

**FRUIT  
PROGRAM**

March 1992



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Development Alternatives, Inc., 74E Ajaib & Sons Plaza, Blue Area, Islamabad, Pakistan

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# FRUIT PROGRAM

March 1992

*Prepared For:*

**OFFICE OF THE AID REPRESENTATIVE  
FOR AFGHANISTAN (O/AID/REP)**

*Prepared By:*

**Jim Cartwright, Consultant  
High Value Horticulture, Plc.**

AFGHANISTAN AGRICULTURAL SECTOR SUPPORT PROJECT/PRIVATE SECTOR AGRIBUSINESS (AASSP/PSA)  
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## **I. INTRODUCTION**

The consultant arrived in Islamabad, February 28, 1992. The terms of reference for the consultancy were:

- o Review the role of the two nursery/demonstration orchards at Swat and Darragh and make recommendations for their future role in DAI;
- o Review the past and present activities of the fruit tree nurseries in Afghanistan and prepare proposals for future activities;
- o Review the activities of the Apricot Drying Project and prepare alternative activities dependant on the output of dried apricots in June 1992;
- o Review the proposal for extending the work on bubble irrigation and make proposals for future work;
- o Participate in the Training Program for extension staff;
- o Participate in seminars with supervisors and nurserymen;
- o Prepare training curricular for nurserymen and supervisors; and,
- o Prepare fruit tree nursery guidelines.

The consultancy was in response to policy and staff changes in the DAI Afghanistan Agricultural Sector Support Project. It was considered that rationalization of the existing activities of the fruit tree nursery and fruit production sections was necessary to bring them into line with the aims and activities of the Agricultural Development and Training (ADT) component of the project.

The consultant wishes to acknowledge the cooperation and assistance given by R. Smith, Chief of Party; D. Oelsgle, ADT Adviser; A. Noori, N. Aslami, A. Naik and Q. Yusufi and for the generous technical assistance given by Dr. Abdul Wakil and M. Naqibullah in Peshawar.

The consultant left Islamabad March 20, 1992.

## **II. SUMMARY AND RECOMMENDATIONS**

### **2.1 Darragh Nursery**

The nursery at Darragh has now ceased to be operational and all the required fruit trees have been removed to cold storage in Peshawar. There are approximately 16,000 trees and rootstocks and these will be distributed in Afghanistan as weather conditions permit.

The residual equipment is of no great value and the bubble irrigation equipment would cost more to remove than it is worth.

### **2.2 Swat Nursery**

The nursery at Madyan has come to the end of its useful life for the production of fruit trees. It would also be inadvisable to continue apple tree production because of the presence of *phytophthora* collar rot. The retention of the demonstration orchard on its own would not be warranted considering the few times it would be used and the limited range of demonstration material available.

The contract for land between DAI and the 15 landlords expires March 31, 1992 at which time the landlords would become the owners of the permanent fruit trees. DAI is expected to remove any crops or nursery trees before the contract expires and this work is almost completed.

### **2.3 Staff**

Haj Kassim is supervisor for five workers at Swat and four workers at Darragh. Three houses are rented in Swat.

### **2.4 Nurseries in Afghanistan**

There are at present seven effective nurseries inside Afghanistan:

<u>Province</u>	<u>Number of Nurseries</u>	<u>Total Area</u>
Maroof	1	27 jeribs
Logar	2	30 jeribs
Wardak	2	30 jeribs
Ghazni	1	15 jeribs
Paktika	1	15 jeribs

These nurseries have been in existence since November 1989. DAI has the right to extend or terminate the contract when it ends on March 31, 1992.

At present the cropping pattern is almost the same for each nursery:

- o Apricot, almond and peach seeds were sown in November 1991.
- o Apricot, almond and peach seedlings were sown in November 1990 and budded in 1991.
- o Seedlings as above were sown in November 1990 and not budded in 1991.
- o Trees budded in 1990 are now being distributed.
- o Apple seedlings were sown in 1989 (Take two years to budding size).
- o Apple seedlings were transplanted and budded in 1991.
- o Russian olive seedlings, mulberry seedlings, ash seedlings were planted.

