla (Diaphorina citri Kuwayama)

This is a vector of citrus greening disease. It seems that the distribution of this pest is rather wide from lower Tarai to higher hill area about alt. 1500m. According to the studies at Pokhara Hort. Res. Stn., adults appear throughout the year, mainly from May to July. However, I think, further studies are needed on the distribution, the appearance term and the host plant range.

Control method is a spraying with the systemic insecticides, i.e. Estox(Metasystox-S), vamidothion, or thiometon when adults and larvae appear.

4 Stink bugs

I have observed larvae and adults piercing fruits, and damaged fruits sold on the road at Mugling. Fruits attacked by this pest become soft and rotten. Several species are injurious, therefore further studies about attacking period, identification and distribution of injurious species are necessary.

Spraying with fenitrothion, phenthoate or trichlorfon is effective.

When these insecticides contact directly to insect body, insecticidal activity is strong, but residual activity does not continue so long, therefore these have little effect on new bugs come flying.

5 Longihorn beetles

Injuried shoots have been observed at Sindhuli Research Center and Bijayachaap. Attacked shoots become dead, so damage is severe. Therefore it is a great problem there, and also I think so.

Further studies are necessary about identification, distribution and life cycle in detail.

Control is rather difficult, so careful timing of spraying insecticides is essential. Ideally the spray application should be made when adults appear, and they are just ovipositing. Phenthoate, methidathion and fenitrothion are effective.

6 Grasshoppers

I have observed two kinds of grasshoppers feeding on shoot at Bijayachhap, Sindhuli. Attacked shoots become dead, so damage is severe. A smaller brownish species has been also observed on the neighbouring grasses and shrubs. Another larger reddish species, I have heard from an extension worker, live numerous in numbers in the forestry.

Spraying with fenitrothion, fenthion, pyridaphenthion, or carbaryl is effective. But control is rather difficult because of its wide host range.

7 Scale insects

I have observed several kinds of scales at Kirtipur, Bijayachhap and Pokhara. However, further studies about identification, distribution and life cycle in detail are necessary.

Control is easy when spraying timing corresponds exactly with hatching or dispersal term. Those terms are different among species and district respectively, therefore detailed observation is necessary at each district. Spraying with dimethoate, methidathion or isoxathion is effective.

8 Fruit-piercing moths

I have observed several kinds of fruit-piercing moths at Sindhulimadi, Bijayachhap, and Pokhara with light-trap. There is a chance for fruits being damaged, so the investigation into the actual condition is necessary.

In case of great damage the only practical method is to catch adult moths piercing fruit at night (from one hour after sunset to midnight). Lighting is also useful to reduce infestation.

9 Other insect pests

At Sindhulimadi I have observed some damaged leaves by lemon dogs and slug catterpillers, and aphids on a shoot. And also a kind of flower chafer is observed in a citrus flower.

Control is easy, without a flower chafer, to spray with insecticides after finding these pests respectively. Trichlorfon and isoxathion are useful for lepidopterous larvae, and Estox, vamidothion, dimethoate and other systemic insecticides for aphids.

Control of a flower chafer is rather difficult. If damage by it is problem, use of insecticides is necessary at the flowering time. Spraying with fenitrothion, trichlorfon and carbaryl may be effective.

II Grape

1 Scarabs

I have observed severly injured grapevines by scarabid beetles at Nepalganj. The investigations about identification of injurious scarabs and its occuring term are necessary.

Control measures should be carried out as soon as the pest is found. Good results may be obtained by spraying with fenitrothion, trichlorfon and carbaryl. But these have no effect to newly coming scarabs, so treatment should be repeated each 7-10 days.

2 Yellow tea thrips (Scirtothrips dorsalis Hood)

Several injured fruits have been observed on the remained bunch of grapes at Nepalganj Hort. Res. Stn. Also numerous adults of thrips have been found on the young leaves of grapevines. In Japan this pest, it is reported, hibernate in buds or under bark in the adult stage, and repeats 5-7 generations in the year. But nobody knows the life cycle of this pest of Nepal.

