REJUVENATION OF CITRUS ORCHARDS

Chaudhary Sajid Ahmad
Horticultural Officer Agriculture (Ext.), Faisalabad.

Importance

Citrus constitutes to be the major fruit crop of the country both in area and production. These fruits are grown on an area of 197700 hectares with a production of 1943200 tons. Citrus is grown in all four provinces but Punjab produces 95 % of the crop due to favorable growing conditions. Major area is under Kinnow, which is 60 %. These fruits carry special significance in view of nutritional, therapeutic and economic values. Their richness in Ascorbic acid (vitamin C and many other mineral substances), Iron, Ca, **P,** Mg, and K is very well recognized. Modern day science is unanimous in categorizing these fruits as scurvy preventives, blood purifiers, good appetizers, cholesterol moderators etc. Moreover they are believed to enhance immunity against debilitating diseases like that of cancer, and different liver and stomach related disorders. Many of these particularly grapefruit and acid limes due to low sugar contents can be used by diabetic patients to whom this disease deprive of other fruits. Juice of citrus fruits possess excellent refreshing qualities and can be used as cheap thirst quenchers.

Yield Gap

Per acre yield of citrus in our country is very low as compared to other citrus producing countries of the world i.e., 8 to 10 tons in Pakistan and 37 to 40 tons per acre, in world respectively.

Main Reasons for Low Production

Production of citrus is very low and remained unchanged in the past. What so ever production increased, has been function of area so main reasons attributed to low productivity are as under.

1. Poor quality of nursery plants.
2. Imbalanced use of fertilizers.
3. Wrong method and timing of irrigations.
4. Ineffective and defective weeds control.
5. Damage by insect-pests and diseases.
6. Inter-cropping.
7. Defective picking and post harvest loses.
8. High soil pH.
9. Deficiency of organic matter in our soil.
10. High temperature

In order to increase per acre yield of citrus and uplifting the living condition of the citrus growers, Government of the Punjab has launched a project namely as “Rejuvenation of Fruit Orchards Project” PHASE-II. The project covers both mango and citrus fruits orchards, but we will discuss here citrus orchards only.

Name of the Project

Rejuvenation of fruit orchards phase-II

Sponsoring

Government of the Punjab, Agriculture Department.

Executation

Director General Agriculture (Ext & AR) Punjab Lahore

Operation

Horticultural Officer, DOA (Ext) and SSMS.

Maitenance Duration

36 months (Jan, 02 to Dec, 04)

Main Objectives

Main objective of the project is to increase the citrus & production in the Punjab province, and sub-objectives of the project are as under.

1. To demonstrate production technology of citrus to orchard growers.
2. To uplift the socio-economic status of the citrus orchard growers.
3. To enhance citrus production qualitatively and quantitatively for foreign exchange earnings.

Location

Major citrus producing districts of Punjab are Sargodha, T.T.Sigh, Faisalabd, Jhang, Mandi-Baha-u-din, Khushab, Mianwali and Layyah. So project has started in these districts.

Selection of orchards

Two hundred orchards of citrus have been selected in the districts of Sargodha, T.T.Sigh, Faisalabd, Jhang, Mandi-Baha-u-din, Khushab, Mianwali and Layyah. The selection criterion was as under.

Selection Criteria

Selection of orchards was made according to the following criteria.

1. Small farms with orchard area of 25 acres holding.
2. No permanent defect of soil and water.
3. Orchard already not covered in phase- I
4. Size of Demonstration Block must not be more than 5 acres.
5. Willing of the owners and easy approach was kept in view.
6. Director General Agriculture (Ext & AR) Punjab, Lahore invited applications from the interested farmers through press for the concerned district.
7. All the applications were scrutinized carefully.
8. Open draw was conducted among the applications fulfilling the criteria. Process was completed by a ommittee comprising of DOA, RON AHO concerned.