The production of fruit trees for distribution in November 1991 was 29,000, consisting of mainly apricot and almond plus 15,000 rooted grape cuttings and 5,000 rooted pomegranate cuttings. 14,000 Russian olive plants were also produced.

The projected production for distribution in November 1992 is 74,000 trees.

The proposed production of trees for distribution in November 1993 is 175,000 (25,000 x 7 nurseries). In March 1992 there remained some 346,000 unbudded seedlings.

## **2.5 Nursery Production Constraints**

A survey of the existing nurserymen showed that their budding rate did not exceed 400 per day and in some cases was much less; most of the budding takes place in September and October and spans 20-30 days.

At 400 per day, a budder has a potential of only 12,000 buds in a 30 day period. This can be a major limiting factor in tree production. The supply of budwood is the other major limiting factor. It is normal practice to hard-prune fruit trees to produce budwood. This

has not usually been done in Afghanistan. Taking this into consideration, it is necessary to limit nursery size to what can feasibly be done. A tentative target of 12-13,000 buds is set for each fruit type, apple, apricot, almond and peach. Not all of these are required in these quantities and a best estimate would be a total of 36,000 budded rootstocks for all types to produce 25,000+ saleable trees.

Trees in commercial nurseries are grown more intensively than the practice followed in the DAI nurseries. It is proposed to increase the tree density from 16,600 to 44,400 which, after making allowance for pathways, bunds, loss on germination and sub-standard trees, will increase the number of saleable trees from 10,000 to 25,000 per jerib.

The proposal to increase the existing orchards by five jeribs and two men is no longer valid because the numbers of seed have to be cut down to a feasible level.

None of the nurseries should exceed 10 jeribs, allowing for three growing sequences in three years. In any one year part of the three jeribs will be used for vegetables or a green manure.

## **2.6 Training**

None of the nurserymen have had any formal training in propagation techniques nor any professional experience in fruit tree nursery production.

It is recommended that the nurserymen should attend a practical training course of six days at the Food & Agricultural Organization (FAO) of the United Nations /Government of Pakistan Fruit Development Project, Agricultural Research Institute, Sariab Quetta.

The supervisors who are ultimately responsible for the nurseries have little or no experience of what a good nursery should look like and would benefit from an extension training course of six days: two days nursery, three days orchard and one day vegetable at the Fruit Development Project in Quetta.

## **2.7 Bubble Irrigation**

This is not a new concept and although it was well demonstrated at Darragh it is not likely to be widely adopted in Afghanistan. To be effective the precise placement of water usually requires precise knowledge of climatic and evapo-transpiration conditions. Bubble irrigation, at present, has limited value in Afghanistan.

## 2.8 Apricot Drying

This is a very ambitious and expensive project. It is not quite understood exactly what the extension workers do for the greater part of the year.

As far as the drying program is concerned, the coming apricot season in June will be critical in deciding the future direction of the program.

If the output of dried apricots is acceptable, the program may continue as envisaged, or the orchard extension work may be taken over by the area extension workers. If the existing organization does not produce a satisfactory output of dried apricots, more emphasis may have to be put on the overall role played by the area extension workers.

In looking to the long term development of the project a number of constraints will have to be dealt with. These are:

- o There is no standardization of apricot varieties.
- o No trees nor budwood of suitable varieties are available.
- o When a suitable variety is found it will take about seven years to produce any quantity of fruit.

Considering the investment at present, it would be reasonable to expect a considerable quantity of dried fruit and that some preparation be made for the marketing of it.

### **III. MAIN FINDINGS AND CONCLUSIONS**

#### **3.1 Nurseries in Pakistan**

Part of the original aim of these nurseries was to make available fruit trees and fruit tree propagating materials to rehabilitate orchards and nurseries in Afghanistan. As the role of the nurseries within Afghanistan increased so the role of the nurseries in Pakistan decreased and has now reached a stage where the nursery work in Pakistan can be discontinued.

Without the nurseries the maintenance of the demonstration orchards becomes uneconomic and with the limited training resources available and the infrequent use made of them, there is little to support continuing with this activity.