Spraying with acephate, cartap or fenvalerate is effective.

3 Fruit-piercing moths

I have observed several kinds of fruit-piercing moths at Nepalganj Hort. Res. Stn. with a light-trap. There is a chance for fruits being damaged, so the investigation into the actual condition is necessary.

In case of great damage the only practical method is to catch adult moths piercing fruit at night (from one hour after sunset to midnight). Lighting is also useful to reduce infestation.

III Chestnut

1 Chestnut curculio (Curculio dentipes Roelofs)

I have heard at Chapauli, Sindhuli that numerous larvae have emerged out of almost all harvested nuts of Japanese chestnut. And I have seen two larvae come out of Chinese chestnut at Kakani Farm. In Japan adults appear in August and September, and they lay eggs through bur rind.

This is the most destructive pest of chestnuts not only in Japan but also in Nepal, I think. Therefore, detailed investigation about distribution and life cycle of this pest in Nepal is necessary.

Usually, fumigation with methyl-bromide immediately after harvesting is effective to reduce injury. Another control method is spraying with fenitrothion or synthetic pyrethroids during the period of adult appearance.

2 Chestnut fruit noctuid (Characoma ruficirra Hampson)

This pest injures chestnuts as same as yellow peach moth. In Japan this pest is overwinter in the pupal stage, and adults appear four times in the year. I have observed injury of Chinese chestnut at Kakani Farm, therefore the detailed investigation about distribution and life cycle of this noctuid moth is necessary.

Spraying with phenthoate, chlorfenvinphos, or trichlorfon during the most egg-laying period will give effective control.

Furthermore, same investigation about yellow peach moth as this noctuid moth is also necessary, because of the wide distribution throughout temperate far east Asia.

3 Flower chafers

I have observed two kinds of chafers injuring bur and young nuts of Chinese chestnut at Kakani. Nobody knows such injury in Japan. If adults appear in August and September, there is a chance for Japanese chestnut being damaged, also. Therefore, detailed investigations about identification of injurious species, and distribution and lifecycle of these pests are necessary.

Spraying with fenitrothion or fenvalerate immediately after finding adults may be effective.

IV General matters

There are few reports on the life history, seasonal changes and yearly abundances of fruit pests in Nepal. For almost all of insect pests, the weak point is the hatching period. This period has no resistance to its environment. Therefore to know this period is most important for controling the insect pests. Usually appearing period and volume of insect pests are slightly different in each year, and these are greatly correlative to weather. These data are necessary not only for planning the pest control program but also for establishing the prediction of pest appearance. These will be able to be done by examining many periodical and objective data.

Moreover the organization of identification on insect pests is insufficient in Nepal. There are few specimens and literatures about insect pests, so in most cases the scientific name cannot be decided in Nepal. This is inconvenient to advance the project. I consider that provision of special research center for taxonomy is necessary.

Sei Sakurai

Sei Sakurai

報　告　書

専門家氏名	今田　準
派遣国	ネパール
指導科目	病害
派遣期間	昭和61年11月5日～12月25日
任国配属機関	農業省 ネパール国園芸開発計画
本邦所属先	農林水産省 果樹試験場 安芸津支場

ネパール園芸開発計計画は昭和６０年１０月に発足しており，日本側専門家は団長のほか長期専門家としてカンキツ，ブドウが各１名，農業機械が１名と調整員を加えた合計５名が活動している。今回の出張は本計画における短期専門家として，カンキツ，ブドウ及びクリの病害，とくにカンキツにおけるグリーニング病も含むウイルス病の対策をたてるために派遣され，次のような結果を得た。