Working Modality

1. Each team is maintaining 10

Sr. No.	**District**	**No.of orchards selected**
1.	Sargodha	60
2.	T.T. Singh	30
3.	Faisalabad	30
4.	Jhang	20
5.	Mandi-Baha-u-ddin	30
6.	Mianwali	10
7.	Khushab	10
8.	Layyah	10
TOTAL		200

demonstration blocks.
2. Each team comprises an Agriculture Inspector or Budder and 10 beldars.
3. Agriculture officer is an in charge of whole district
4. Entire responsibility of project activities rest with DOA (Ext) concerned.
5. One single cabin pickup has been provided for transportation of labour and required material for 2 teams.
6. Entire production technology is being followed on demonstration blocks.
7. All operations are carried out by the extension staff.
8. Equipments, tools and inputs (Gypsum and Micronutrients) are provided from the department and remaining inputs are provided by the concerned farmer.
9. Project orchards infested with insect pests or diseases are visited by the Extension staff.
10. Plant parts infested with insectpests or diseases are collected and brought to Research laboratories for analyses.
11. After research studies, control measures suggested from the research experts, are brought to notice of concerned farmers for control of insect-pest or diseases whatever the attack may be.

Equipment/machinery

Following equipments/machinery have been provided to each team for the rejuvenation activities.

Dissemination of Citrus Production Technology

In order to boost up the production of citrus and uplifting the condition of citrus growers, emphasis has been given on the following points:

1. Rejuvenation of old citrus orchards.
2. Production of disease free citrus plants.

A Rejuvenation of Old Citrus Orchards

Selection of Districts

The district with at least 3000 acres under citrus orchards have been selected for the rejuvenation activities.

#	**Equipments/Machinery**	**Quantity per Team**
I	Pole Prunner	2
2	Scatuer-9"	2
3	Pole Saw	10
4	Folding Ladder	3
5	Tractor mounted sprayer with 4 guns	1
6	Spade	10
7	Pole Picker	5
8	Hand Saw	5

Cultural Practices

#	Months	Cultural Practices Being Adopted
1.	January	▪ Pruning of unwanted/diseased branches. ▪ Harvesting/picking. ▪ Preparation of land. ▪ Digging of pits. ▪ Layout.
2.	February	▪ Pruning of undesired/diseased twigs. ▪ Transplanting of nursery. ▪ Budding /grafting operations ▪ Hoeing/ploughing.
3.	March	▪ Hoeing & Ploughing, eradication of weeds through spray. ▪ Harvesting & disposal of Kinnow and Valencia late. ▪ Budding / grafting and transplanting of nursery. ▪ Burying of dropped and diseased fruits.
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4.	April	▪ Removal of water sprouts/shoots. ▪ Hoeing & Ploughing.
5.	May	▪ Removal of water sprouts. ▪ Eradication of weeds through ploughing or spray.
6.	June	▪ Make irrigation bunds and channels.
7.	July	▪ Harvesting of sweet lime. ▪ Drain out excessve water of rains.
8.	August	▪ Picking of sweet lime. ▪ Sowing of Khatti seed. ▪ Digging of pits.
9.	September	▪ Removal of water sprouts/shoots. ▪ Budding/grafting of nursery. ▪ Filling of pits.
10.	October	▪ New plantation for orchard establishment. ▪ Continue budding/grafting operation. ▪ Removal of water sprouts/shoots ▪ Hoeing and ploughing.
11.	November	▪ Harvesting of early varieties.
12.	December	▪ Harvesting/picking. ▪ Pruning of harvested plants.

District wise distribution of citrus teams

20 citrus teams have been constituted from the existing extension staff. At least one team is deputed to the district with area less than 5000 acres under citrus orchards. A maximum of 6 teams are deputed keeping in view the compactness of the citrus orchards in districts with more than one lack area under citrus orchards.

PRODUCTION TECHNOLOGY

Following month wise production technology is being implemented in the selected citrus demonstration blocks.

#	District	Citrus Area(Acers)	No. of Teams
1.	Sargodha	103831	6
2.	Faisalabad.	17610	3
3.	Toba.Tek.Singh	16461	3
4.	Mandi - Baha-u-din	15040	3
5.	Jhang	9493	2
6.	Layyah	5669	1
7.	Khushab	4597	1
8.	Mianwali	3148	1
	Total:	175849	20

Irrigation

#	Months	Schedule of Irrigation.
1.	January	Irrigation during frosty nights.
2.	February	Withhold irrigation for few weeks before blooming.
3.	March	One irrigation in last week after fruit set.
4.	April	14 days interval.
5.	May & June	7 to 14 days interval.
6.	July & August	Interval according to climatic conditions.
7.	September & October	14 days interval.
8.	November & December	One month's interval depending on climatic condition.