##### **3.1.1 Darragh Nursery/Demonstration Orchard**

This nursery has now been cleared of fruit tree propagating material and fruit trees for distribution in Afghanistan. Low chilling varieties of apple were in bloom when the nursery was being cleared and they were not lifted. The demand for budwood of these is limited. It can be obtained at research centers in Swat and Quetta.

The bubble irrigation equipment demonstrated the possibilities of this technique. The extent to which it can be adapted for use inside Afghanistan under present conditions is doubtful. The equipment has no great value and would cost more to lift than it is worth.

##### **3.1.2 Swat Nursery/Demonstration Orchard**

Like the nursery in Darragh, the role of the nursery in Swat has declined and can now be terminated and, as with Darragh, the maintenance of the demonstration orchard on its own becomes doubtful. The orchard has some features of interest to the project in recently introduced apple varieties and tree training techniques.

The Project Director of the Malakand Fruit and Vegetable Project (MFVP) has expressed an interest in taking over this orchard. This is a joint venture project of Pakistan and the Swiss Government and much of its work is relevant to the training needs of DAI.

It would be their intention to widen the scope of the demonstration orchard and they would be willing to make the facility available to DAI for training purposes.

The contract (Appendix II) between DAI and the 15 landlords expires March 31, 1992 at which time the landlords would become the owners of the trees.

An early decision and action could facilitate the transfer of the lease to MFVP.

### **3.2. Nurseries in Afghanistan**

It was originally intended that there would be nine nurseries inside Afghanistan. A good start was made with two nurseries in Logar, two nurseries in Wardak, two nurseries in Ghazni and one nursery in Maroof, Kandahar.

In Ghazni one nursery failed almost from the outset. It was closed in 1991 after it did not reach its expected target of trees and could not cover its expenses. The nursery in Paktika had a later start than the others and a small sowing of apricot and almond seed was made in November 1991. The proposed nursery at Parwan has not yet been established.

The original contracts (Appendix III) for these nurseries were signed in November 1989 and expire in March 1992. Because these were drawn up between Volunteers in Technical Assistance (VITA) and the farmers, it would be advisable to regularize the renewal of the leases as soon as possible and extend them to December 1992.

Approximately 29,000 fruit trees were produced for sale in the period from November 1991 to April 1992. These were produced in four nurseries, Logar, Wardak (two) and Maroof, giving an average of 7,000 trees each.

Seed sown in November 1990 and budded in October 1991 should produce a crop of 92,000 trees of which 70 percent (allowance for pathways, bunds etc) will be saleable quality.

Some 346,000 seedlings remained unbudded at the end of 1991 and of these 170,000 are apple which require two years growth before budding. The reason they were not budded was because there was not enough budwood or budders.

It is intended to graft them in March/April 1992. If there was not enough budwood in October 1991, it is unlikely there will be enough graft wood now because it takes about three times as much graft wood as it does budwood for the same number of seedling stocks.

If by chance graft wood is available, then the slowness of grafting will be a

considerable constraint in achieving any appreciable numbers of grafted trees. The alternative to grafting for spring propagation is chip budding but this technique is almost unknown to the DAI nursery men.

If some of these seedlings, including the apple seedlings, are to be planted at the recommended rate of 15cm between plants and 75cm between rows and another crop to be sown in November, then it is understandable why additional land and staff have been requested.

It is proposed, however, to rationalize the production by first recognizing the constraints. If one budder can put on 400 buds in one day and the effective budding season is 30 days, his potential is 12,000 buds. If he decides to produce apples, apricots and almonds, then to produce 12,000 of each he will need the help of two more budders each able to bud at 400 per day. He will also need to have sufficient budwood available. Under the prevailing conditions in Afghanistan budwood cannot be cold stored and even if kept in a damp cloth it would be doubtful if it would keep more than three or four days after cutting from the mother tree.

Allowing for the fact that all budders can not put on 400 buds per day and that to begin with the supply of budwood could be difficult to obtain, a reasonable target for the Afghan nurseries would be 36,000 budded rootstocks of whichever kinds of fruit trees are required. If the tree density is increased by sowing or transplanting at 7.5 cm between the seed and 60 cm between the rows (the commercial spacing in Swat and Quetta), less land is required.

A second part of the rationalization should be the standardization of the area of each nursery at 10 jeribs.