1) カンキツの病害

ネパールのカンキツ栽培地帯であるシンズリ，ラメチャップ，ダンクッタ，ポカラ，ジャナカプール，カトマンズ近郊においてカンキツ病害の発生状況調査を行った。ネパールで栽培されているカンキツはスンタラ（ポンカンに似たマンダリン類に属するもの）とジュナール（スイートオレンジの一種）が主でその他ライム，ニブア（レモンの一種）などである。各地域に発生していた病害の種類及びその発生状況は以下のとおりである。

グリーニング病　本病はカンキツの病害の中で最も重要な病害の一つで，南アフリカ，インド，中国本土，台湾，タイ，インドネシアなどで発生し，呼び名もダイバック（インド），リーフモトリング（フィリピン），イエローシュート（中国），リクビン（台湾），CVPD（インドネシア）と各国によって異なっている。本病の病原体は，はじめマイコプラズマ様微生物とされていたが現在では，細菌の範ちゅうに入る病原とされ，接ぎ木で移るほか，２種類のミカンキジラミにより媒介される。病徴は，亜鉛欠乏症に似た葉の黄化，葉脈の退緑，モトリング小葉化，枝の枯れ込み，樹全体の萎縮，枯死である。今回の調査では，本病はポカラ園芸試験場ほ場の1962年にインドから導入したカンキツ全樹，それらから繁殖した樹及びネパール在来のスンタラのほぼ全てに激発していた。またシンズリサブセンター及びJADPのほ場栽植樹及び育成中の苗木にもその発生を認めた。しかしながら上記以外の地域とくにジュナールの主産地であるシンズリ，ラメチャップ地域の農家ほ場には幸いなことに本病の病徴は見あたらず，これらの地域が未汚染地域であることが明らかになった。そこで本病汚染地域の拡大阻止及び汚染地域での本病撲滅のため，ネパール当局に対し，以下のことを指示した。

① 本病に汚染されているポカラ園芸試験場，シンズリサブセンター及びJADPで育成中の苗木の移動禁止と伐採，並びに同ほ場に栽植されているり病樹の伐採

② 無毒苗木の作出，育成，栽植

③ 媒介昆虫であるミカンキジラミを根絶するための殺虫剤の散布，また仏領レウニオン島で行われかなりの成果をおさめている，ミカンキジラミの天敵である寄生バチによる生物防除の可能性の検討

④ 発病樹が見つかった場合，即座の伐採と周辺樹への殺虫剤の散布，本病の中間寄主になるとされているゲッキツの栽植の禁止

これを受けてネパール当局もグリーニング病がこれ以上広がるのを防ぐため，早速，り病苗木の移動禁止措置，調査団を編成して調査を行い，り病樹の伐採等に取り組む旨の回

答を得た。

すそ腐れ病(Foot rot)　現在のネパールのカンキツ栽培において最も被害の大きい病害の一つである。樹の地際部が本病の病原菌に侵され，褐色となって腐敗し，葉は黄化，萎縮し，立ち枯れ症状を呈する。モンスーン季の集中的な降雨と排水不良が多発の要因である。対策としては，排水をよくすること，抵抗性台木を用いた接ぎ木苗の栽植，り病樹の病幹部を切除した後の殺菌剤の塗布，発病初期の樹への根接ぎによる樹勢回復があげられる。

その他，かいよう病，うどんこ病，そうか病，黄斑病，すす病，樹脂病，トリステザウイルス，タターリーフウイルスによると思われる接木部異常症の発生が認められたが，これらはグリーニング病，すそ腐れ病に比べると第二義的な病害と思われる。