Fertilizer

#	Months	Nutrients (Active ingredient in gms /plant)
I	February	N @ 350gms
2	April	N @ 350gms
3	August/September	N @ 350gms
4	December	P @ 500gms K @ 500gms Zn @ 100gms F.Y.M @ 40-50 kg

Plant Protection Measure

#	Months	Plant Protection Measures
1.	February	▪ Spray pre-bloom fungicide & insecticide against diseases and insects.
2.	March	▪ Spray nursery and orchard against leaf miner, Citrus sylla and white fly.
3.	April	▪ Spray against leaf miner if needed. ▪ White washing of stems with mixing of un-slacked lime and $CuSO_4$
4.	July	▪ Spray of Bordeaux mixture.
5.	August	▪ Spray nursery and orchards according to infestation of insect and diseases.
6.	September	▪ Spray against fruit fly & lemon butterfly & leaf miner.
7.	October	▪ Spray against diseases.

OPERATION UNDER TAKEN BY THE DEPARTMENT

1. Agreement

An agreement has been signed between the department and owner of the citrus orchards for the adoption of production technology, provision of 50 % labour and supply of inputs.

2. Soil Analysis

The ideal soil pH for citrus fruits is 6.50 to 7.00 but in our soil pH ranges from 8.00 to 9.50. Therefore, soil samples from the orchards selected under rejuvenation project were collected and sent for analyses. Analysis reports along with recommendations from the Soil Chemist have been received and supplied to the concerned orchards growers for rehabilitation of the soil, because soil pH was on higher side ranging from 8.00 to 9.6.

3. Inter cropping stopage

Intercropping is very injurious for the citrus orchards particularly when orchard is at bearing stage. However, pulses like moong, mash, gram and lentil can be grown before the bearing of orchards. Citrus growers were guided regarding the demerits of intercropping and now intercropping has totally been stopped in the selected orchards of citrus and results are encouraging.

4. *Pruning of citrus trees*

Dry and diseased twigs create hindrance for better citrus production. The best time of pruning is just after picking the fruits i.e. in December and January for early varieties i.e Feutrells Early, Musambi, and Grape fruit, and in February/March for Kinnow and pruning must be followed with fungicide spray. Farmers have been advised to prune the branches along with 2-3 inches of healthy part, so that disease may not proceed further. Before the commencement of the project, this practice was almost nil. Due to demonstration the farmers have adapted this practice.

5. Remov al of water shoots

Farmers have been advised to remove the water shoots from the stems of the citrus trees in the month of April and September to make them more lucrative. So this practice is in progress in the selected orchards.

6. Eradication of weeds

Farmers have been educated, that weeds may reduce their production of fruit up to 30%, compete for food and also provide places for breeding of insects and diseases. Now removal of weeds has been started due to the continuous guidance of the extension staff in the selected orchards, and all the citrus orchards are free from weeds.

7. Preparation of basins / bunds

Before the implementation of the project, preparation of basins/bunds was not in practice. Farmers have been guided to prepare the basins around the plants to save them from direct touching of water and infestation of diseases. So, basins have been made around the plants in the selected orchards and farmers are also adapting this practice in their orchards.

8. White Washing of Stems

White washing of stems was not in practice before the starting of the project, now all the plants in the selected orchards are being white washed twice in a year in the months of April and

October with Bordeaux paste 1:2:10 (lime, Copper sulphate and water).

9. Fertilizer Application

Plants need about 16 major and minor elements for its growth and production. The major and minor elements are N, P, K and Zn, Cu, Mg respectively. Before the commencement of the project, fertilizer application to the citrus orchards was almost very low to nil. Farmers have been educated to apply Nitrogen, Phosphorus and Potash in the form of Ammonium Sulphate, Single Super Phosphate and Sulphate of Potash instead of Urea, DAP and MOP according to the doses and time of application given as under:

10. Application of Micronutrients

The micronutrients i.e, Zinc Sulphate is very essential for citrus. Before the commencement of the project, farmers were not familiar with the application of Zinc Sulphate and its importance. Extension staff is guiding the orchard owners to apply the Zinc in the month of December and April at the rate of 50gm per plant for better production and quality fruits. The results are very encouraging and practice is being adapted in the citrus orchards.