This will allow the present crops of budded stocks to be harvested and the budding of new seedlings (November 1991 sown) to be budded in 1992 and distributed in 1993. This nursery phase will end in 1993. The new intensive nursery phase can begin now with two jeribs of land being sown with a green manure crop in June to be ploughed in September ready for seed sowing in October 1992.

From the figures available the proposed production of fruit trees for distribution in 1993 is 175,000. The production of the nurseries in 1993 and 1994 based on bud stocks and rootstock seed sown shows a considerable potential increase in output and, if valued at Pak Rs 10 per tree, a rapid move towards break-even point.

1991 - 1992, 29,000 @Rs 10 = 290,000/4 nurseries = 72,500 per nursery.

1992 - 1993, 74,000 @Rs 10 = 740,000/6 nurseries = 123,333 per nursery.

1993 - 1994, 175,000 @Rs 10 = 1,750,000/7 nurseries = 250,000 per nursery.

When the income from the nurseries reaches the level of investment by DAI, the nurserymen will be encouraged to become independent.

### 3.3 Fruit Varieties

Only in apple does there seem to be a clear cut choice of variety. *Shin Kulu* sometimes referred to as *Golden Delicious*, is the main yellow variety. It is sweet with good keeping qualities, a good yielding variety but, prone to biennial bearing. Forms with a red blush make premium prices.

*Tor Kulu*, *Kala Kulu* and *Red Delicious* varieties show the typical *Red Delicious* dark red with streaks of darker red, five knobs at the calyx end and an elongated appearance. They are sweet, soft fleshed, keep well but are subject to biennial bearing. They bring more per kg in the bazaar than *Shin Kulu* but are not as heavy a cropper.

#### 3.3.1 Apricot

Apricots are almost entirely of seedling origin; some selection is underway to identify varieties for drying.

The local varieties *Saqi* or *Cherki* appear to be suitable for drying and should be evaluated in the coming season. A good desert variety is *Armiri*, a white apricot with a red blush. Most growers prefer apricots for drying which have sweet kernels which they sell as almonds.

#### 3.3.2 Almonds

There are a number of thin shelled almond varieties, such as *Satar Bai* and *Wahidi* but most are lumped together under the generic name of Kaghzi.

A limited number of introductions are available, such as *Carmal*, *Non Pareil* and *Jordanella*.

Extension staff should always be on the lookout for improved forms of fruit and nuts.

### **3.4 Apricot Drying Project**

This project has now approached its first major crop after one year of operation. There has been a considerable investment in the project, especially in staff payments. The specialist apricot advisors have cost almost Rs 1,000,000 in the first nine months and there is little or no evidence to show exactly what they have been doing.

Each extension officer was supplied with 100 kg of sulphur which means he has the capacity to dry 2.300 tons of fresh apricots which at a 5.1 reduction on drying would mean a potential yield from the project of 460 tons of dried apricots.

If the outcome of the project should prove disappointing in June, it may be time to consider using the existing extension staff to carry out the orchard extension work and even the sulphuring/drying extension.

If the outcome is encouraging, samples should be coming to DAI. High Value Horticulture (HVH) should then be alerted in order to carry out market testing. A training course is proposed to be held mid to late May for the apricot special extension staff. It may be possible to include some of the general extension staff on this course. When the date of the course is known, HVH should be advised so that they can have the consultant for fruit drying, possibly by May 15, 1992.

There should be a close scrutiny of the named apricots *Cherki* and *Saqui* to establish if it is worthwhile to propagate them.

The proposal to begin planting orchards did not happen as the trees earmarked for the project had been allocated elsewhere. These trees have mixed varieties in them and are not the most suitable. Trees from Quetta also included in the planting program are the wrong varieties.

A more realistic decision should be reached after the 1992 crop about which varieties, if any, should be propagated.

There would appear to be a need for some specialist pruning training for apricot orchard management.

### **3.5. Bubble Irrigation**

This system has been in existence for a number of years. It seems to fall between traditional basin irrigation and dip irrigation but has not been adopted on a worldwide scale in spite of its simplicity and low cost. If it is only used to fill basins round the tree, then it has no great advantage over furrow irrigation.