2)　ブドウの病害

ネパールにおけるブドウ栽培の歴史は浅く，今日なお試作の域をこえていない。今回，日本からの導入品種の試作が行われているネパールガンジ農業試験場とJADP及びネパールガンジ近郊の2農家(デモファーム予定地)のほ場において枝葉について病害の発生状況調査を行った。果実については収穫後であったため調査できなかった。調査品種は巨峰，オリンピア，デラウエア，タノレッド，ブラックオリンピア，スチューベン，ベーリーA，ネオマスカット，バーレット，トムソンシードレスである。べと病，黒とう病，褐斑病がほとんどのブドウ樹に，つる割病が多くのブドウ樹に発生していた。さび病，うどんこ病，根頭がんしゅ病の発生は今回の調査では認められなかった。上記地域はモンスーン地帯に属し，年間2,000㎜以上の降雨量があり，そのほとんどが6～11月に集中することからブドウ栽培には耕種的防除とあわせ殺菌剤散布による防除が必須と思われる。

3)　クリの病害

ネパールには小果で商品性の乏しいチベットグリと呼ばれる野生グリがカカニ，ドビドンガー両園芸農場及びその周辺にわずかに植えられているのみである。本プロジェクトでは，カカニ園芸農場での試作で良い成績が得られている日本グリを主体に導入を図っている。今回はキルティプール園芸試験場及びカカニ園芸農場でのほ場に栽植されている日本グリ(品種：筑波，丹沢，大和早生，石鎚，伊吹)と中国グリ実生樹について病害発生調査を行った。その結果，疫病及び胴枯病の発生が日本グリに散見されたが，中国グリには見られなかった。果実・葉については冬季のため調査できなかった。

REPORT ON SURVEY OF CITRUS, GRAPEVINE AND CHESTNUT DISEASES IN NEPAL

JUN IMADA
November 7, 1986 to December 23.
Akitsu Branch, Fruit Tree Research Station
Ministry of Agriculture, Forestry & Fishery.
Japan.

ABSTRACT OF PRELIMINARY REPORT

From November 7, 1986 to December 23, 1986 I was dispatched to the Kingdom of Nepal by JICA as a short term expert of Horticultural Development Project in the field of plant pathology for survey of citrus, grapevine and chestnut diseases and for providing some suggestions to solve the problem and carried out surveys on the occurrence of citrus, grapevine and chestnut in co-operation with Mr. Y. Tomiyasu, citrus expert, Mr. A. Suzuki, grapevine expert, and Mr. T. Yao, chestnut expert of Japan.

(I) Survey on the occurrence of citrus diseases.

Main items of this survey are as follows:

I) Whether greening disease occurs in citrus growing areas such as Sindhuli, Ramechhap etc. as by the invasion from affected area (Pokhara) or not.

2) What kind of citrus diseases have occurred.

The surveys has been carried out in citrus orchard located in Pokhara, Kathmandu, Dhankuta, Janakpur, Sindhuli and Ramechhap.

Citrus varieties are Suntala (belonging to mandarin group). Junar (belonging to sweet orange). Lime, lemon, Pommelo and introduced cultivars from India (Sweet orange, Grapefruit , lime, Kinnow etc.)

Disease symptoms occurring on citrus trees were observed with the naked eye for almost every tree per orchard,and kind of citrus disease and degree of disease occurrence were judged. Control measure written for each disease is to be performed in Japan and I recommend them.

Disease names observed and the degree of disease occurrence for each disease were shown in Table I. Appearance of each disease was as follows:

Greening

Greening is one of the most serious disease of citrus and exists in the south Sahara of the African continent and South Asian countries. This is called "dieback" in India, "leaf mottling" in Philippines, "Likubin" in Taiwan, "Yellow shoot" in China and "Vein-phloem degeneration"in Indonesia, all caused by phloem limited bacteria (PLB) and transmitted by citrus psyllid (Diaphorina citri and Torioza erytreae).

As a result of survey of citrus orchard in Pokhara Horticultural Research Station farms,greening has occurred not only on the introduced cultivars from India in 1962,but also on Suntala the native variety. In the farms of Sindhuli sub-centre and JADP,trees and nursery plants of Junar were also infected with greening.

