

# REJUVENATION OF DECLINED CITRUS TREES

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## ABSTRACT

*Although there is an appreciable progress in the production of citrus fruits in Nepal, there is a little change in management practices. Citrus orchards still continue to face the threat of declines. The citrus productivity is very low in Nepal, which is mainly due to absence of cultural practices. Severe decline symptoms were observed in the orchards of Dhankuta Agriculture Station in 1987. Rejuvenation of these orchards was made possible by following ten orchard management practices. Based on this study and the current situations of citrus orchards in the country, some measures are suggested for the rejuvenation of declined citrus orchards.*

## INTRODUCTION

Citrus fruits account for about 25 percent of the total fruit production of Nepal. The citrus industry is expanding rapidly in the country because of the favourable government policy, suitable climates and available markets. But, almost complete absence of cultural practices like fertilizer application, irrigation and plant protection measures and wrong practices of growing intercrops have aggravated citrus decline throughout the country. Severe decline symptoms were observed in the orchards of Dhankuta Agriculture Station (DAS), Paripatle, Dhankuta in 1987. Most of the madarin (*Citrus reticulata* Blanco), Sweet orange (*Citrus sinensis* Osbeck), lime (*Citrus aurantifolia* Christ m) and lemon [*Citrus Limon* (L) Burm.f] trees of DAS were badly affected by Citrus decline malady. The term "citrus decline" denotes a condition of ill health and decadence of citrus trees which may arise from a number of causes. The possible causes contributing to the decline syndrome are one or more of the following:

1. Unfavorable soil and climatic conditions.
2. Incidence of virus and other diseases.
3. Incidence of insect pests and
4. Lack of proper orchard management.

The climatic factors influencing citrus trees are temperature, rainfall, wind, light and humidity. The temperature range for the growth of citrus is 20° C to 35° C. The mean summer temperature range of mid hills of Nepal lies within this limit. The winter temperatures of citrus growing areas do not go below freezing point and hence, there is no problem of winter injury. Except occasional drought during flowering periods and hailstones just after fruit set, all other climatic factors prevailing in mid-hills are suitable for citriculture. Though poor in organic matter, the sandy loam soils of hilly areas can be considered preferable for citrus growth.

Although there are many diseases and insect pests associated with citrus decline in Nepal, the main contributing factor for citrus decline is the proper orchard management. Many of the existing orchard trees of Nepal are on the edges of the bench terraces and they normally suffer from malnutrition due to restricted root growth. The author has observed that even such trees when received required amounts of manures and fertilizers have grown quite well. This paper

is mainly based on the study of declined citrus trees in the orchards of DAS in 1987. Recently, when the author visited some orchards in Tanahu, Gorkha, Dhading and Dhankuta districts, similar conditions were found. This is an indication that even today, the citrus decline in the country is caused mostly due to the absence of proper orchard management practices.

## METHODOLOGY

First of all, frequent observations were made on the orchards by intensive field visits by the author to study diseases but no visual symptom of virus and virus-like diseases except bud union crease and foot rot in few trees of Junar and rough lemon and stem pitting in two nucellar trees of lime, was noticed. Hence, lack of proper orchard management was considered as the main factor causing citrus decline in the station. Amounts of manures and fertilizers were based on field trials and soil analysis. The plant protection schedules were based on field observations and presence of insect-pests and diseases in the orchards.

### Conditions of Declined Trees

The trees selected for this study were in severe stage of decline. Most of their twigs and shoots were dead right down to the main trunk. Subsequent secondary growth consisted of short, upright, small and weak few shoots from the main trunk (Fig. 1)



*Fig 1: A declined mandarin tree*

Other historical details of these trees are presented in table 1.

Table 1. Historical details of the trees

S. No.	Kind of Fruit	Cultivar	Age	No. of trees selected for the study.
1	Mandarin	Local	10	1319
2	Sweet orange	Junar	10	297
3	Lemon & Lime	Ureka/Local	10	367

Practices of the rejuvenation followed:

The following steps were practised for rejuvenation.

1. The orchards were kept clean all the year round.
2. Areas around tree trunks upto canopy spread were hand-weeded regularly and light hoeing was done during winter.
3. Plant parasites such as *Loranthus* sp. and some other wild creepers were removed from the trees whenever noticed.
4. Dead, insect-pest and disease infested and other unwanted branches were pruned during winter.
5. Tree trunk up to 50 cm high from the ground level was painted with Bordeaux paste during winter.
6. Trees were mulched once in a year with scraped weeds and dry leaves during September/October.
7. Manures and fertilizers were applied as shown in annexure 1 (A, B, and C)
8. Water stagnation around tree base was avoided during rainy season.
9. Inarching was done with trifoliolate (*Poncirus trifoliata*) rootstock (Fig.2) to save the trees infested with root rot diseases.