If it is intended to save water by accurate placement, it has a number of flaws. The water is placed only on one side of the tree. There is no measure of how much water the tree needs. Trees lose water by transpiration which is usually measured by evapotranspiration which is then interpreted as quantity of water to be supplied to the tree usually in liters per hour. No such measurements have been made with the pilot bubble irrigation, and it cannot be known whether the trees are getting the right amount, too little or too much. No further development should take place until the irrigation can be quantified.

### **3.6. Training program**

The main part of the training in fruit tree propagation and production had been completed before the arrival of the consultant. This consisted of 20 hours of lectures on the theory of propagation, followed by 16 hours of lectures on the more practical aspects of propagation and general tree production. Part of the Plant Protection course was concerned with pests and diseases of fruit trees. The consultant rounded off the training course with a talk and discussion about the work of the extension officer when meeting with the grower in the orchard. This was treated on a "where to look for what, why and what to do" basis, under the following headings:

- o The appearance of the whole tree/orchard.  
Vigorous - lacking in vigor - color - crop.
- o The soil as a source of problem.  
Physical state - pH - nutrient status as reflected by leaf shoot and fruit.  
Availability of water - quality of water - frequency or infrequency of irrigation;  
State of orchard floor - weeds as competitors for nutrients and water.
- o Trunk, main branch framework and shoots.  
Effect of training on shape of tree; effect of pruning on cropping; too hard pruning; too little pruning; fruit bud inducement; leaf and shoot disorders; temperature effects on dormancy; breaking dormancy; pollination and fertilization; reaching a decision about whether to spray or not; the need for honesty with the growers in "Don't know situations but will find out", the need for quality; film on marketing by HVH; nursery management, supervisors and nurserymen.
- o Constraints.  
Ability of budders - number per day;  
Availability of budwood;  
Trench layering of apple rootstocks;  
Intensive management systems;  
Use of fertilizers - animal manure - green manure; and  
Rotation - vegetables - green manure;

### **3.7 Fruit Tree Budding Survey**

A questionnaire was prepared to obtain information about the skills and experience of the nurserymen who were present at the training course. (Appendix VI). These men are responsible for the operation of the nurseries inside Afghanistan and should have a high level of professional ability.

Most have experience of budding apple, apricot and almond and also some peach. All have experience of T budding and none had experience of inverted I or chip budding. One had experience of flute budding. One can bud at a rate of 400 buds per day; the others between 200 to 300 per day. All have from three to five years experience of nursery work. The time of removing the tie varies from two to twenty weeks. Budding in September/October was favored by all. The appointed nurseryman for the proposed nursery at Parwan has no experience.

From the limited assessment it would appear that the nurserymen have the basic knowledge and skills. While this may be adequate for institutional operations, it is not adequate when managing at a commercial level.

They should be able to bud by three different methods at rates in excess of 400 buds per day and with a bud survival of 95%.

The nurserymen would benefit from an intensive course of training in propagation of fruit trees. However the nurserymen come under the supervisors who should also receive some extension training in what constitutes good nursery practice. This could be combined with practical orchard extension training.

### **3.8 Nursery Training Courses**

The curriculum of the training course is designed to increase the awareness and develop the skills of the participants in nursery management. The course will be carried out over six consecutive days.

#### **Topics:**

- Soils management. (1 hour lecture/practical). Structure - farmyard manure - fertilizers, seed bed preparation.
- Water management. (1 hour lecture/practical). Water - stress - water imbibition in seeds.

- Irrigation. Avoidance of wetness round collar of rootstocks or trees (cause of *phytophthora* collar rot).
- Rootstock. (10 hours lecture/practical). Seedling - rooted cuttings - stoolbeds - trench layering - grading of rootstocks.
- Scions. (10 hours lecture/practical). Buds (wood in, wood out) - T bud - inverted T buds - chip buds - grafts whip and tongue - selection of bud sticks and grafts.
- Pest control. (2 hours lecture/practical). Insect and disease control - operation and maintenance of sprayers.
- Tools and equipment. (2 hours lecture/practical). Budding knives - Grafting knives - tying tape.
- Lifting and grading/packing rootstocks. (2 hour lecture/practical). Care of roots - keeping damp.
- Time of budding. (2 hours lecture/practical). Spring - Summer - Autumn - cutting back rootstock - cutting tape - grafting.