Affected trees were stunted and showed severe yellowing like zinc - deficiency,vein chlorosis,leaf-blotch mottling, sparse foliage,twig dieback and poor fruit setting.The leaf symptoms,however,differed from typical zinc-deficiency in the presence of small green-blotches between veilets.

According to the report by Catling H.D. (1968),a citrus psyllid, Diaphorina citri,which has been proved as a vector of Asian type greening disease established in India,Philippines,Taiwan,China and Bangladesh was commonly observed on citrus plants during monsoon season in Nepal.

It is considered that in Pokhara the natural spread of the greening occurred into the greening free trees of Suntala.

Fortunately we didnot find the greening symptoms in the framer's fields of Sindhuli,Ramechhap and Dhankuta except the above mentioned regions. It must be inhibited to move the citrus scions and saplings from Pokhara region,Sindhuli sub-centre and JADP to other regions.

In the above mentioned regions affected trees must be cut down immediately. When the affected trees are found out in other regions they must be cut down as soon as possible.

Foot rot (Phytophthora sp.)

This disease has given most severe damage to the citrus trees in whole citrus areas and almost all trees in some orchards were destroyed.So,this disease became one of the main causal factor of citrus disorder in Nepal. Trunk of citrus trees above the ground was infected by pathogen,and the infected part became brownish and decayed.The lesions sometimes encircled the trunk.Leaves turn yellow,defoliation occurrs and finally citrus trees die.

Planting citrus seedlings,heavy rainfall in rainy season and planting in orchard with poor drainage are factors of severe occurrence.
Recently grafted nursery plants on Rough lemom and citrange seedlings are partially planted.

Now,the posters describing about its control measures by Japanese citrus expert are distributed to farmers.

Control measure:

I) To do well drainage in citrus orchard.
2) To plant grafted nursery plant.
3) After cutting off diseased part,paint with Captafol,Fostyl-Al,Metalaxyl etc.
4) Root grafting to affected trees.

Canker (Xanthomonas campestris pv.citri)

Canker was prevalent,particularly on Junar,Lime,Lemon but the degree of disease occurrence was slight except JADP farm located in the low plain of Terai.

Control measure:

I) To cut off the diseased leaves and twigs.
2) To spray Bordeaux mixture and inorganic copper at the interval of 25 -30 days in rainy seasons.

Powdery mildew (Oidium tingitanium)

This disease was observed on the surfaces of new shoot and young leaves of mandarin and sweet orange groups in Dhankuta,and of Junar in JADP,Sindhuli

and Ramechhap.

Severely infected shoots die.Symptom looks like those spattered by flour.

Control measure:

To spray Benomyl,Colloidal sulfur and Sulfur (powder).

Sooty mold

Sooty mold was observed in whole citrus areas and the degree of disease occurrence was slight to severe.Main cause of this disease is insects.This fungus grows on honey-dew secreted by aphids,scales and other insects and the surface of loaves,fruits and twigs are covered with black mycelium. Effective control method is to eradicate insects.

Control measure

To spray Karphos,Papthion,Dimethoate and Petroleum oil etc.

Greasy spot (Mycosphaerella citri)

Greasy spot was observed in whole citrus areas and the degree of disease occurrence was slight to moderate.This disease has a tendency to occur when tree vigor weakens,so farmers must manage their orchards well.

Control measure:

I) To manage orchard well and keep citrus trees vigorously.

2) To spray Bordeaux mixture,inorganic copper,Zineb,Maneb,Mancozeb,Benomyl,Thiophanate methyl of Captafol.

Tristeza (Citrus tristeza virus)

Slight symptoms vein clearing and stem pitting were observed on lime in Kathmandu and Ramechhap.

Twig dieback

Twig dieback occurred slight to severe in almost whole citrus areas. It is considered that this disease may occur by many causes such as Greening,Foot rot,Phomopsis sp,Colletotorichum sp.,some insects ans non parasitic factors.

Other

Scab and Gummosis were also observed but they seemed not so important in the country.