Fig 2: Inarching into mandarin tree

## RESULTS AND DISCUSSION

The responses of management practices mentioned above on declined trees were found very encouraging (Table 2). More stronger shoots with larger leaves were developed in each tree. Sparsely foliated trees were changed into densely foliated ones (Fig 3).

The canopy of each tree has been developed fully. Trees from which scion sticks were not taken, started to produce fruits satisfactorily after two years of time period.

Table 2: Rejuvenation of citrus trees.

S. No.	Kind of Fruit	Total No. of Trees	No. of Rejuvenated trees after two years	Percentage of rejuvenated trees
1.	Mandarin	1319	1287	97.6
2.	Sweet orange	297	261	87.9
3.	Lemon & lime	367	309	84.2

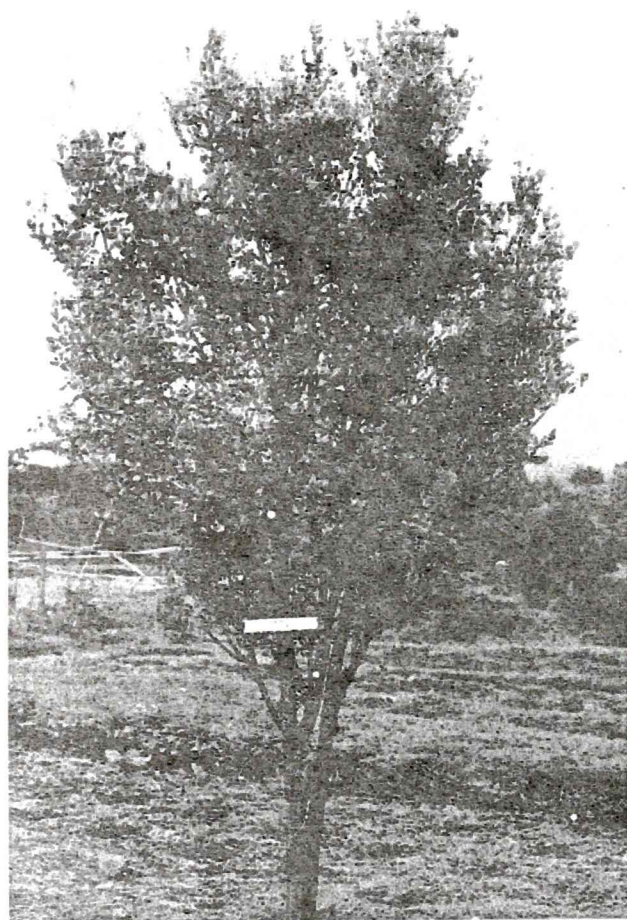


Fig 3: A rejuvenated mandarin tree

The results presented in table 2 proved that the main cause of citrus decline in DAS was lack of proper orchard management and trees declined to the extent described above could be rejuvenated by following appropriate management practices. The finding of this study are in agreement with the earlier findings of Anon, 1978 and Gosh *et. al.* 1981. Ghosh and Singh (1993) also have reported that declined citrus orchards could be brought back to optimum productivity levels by 3<sup>rd</sup> year by judicious cultivation practices such as cleaning, weed control and manures and fertilizers application. The author had also found similar results from a declined junar orchard in Sindhuli where some orchard management practices were followed for two years (1983 and 1984).

## CONCLUSION AND SUGGESTIONS

Although there is an appreciable progress in the production of citrus fruits in Nepal, there is a little change in management practices. As a result, citrus orchards still continue to face the threat of declines. The productivity of citrus is very low in Nepal (10.23 mt/ha), which is mainly associated with ill management of orchard trees. Scope for further increase in production through area expansion is limited and hence, future increases will have to depend mainly on the improvement of productivity levels, for which management should be more intensive. Citrus production cannot be sustained for long without following basic practices of orchard management. Based on the study and the current situation of citrus orchards in the country, the following measures are suggested for the rejuvenation of declined citrus orchards.

1. Key factors responsible for decline are to be identified by regular inspections of orchards.
2. Recommendations on manuring and fertilization should be based on experiences, field trials and leaf and soil analysis.
3. The aforesaid practices of rejuvenation should be followed every year.
4. Technologies for integrated pests and disease management in citrus should be developed and followed.
5. Regular campaign to bring awareness of the growers for adopting necessary measures for healthy orchards is needed.
6. Growers should also be trained to develop skills in orchard management.
7. Intercropping around tree trunk, at least, up to canopy spread, should be avoided. For this, a strong campaign is essential.