Visit local nurseries. (1 day).

### **3.9 Fruit Production Training Course**

The curriculum of the training course is designed to increase the awareness and develop the skills of the extension staff in fruit production. The course will consist of eighteen lectures and six practical sessions to be carried out over six consecutive days.

Topics:

Temperate Fruits: Pome - stone - trees - bush - cane - runner - vine climatic limitations - dormancy - chilling requirements - species - varieties.

Soil: Structure - pH - acidity - alkalinity - major elements - minor elements - organic manures - fertilizers.

Water: Quality - chemical composition - salinity - water stress - irrigation methods.

Propagation: Rootstocks - cuttings - scions - buds - grafts - budding - grafting - equipment.

Planting: Lining out before planting - spacing planting techniques - pruning - training (for different fruits, apple, peach, apricot etc). calendar of events.

Planting Pathology: Identification of diseases (fungal and viral) - methods of control.

Entomology: Identification of major insect pests - methods of control.

Tools & Equipment: Awareness, use and maintenance of tools and equipment used in fruit production (particularly knapsack sprayers).

Harvesting: Stages of maturity and ripeness - handling of fruit - grading storing - packing - marketing.

Extension Methods: Demonstrations - illustrations - discussion groups - hands on training - recommendations to grower (fertilizer, insecticide, fungicides).

The training will be carried out at the Fruit Development Project at the Agricultural Research Institute, Sariab, Quetta. The Nursery Course could be June 27 to July 3 or July 4 to 10.

The Extension/Fruit Production course could be held May/June for stone fruits or August/September for Apples.

Training courses in fruit tree pruning are available and these could be used to train trainers. The supervisors could attend a winter course on pruning and then train the extension staff. In turn the extension staff would show the grower how to prune.

The contact person at the Fruit Development Project in Sariab is Dr. Hussain Ahmed, Chief Technical Advisor to the project. Telephone Quetta: (081) 43621.

Dr. Hussain Ahmed has agreed in principle to carry out any of the courses as required.

ACKU

ITINERARY/PERSONS METFebruary 1992

- 27 Depart Armagh
- 28 Arrive Islamabad. Brief, Don. Oelsligle
- 29 Islamabad briefing, Dr. Wakil

March 1992

- 1 Islamabad USAID, F. Smith  
DAI, R. Smith, Chief of Party  
Departure for Peshawar
- 2 Peshawar Training Course
- 3 Peshawar Training Course/Darragh Nursery
- 4 Peshawar Training Course/Durgai
- 5 Peshawar Briefing, Dr. Wakil, M. Naquibullah
- 6 Mingora/Malakand Fruit & Vegetable Project, I. Gibson, A. Portman
- 7 Madyan DAI Nursery, S. Yousufy Malam; MFVP Demonstration  
Orchard, Zarin Nursery, M. Zarin
- 8 Peshawar, Nurserymen/Workshop
- 9 Peshawar Seminar/Supervisors, Agri. Res. Inst. Tarnab, Dr. S. Kattak
- 10 Peshawar, Seminar/Supervisors, Apricot Drying
- 11 Islamabad, Discussion/Summary/Recommendations
- 12 Islamabad, F.A.O., A. Fitzherbert
- 13 Islamabad, Report Writing
- 14 " "
- 15 Report Writing, Dr. Wakil
- 16 Islamabad, USAID, G. Lewis
- 17 Islamabad, F.A.O., A. Fitzherbert
- 18 Islamabad, Report Writing
- 19 " "
- 20 Departure Islamabad

**MADYAN NURSERY CONTRACT****AGREEMENT**

This agreement is between Volunteers in Technical Assistance, hereinafter referred to as 'VITA' and Haji Fazal Mohammad of Matanai, hereinafter referred to as 'Haji Fazal Mohammad' about the lease of agricultural land.