#	Time of Application	Nutrients (Active Ingredients) g/plants				
		N	P	K	Zn	FYM/KG PIP
1.	December	-	500	500	100	40-50
2.	February	350	-	-	-	-
3.	April	350	-	-	-	-
4.	August/September	300	-	-	-	-
	Total:	1000	500	500	100	40-50

Calculation of Fertizer Quantity

#	Type of Fertilizer	Quantity
1.	Nitrogen-350gm	1.75 kg Ammonium Sulphate, or 700gms Urea or 1.350kg Ammonium Nitrate.
2.	Phasphorus-500gm	2.50kg Single Super Phosphate or lkg Triple Super Phosphate.
3.	Potash-500gm	lkg Sulphate of Potash.

l1. Irrigation at Proper Time

Water plays important role in the production of citrus fruits, especially in the months of April, May and June, which are critical periods for the

development of fruit: Before the starting of the project, the farmers were applying frequent irrigation to their orchards without keeping the time of application and quantity of water. Farmers have been educated to apply irrigation to their citrus orchards at with the interval of 7 to 14 days in the summer months and with one-month intervals in the winter season, care may be taken to save the stems from direct touching of water, and always avoid tube well irrigation.

12. Plant protection measures

Farmers have been educated about insectpests and diseases of citrus plants and their control measures. Following insects and disease infested the citrus plants throughout the year especially in the months of February, March and September, October. Now, farmers are familiar about the identification of insects and disease, their time of infestation and control measures. The major insects and diseases of citrus plants are given as under

INSECTS

i. Citrus psylla
ii. White fly
iii. Black fly
iv. Leaf miner
v. Citrus thrips
vi. Citrus mites
vii. Lemon butterfly
viii. Citrus fruit fly
ix. Citrus mealy bug

DISEASES

i. Root rot.
ii. Collar rot
iii. Gummosis bark splitting.
iv. Citrus Wither tip.
v. Citrus Canker.
vi. Quick decline of citrus.

13. Picking/harvesting of citrus fruits

Farmers have been educated regarding the proper time and techniques of picking of citrus fruits.

14. Collection and destruction of fruit drop

Farmers have also been educated for the collection and destruction of diseased and dropped fruits of citrus. The practice is in progress.

15. Provision of Printed Literature

#	District	District
1.	Sargodha.	12100
2.	T.T.Singh	7300
3.	Faisalabad.	7300
4.	M.B.Din.	4900
5.	Jhang.	7300
6.	Khushab.	2450
7.	Mianwali.	2450
8.	Layyah.	2450

A annual citrus calendar in Urdu language has been prepared, vetted from the experts of different disciplines, Horticulture, Entomology, Pathology and Soil Science, got printed and have provided to the farming community especially, the citrus growers. The district wise distribution of citrus calendar is as under:

16. Farmer Days

Two farmer days are arranged in each district of citrus project in a year, to educate the farmers about the latest Production Technology, Plant Protection Measures, Soil Health problems and advances in Horticulture. In these farmer days, experts from the Research Wing are invited to deliver lectures. The practice is in progress and has become popular among the citrus growers.

17. Radio Talks

Horticultural Officer Agriculture (Ext.) Faisalabad recorded radio talk once in a month, which is telecasted at Radio Pakistan stations Faisalabad and Lahore, twice and once in a month respectively. In these radio talks all operations due in that very month are discussed in detail: Up till now, 16 radio talks have been recorded and 32 times telecasted.

B- Production of Disease Free Citrus Plants

Certified plants plays very important role in the production of citrus fruits.

Therefore, farmers have been educated to plant the certified plants in the orchards. At present, certified plants are not available in the market. In order to produce the certified plants, nurseries have been established at different Government Agriculture Farms detailed as under:

#	**District**	**No. of Nurseries**	**Location.**
1.	Sargodha.	2	Government Agriculture Farm Rasala No.5.
2.	T.T.Singh.	2	Government Agriculture Farm, Chak No.357/JB. Gojra.
3.	Faisalabad.	1	Government Agriculture Fruit Nursery Rasala No.12.
4.	M.B.Din.	1	Government Agriculture Farm, Chillian W ala.
5.	Khushab.	1	Government Agriculture Farm, Joherabad.
6.	Mianwali.	1	Government Agriculture Farm Mianwali.
7.	Jhang.	1	Government Agriculture Demonstration Farm, Jhang.
8.	Layyah.	I	Government Agriculture Farm, Layyah

Working Modalities

1. Each nursery is required to produce 5000/- quality grafted citrus plants annually. Production may start after the third year of the project.
2. Price is @ Rs.15/- per plant.
3. For quality irrigation, a water tank (50x50x5) is dug out at each farm and covered with plastic sheets to save water losses due to seepage.
4. A small peter pump is installed for lifting water to irrigate nursery plants.