(2) Survey on the occurrence of grapevine disease.

The surveys are carried out in orchard of Nepalgunj Horticulture farm, two farmer's orchards located in Banke district and JADP orchard. Grapevine varieties are Kyoho, Olympia, Delaware, Tanored, Black olympia, Steuben, Muscat Bailey A, Neo Muscat (these were introduced from Japan), Perlette, Thompson seedless (may be introduced from India) and Potch (introduced from Canada). Disease symptoms occurring on grapevine trees were observed with naked eye for almost all trees per orchard and kind of disease and the degree of disease occurrence were judged. Defoliation already started and I could not observe diseases about fruit on account of winter season.

Disease names observed and the degree of disease occurrence for each disease were shown in Table 2. Downy mildew (Plasmopara viticola), Anthracnose (Elsinoe ampelina) and Leaf spot (Phaeoisariopsis vitis) observed on almost all grapevine plants and the degree of disease occurrence was slight to severe.

Deadarm (Cryptosporella viticola) also observed on many grapevine plants but the degree of disease occurrence was slight. There were no Rust, Powdery mildew and Crown gall as far as I surveyed.

A spray calendar for grapevine diseases in Japan was shown in Table 3.

(3) Survey on the occurrence of chestnut diseases.

The surveys are carried out in the chestnut fields of Kirtipur Horticultural Research Station and Kakani Horticulture Farm. Chestnut varieties are Tskuba, Tanzawa, Yamato-wase, Ishizuchi, Ibuki and seedlings of Chinese chestnut. Diseased symptoms on chestnut trees are observed with naked eye and kind of chestnut disease and the degree of disease occurrence were judged. I could not observe diseases about leaf and fruit on account of winter season.

Disease names observed and number of diseased trees were shown in Table 4.

Trunk rot (Phytophthora katsurae) and Endothia canker (Endothia parasitica) observed on the introduced cultivars from Japan. A spray calendar for chestnut diseases in Japan was shown in Table 5.

Conclusion:

The most important diseases in Nepal are greening disease caused by phloem limited bacteria,the citrus psyllid transmitted pathogen,and foot rot.

At present,planting of grafted nursery plant has promoted as a counter-measure of foot rot.The posters,describing the good drainage system in citrus orchard and to paint with Bordeaux paste after cut off diseased part as a first step to foot rot,has been distributed to the farmers by Horticultural Development Project.

However,any greening disease counter measures,like cutting of diseased trees,vector control,production of greening-free sapling etc.has not been taken yet.It goes without saying in Pokhara,a lot of greening symptoms in nursery plants has been found in JADP farm and Sindhuli sub-centre by this time survey in those areas.If this disease invades in greening-free Junar production areas like Sindhuli and Ramechhap,since vector is expected to exist,the production of Junar and Suntala will face the difficulty.

Hence,the citrus industry in Nepal may be damaged completely.

A program of integrated control of this disease may propose as follows:

(I) Prohibit the moving of citrus scions and saplings of Pokhara Hort.Res.Stn., Sindhuli sub-centre and JADP farm where greening disease occurred in field and nursery plants to other regions,and cut those down immediately.

In future,production of citrus saplings to distribute among the farmers should be started in a screen house to prohibit sucking of the psyllid vector, or in a disease-or vector-free area where greening carrier plants had been eradicated (must avoid production of citrus saplings in tropical and sub tropical regions) and also be started by using greening free budwood obtained by treatment of Penicillin,heat treatment or micro-grafting. At the present time,we have no choice to use the budwood of old aged healthy tree.

(2) Cut down the affected trees in the above mentioned regions immediately to eradicate the inoculum of insect transmission.

(3) Control citrus psylla by insectiside,such as dimethoate,methasystox, dimecrom or nuvacron.The attempt of biological control against it by researchers of Nepal should be promoted.

All steps from (I) to (3) are of very importance for the control of the disease.