Both parties agree as follows:

1. Haji Fazal will put 11 (eleven) jeribs of land at the disposal of VITA for planting orchards and nurseries.
2. Sufficient irrigation water will be made available from the two wells present on the property in order to irrigate the plants as and when they need water for optimum growth.
3. Haji Fazal will make available more land under the same terms to VITA as VITA may find the need for more acreage.
4. The termination of this agreement will be at the discretion of VITA. VITA will decide when to terminate this contract. However, VITA will notify Haji Fazal of its intention to terminate as early as possible so Haji Fazal can make necessary preparations for taking possession and putting in a crop. VITA has no intention of keeping this land for any commercial purposes or longer than is necessary for the study purposes of the performance of the new fruit varieties introduced.
5. This land is located about 45 kms southwest of Peshawar near Matanai.
6. The trees planted will be the property of Haji Fazal and will be turned over to him whenever VITA decides to do so. However, the nursery stock that may be grown in the land will be the property of VITA and will be dug up and used as deemed fit by VITA.
7. VITA will pay 850 kg. wheat or equivalent in cash per jerib/year as rent on land. This payment will be made in the month of November of each year.

VITA

\_\_\_\_\_  
by: Chief of Party  
John E. Soden

Date Feb. 15, 1989

\_\_\_\_\_  
Haji Fazal Rahman

Date \_\_\_\_\_

\_\_\_\_\_  
Witness

Date \_\_\_\_\_

ACKU

AGREEMENT

This agreement is made in Swat this 1st day of April 1990, between DAI and the undermentioned landlords:

1. Ashbar Mian
2. Shamsuddin
3. Mian Said Alishah
4. Akram Khan
5. Shajan
6. Mohd Yousuf
7. Mian Badarshah
8. Roydad Mian
9. Said Jalal Mian
10. Amir Mian
11. Haji Neshan
12. Ali Jan
13. Shamroz Khan
14. Abid Shah
15. Jahanzib

Both parties have agreed to the following terms and conditions:

1. This agreement between DAI and the aforementioned landlords commences 1st April 1990 and expires 31st March 1992. The contract may be extended beyond this if DAI's contract with USAID is extended.
2. Water rights for the land during the period of this agreement will be in accordance with the quota fixed by the land revenue office for each individual's land and said water will be made available in full.
3. The aforementioned landlords will be the owner of such permanent orchard trees as may be planted in the fields after the expiry of the agreement.
4. DAI will be the owner of the nursery plants and any other temporary crops planted in the land.
5. Upon the termination of this agreement, DAI will remove any crops or nursery plants other than the permanent orchard trees before the end of February of that year.
6. Both parties agree to conform to the terms and conditions of this agreement in full.

## APPENDIX II

7. The annual payment fixed as land rent for each landlord according to the measurement of the land will be as follows:

S. No	Name of owner of Land	No. of plots	No. of paw	Rent/paw in Kg Wheat	Total Rent in kgs Wheat	Price wheat/kg Rs. Paiza	Total Rent per year in Rs	Remarks
1	Ashbar Mian	11	2	750	1500	4	6000	
2	Shamsuddin	2	2	750	1500	4	6000	
3	Mian Said Ali Shah	2	1	750	750	4	3000	
4	Akram Khan	12	5	750	3750	4	15000	
5	Shajan	22	5	750	3750	4	15000	
6	Mian Bader Shah	5	2	750	1500	4	6000	
7	Mohammad Yousuf	2	2	750	1500	4	6000	
8	Roydad Khan	8	2	750	1500	4	6000	
9	Said Jalal Mian	4	4	750	3000	4	12000	
10	Amir Mian	1	0.4	750	300	4	1200	
11	Haji Neshan		2.5	750	1875	4	7500	
12	Ali Jan		2.5	750	1875	4	7500	
13	Shamroz Khan		1.5	750	1125	4	4500	
14	Abid Shah		2	750	1500	4	6000	
15	Jahanzib	1	0.57	750	562,5	4	2250	
	Total						103950	

Notes : 00 Marla is equal to 1 Jerib

8. As this land carries crops of wheat and clover DAI agrees to pay compensation for these crops as under and turn the crop in. This is one time payment only.
9. DAI agrees to provide the above mentioned fixed payment to every land lord in the month of November for each contracted year.