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### Annexure 1 A: Manure and fertilizer schedule recommended for Junar

(in kg per plant)

S. N.	Type of manure and fertilizer	Time Of application	1 Year	2-3 Year	4-5 Year	6-7 Year	8-9 Year	10 Yrs & Onward
1	Compost or F.Y.M.	Paush-Magh (Jan-Feb)	10	25	35	50	60	75
2	Urea	Falgun (Feb-Mar)	0.050	0.075	0.100	0.150	0.250	0.400
3	Single super phosphate.	Falgun (Feb-Mar)	0.050	0.075	0.100	0.150	0.200	0.250
4	Murate of Potash	Falgun (Feb-Mar)	0.050	0.100	0.150	0.200	0.250	0.300
5	Complexal	Jestha (June)	0.050	0.100	0.150	0.200	0.250	0.300
6	Urea	Bhadra-Aswin (Sept-Oct)	0.010	0.050	0.100	0.150	0.200	0.200
7	Agri.Lime	Paush-Magh (Jan-Feb)	-	0.500	-	1.000	-	1.500
8	Agromin or plantoplex or any other readymade micronutrients	Chaitra-Baisakh (April-May)	-	1.5 gm in ½ lit. water	3 gm in 1 lit. water	6 gm in 2 lit. water.	12 gm in 4 lit. water	15 gm in 5 lit. water

### Annexure-1 B: Manure and fertilizer schedule recommended for local mandarin

(in kg per plant)

S. N.	Type of manure and fertilizer	Time of application	1 year	2-3 year	4-5 Year	6-7 year	8-9 Year	10 yrs & onward
1	Compost or F.Y.M.	Paush-Magh (Jan-Feb)	10	25	35	50	75	100
2	Urea	Falgun (Feb-Mar)	0.050	0.100	0.200	0.300	0.400	0.500
3	Single super phosphate.	Falgun (Feb-Mar)	0.050	0.075	0.100	0.150	0.200	0.300
4	Murate of Potash	Falgun (Feb-Mar)	0.050	0.100	0.150	0.200	0.300	0.400
5	Complexal	Jestha (June)	0.050	0.100	0.150	0.200	0.250	0.300
6	Urea	Bhadra-Aswin (Sept-Oct)	0.010	0.050	0.100	0.150	0.200	0.200
7	Agri.Lime	Paush-Mahg (Jan-Feb)	-	0.500	-	1.000	-	1.5-2.0
8	Agromin or plantoplex or any other readymade micronutrients	Chaitra-Baisakh (April-May)	-	1.5 gm in ½ lit. water	3 gm in 1 lit. water	6 gm in 2 lit. water.	12 gm in 4 lit. water	15 gm in 5 lit. water

### Annexure 1 C: Manure and fertilizer schedule recommended for lime and lemon

			<i>(in kg per plant)</i>					
S. N.	Type of manure and fertilizer	Time Of Application	1 Year	2-3 Year	4-5 Year	6-7 Year	8-9 Year	10 Yrs & Onward
1	Compost or F.Y.M.	Paush-Magh (Jan-Feb)	10	15	20	30	40	50
2	Urea	Falgun (Feb-Mar)	0.025	0.050	.075	0.100	0.150	0.200
3	Single super phosphate.	Falgun (Feb-Mar)	0.025	0.050	0.075	0.100	0.150	0.200
4	Murate of Potash	Falgun (Feb-Mar)	0.025	0.050	0.100	0.150	0.250	0.250
5	Complexal	Jestha (June)	0.025	0.050	0.100	0.100	0.150	0.150
6	Urea	Bhadra-Aswin (Sept-Oct)	-	-	-	-	-	-
7	Agri.Lime	Paush-Mahg (Jan-Feb)	-	0.250	-	0.500	-	0.700
8	Agromin or plantoplex or any other readymade micronutrients	Chaitra-Baisakh (April-May)	-	1.5 gm in ½ lt. water	1.5 gm in ½ lit. water	3 gm in 1 lt. water.	6 gm in 2 lit. water	6 gm in 2 lit. water

### Annexure 2: Plan protection schedule

#### A: For insect pests

Time of application	Control measures followed	To control
Jan-Feb	Rogor (15 ml in 10 lit. water) was sprayed.	Scales, aphids, lemon butterfly, stem borer etc.
May-June	Metasystox (15 ml in 10 lit. water) was sprayed.	Leaf miners, aphids, scales, stem borer etc.
July-August	Malathion (20 ml in 10 lit. water) was sprayed.	Scales, aphids, bugs, lemon butterfly, mites etc.
Sept-Oct	Demecron (3-5 ml in 10 lit. water) was sprayed.	Scales, bugs, aphids, stem borer etc.

#### B: For diseases

Time of application	Control measures followed	To control
Dec-Feb	Cut ends and tree trunk were painted with bordeaux paste.	Gummosis, foot rot, pink diseases.
June-July	Karathane (5 ml in 10 lit. water) was sprayed at one month in interval.	Powdery mildew
Sept-Oct	1 % bordeaux mixture was sprayed.	Pink disease, scab, leaf fall, fruit rot etc.