TABLE I. Survey of citrus diseases in Nepal.

(November to December 1986)

District	Vicinity of Pokhara			Pokhara					Kathmandu					Dhankuta							Janakpur	
Location	Kubinde			Pokhara Hort. Res. Stn.				Chang Manahari	Pihkel			Charankel		Dhankuta Hort. Stn.							JADP	
Citrus cultivar[a]	S	S	S	O	G	K	S	S	L	S	N	P	S	S	J	J	S	O	K	J	J	J
DISEASES NAME: Tristeza (SP)	—[b]	—	—						+													
Greening	—	—	—	+++	+++	+++	+++	—	—	—					—	—	—			—	++	+
Canker	—	—	—	+	+	+	+				+				+	+					+++	++
Foot rot	++	+	+	—	—	—	—	+		—		—	+		—	—					—	
Gummosis	—	—	—	—	—	—	—								—	—				+	++	
Pink disease	—	—	—					—							—	—					—	
Powdery mildew	—	—	—											++	+	+	+	+++	++		++	
Scab	—	—	—										++		—	—			+			
Greasy spot	+	+	+	+	+	++	++			++			+		+	+		+	++		+	
Sooty mold	+	++	++	+	+	+	+			++	++		+		—	—		+++			—	
Armillaria rootrot	—	—	—																		—	
Agar	+	—	+	+	+	+	+								—	—					—	
Twig dieback	+++	+	+	+++	+++	+++	+++	+			+	++	++		—	—	+++				++	
Tree age (year)	25	25	25											8	5	5	20	>20	5	2	4	I
Remark				rs:R					vc:+					rs:R		rs:T		rs:R[c]		rs:T		

a. S: Suntala, O: sweet orange, G: grapefruit, K: kinnow, L: lime, N: nibuwa, P: pommelo, J: junar, R: rough lemon, T: trifoliata orange, C: troyer citrange .

b. Degree of disease occurrance +++: severe, ++: moderate, +: slight, - : no.

c. Bud-union disorder occurred.

TABLE I-2

District	SINDHULI							RAMECHHAP					
Location	Sindhuli Agri.Farm			Nanyakharka				Bijyachhap		Sukhajor	Salu	Okhareni	Gaitar	Bangeri	
Citrus cultivar	J	J	J	S	J	J	J	J	S	L	L S J	J	J	J	S
DISEASES NAME: Tristeza (SP)	−									+	+				
Greening	+	+	+	−	−	−	−	−	−	−	− − −	−	−	−	−
Canker	+	+	+	−	−	−				+	+ − −				
Foot rot	+			++	+	++	−	+	+		− −	++	++	+	+
Gummosis	+							+	+	−	− − −			+	+
Pink disease	−														
Powdery mildew	−						+						+	+	+
Scab	−														
Greasy spot	+			+	+	+	+				+ +			+	+
Sooty mold	+													+	+
Armillaria rootrot	−														
Agar	−														
Twig dieback	+										− −				
Tree age (year)	5	I	I	IO	IO	6	I6	I8	25	I5	I5 I5 ~20 ~20	7			
Remark	rs:R	rs:R	rs:R			rs:R				vc:+	vc:+	rs:R			

TABLE 2. Survey of grapevine diseases in Nepal.

(November to December 1986)