Material

Following materials have been provided to each farm for the production of quality plants.

#	**Machinery**	**Quantity per nursery**
1.	Budding knife.	5
2.	Pruning Scissor.	5
3.	Hand Trolley (Rubber Wheels).	5
4.	Hand Sprinkler.	5
5.	Spade.	5
6.	Khurpa.	10
7.	Chowa Ramba.	5
8.	Hand Sprayer.	1
9.	Water lift pump.	1

Material

#	**Material**	**Quantity per nursery**
1.	Plastic Sheet.	Lumpsum.
2.	Seeba.	Lumpsum.

Inputs

#	**Input**	**Quantity per nursery**
1.	Urea.	5 bags per year.
2.	D.A.P.	5 bags per year.
3.	S.O.P.	5 bags per year.
4.	Citrus seed (khatti).	Lumpsum.
5.	Plant Protection.	Lumpsum.

District Wise Production of Certified Plants

It is hoped that following number of certified plants will be available after third year of the project.

#	Districts	No. of Nurseries	No. of Plants
1	Sargodha	2	10000
2	T.T.Singh	2	10000
3	F aisalabad	1	5000
4	Jhang	1	5000
5	M.B.Din	1	5000
6	Khushab	1	5000
7	Mianwali	1	5000
8	Layyah	1	5000
	Total	20	50000

Income from Citrus Plants

The income of Government will be Rs.7, 50, 000 from 50,000 certified.

Plants after third year of the project and total income will be Rs. 22,50,000

Economic Benefit to Growers

The main objective of all the rejuvenation activities carried out at selected orchards is to raise the income of the citrus orchard growers, which can be seen from the following tables.

1- Maximum Increase in Sale Price

#	District	Name	Total Area	Sale price in Rs		% +1-
				2002	2003	
1	Sargodha	Master Muhammad Hussain, RIO *87/NB*	3	17500	62000	254
2	T.T.Singh	Hafiz Muhammad Amin RIO 2981GB Tehsil & District T.T.Singh.	2	18000	70000	289
3	Faisalabad	Muhammad Irfan RIO 4151GB Tehsil Tandlianwala	5	5000	25000	400
4	Jhang	Rab Nawaz RIO 406/JB Tehsil Shorkot.	4	8000	15500	158
5	M.B.Din	Ghulam Rasul RIO Mianwal Ranjha Tehsil Phalia	3	15000	30000	100
6	Khushab	Malik Muhammad Amir RIO Mitha Tiwana	7	40000	105000	163
7	Mianwali	Malik Fateh Khan Muzaffar Pur Tehsil & District Mianwali	11	50000	220000	340
8	Layyah	Muqaddar Hussain RIO 75-C/TDA Tehsil Karor.	6	30000	150000	400

2- Minimum Increase in Sale Price

#	District	Name	Total Area	Sale price in Rs		% +1-
				2002	2003	
I	Sargodha	Ch. Tariq Mahmood Bajwa, RIO 33/SB	3	84000	86000	2
2	T.T.Singh	Rehana Kausar RIO 2451GB Tehsil Gojra.	25	1300000	1380000	6
3	Faisalabad	Khalid Mahmood Bajwa *RIO* 1991GB Tehsil Samundri.	10	96000	100000	4
4	Jhang	Ray Shahid Sultan Bhatti *RIiO* Pir Punjab Tehsil Chiniot.	5	81000	90000	11
5	M.B.Din	Akhtar Nawaz *RIO* Pindi Rawan Tehsil Malakwal	3	64000	66000	3
6	Khushab	Malik Khuda Yar *RiO* Bandial	2	250000	255000	2
7	Mianwali	Malik Muhammad Waris Wan Bhachran Tehsil and District Mianwali	15	260000	300000	15
8	Layyah	Syed Tanveer Abbas *RiO* 116-B/TDA Tehsil Layyah.	14	235000	305000	30

District Wise Average Increase in Sale Price

District wise average increase in sale price of selected orchards than last year can be seen from the following table.

#	District	Average % increase in Sale Price
1	Sargodha	42
2	T.T.Singh	83
3	Faisalabad	78
4	Jhang	46
5	M.B.Din	28
6	Khushab	43
7	Mianwali	91
8	Layyah	125