District	NEPALGUNJ				JANAKPUR
Location	Nepalgunj Hort. Farm		Farmer's field -1	Farmer's field-2	JADP FARM
Grapevine cultivar[a]	K O D TR BO S BA N	K S P T D O TS F	K S D TR O	K S D TR O	O TR C S D
Disease's name: Downy mildew	+++[b] ++ ++ ++ ++ ++ ++	+ + + + + + ++ −	++ ++ ++ ++ ++	++ ++ ++ ++ ++	+++ +++ +++ +++ +++
Anthracnose	+ + + + ++ + + ++	+ ++ +++ + + + +++ −	+++ ++ ++ ++ ++	+++ ++ ++ ++ ++	+ + + + +
Leaf spot	+++ +++ +++ +++ +++ +++ +++ +++	++ ++ ++ ++ + + + ++	+++ +++ +++ +++ +++	+++ +++ +++ +++ +++	++ ++ ++ ++ ++
Powdery mildew	− − − − − − − −	− − − − − − − −	− − − − −	− − − − −	− − − − −
Rust	− − − − − − − −	− − − − − − − −	− − − − −	− − − − −	− − − − −
Deadd arm	+ − − − − − − +	+ + + + − + ++ −	+ − − + +	+ − − + +	+ + + + +
Crown gall	− − − − − − − −	− − − − − − − −	− − − − −	− − − − −	− − − − −
Tree age (year)	2 2 2 2 2 2 2 2	4 4 4 4 4 4 4 4	5 5 5 5 5	5 5 5 5 5	8 8 8 8 8
Remark					

a. BA:Muscat Bailey A, BO:Black Olympia, C: Campbel Early, D: Delaware, F: Fotch, K: Kyoho, N: Neo Muscat, O: Olympia, P: Perlette, S:Steuben, TR: Tanored, TS: Thompson seedless.

b. Degree of disease occurrance +++: severe, ++ : moderate, + : slight, −: no.

Table 3. A SPRAY CALENDAR FOR GRAPE DISEASES

(cv. Dalaware, Yamanashi Prefecture, 1983)

Time of application		Fungicide	Disease
March	Early - Middle	PCP + Lime sulfur	A LS DA
May	Early - Middle	Mancozeb Bordeaux mixture	DA DM
	Late	"	LS DA DM
June	Middle	Bordeaux mixture	DM
	Late	"	DM R
August	Late (Just after harvest)	"	LS DM R

(cv. Kyoho, Nagano Prefecture, 1983)

Time of application		Fungicide	Disease
April	Middle (Before sprouting)	Lime sulfur	A LS DA
May June	Late Early	Mancozeb + {Benomyl Thiophanate methyl}	A LS DA DM R GM
	Late	Bordeaux mixture	LS DA DM R PM RR
July	Early	"	LS DM R PM RR
	Middle - Late	Milneb Polycarbamate	LS DM R PM RR
August	Middle	Bordeaux mixture	DM R PM
September	Late Early	"	DM R PM
	Middle (after harvest	"	DM R PM

A : anthracnose, DA : dead arm, DM : downy mildew, GM : gray mold,
LS : leaf spot, PM : powdery mildew, R : rust, RR : ripe rot

TABLE 4. Survey of chestnut diseases in Nepal.

(November 1986)

Location / Disease's name \ Chestnut variety	Kirtipur Hort. Res. Stn.						Kakani Hort. Res. Stn.				
	Ts[a]	Ta	Y	Is	Ib	S	Ts	Ta	Y	Is	Ib
Trunk rot	2/6[b]	2/6	2/6	0/5	0/2	0/39	0/4	0/8	I/I0	I/I0	0/2
Endothia canker	0/6	0/6	I/6	4/5	0/2	0/39	0/4	0/8	0/I0	0/I0	0/2

a. Ts: Tsukuba, Ta: Tanzawa, Y: Yamato-wase, Is: Ishizuchi, Ib: Ibuki, S: seedlings of Chinese chestnut.

b. No. of trees diseased / No. of trees surveyed.

Table 5. A SPRAY CALENDAR FOR CHESTNUT DISEASES
(Ibaraki Prefecture, 1983)

Time of application		Fungicide	Disease
Winter	Dormant stage	Thiophanate methyl paste	EC TR
May	Early	Difolatan Basic copper sulphate	TR
June	Early	Difolatan Basic copper sulphate	TR
July August	Late Late	Benomyl Polycarbamate	AR

EC : Endothia canker, TR : trunk rot, AR : anthracnose rot

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