SIGNATURES OF LANDLORDS:

Signed:

1. Ashbar Mian
2. Shamsuddin
3. Mian Said Alishah
4. Akram Khan
5. Shajan
6. Mohd Yousuf
7. Mian Badarshah
8. Roydad Mian
9. Said Jalal Mian
10. Amir Mian
11. Haji Neshan
12. Ali Jan
13. Shamroz Khan
14. Abid Shah
15. Jahanzib

John Soden for DAI

Date: April 1, 1990

Date: \_\_\_\_\_

**AFGHANISTAN NURSERY AGREEMENT EXTENSION**

Development Alternatives Inc.(DAI), a USAID contractor, assumed responsibility for certain nurseries in Afghanistan from VITA. The agreements for these nurseries expire March, 1992 and DAI wishes to exercise its right to extend the agreements. The following terms and conditions are agreed upon:

1. The farmer/nurseryman is a contractor of DAI with a maximum payment of 1500 Rs./month.
2. A number of co-workers will be employed by this contractor with a maximum salary of 1000 Rs./month. DAI must approve these positions.
3. Seed, simple agricultural tools such as shovels, cultivators, spraying equipment and pruning equipment have been and will be made available when necessary to the nurserymen.
4. The current land included in the nursery cannot be expanded.
5. The owner of the land must provide irrigation water for the nursery.
6. The owner of the land cannot apply his own plan for the land or claim ownership until the program expires.
7. The extension of this agreement is from April 1, 1992 to December 31, 1992, with a possible extension to September, 1993.
8. This agreement can be extended by DAI. If DAI intends to extend the contract, the land owner cannot deny an extension and the accepted condition of the contract remains unchanged. DAI will notify the land owner of its decision prior to the expiration of the contract.
9. The payment of the land rent is fixed and is 80 seers of wheat per jerib per year and the amount is to be paid during the month of October for the current year.
10. The size of area, number and quality of seedlings grown in the nursery are listed and prepared by DAI.
11. The cost of seedlings taken from the nursery should be estimated according to their current value as income for the nursery. These seedlings are the property of DAI. Although money may not be charged while distributing the seedlings, their cost is estimated according to the seedling costs common in the area and recorded and

estimated according to the seedling costs common in the area and recorded and accounted as income for the nursery.

12. The agreement is terminated when the total income of the nursery exceeds the sum of salary and other expenses paid by DAI. If the income of the nursery has not covered the expenses, the nurseryman should continue working until the conditions are met or until the contract is terminated in writing by DAI.
13. Periodically, DAI staff will check and evaluate the nursery's performance. If it does not show significant progress and it is determined that it will not be possible for the nursery's income to cover the expenses, the nursery activity will be terminated and the employees dismissed.

Nursery and Location: \_\_\_\_\_

HEAD NURSERYMAN: \_\_\_\_\_

DATE: \_\_\_\_\_

NURSERY OWNER(S): \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

DATE: \_\_\_\_\_

DEVELOPMENT ALTERNATIVES: \_\_\_\_\_

DATE:

This is an agreement between Development Alternatives Inc. located at 4 A/C Park Avenue, University Town, Peshawar, Pakistan and \_\_\_\_\_, located at \_\_\_\_\_

hereinafter referred to as DAI and \_\_\_\_\_

The objective of this agreement is to develop and promote the export of dried apricots from Afghanistan. DAI hopes within the two cropping seasons covered by this contract (Summer 1991 through Winter, 1992) that a suitable market is found for dried Afghan apricots; DAI support for this activity is limited to the two cropping seasons included in this agreement. To achieve this objective, DAI and \_\_\_\_\_

agree as follows:

- A. Development Alternatives, Inc.
- DAI will provide in-service training for upto \_\_\_\_\_ candidates introduced by \_\_\_\_\_ Training will focus on handling, processing, drying and packaging of apricots. Marketing techniques and better growing culture for apricots will also be introduced. Out of the \_\_\_\_\_ candidates to be introduced, an estimate \_\_\_\_\_ will be retained who successfully pass the initial interview and training.

این یک موافقت نامه است بین موسسه DAI ای سی پارک اویونی، یونیورسٹی ٹاؤن، پشاور پاکستان .

و ( ) ( ) ( )

هدف این موافقت نامه عبارت است از انکشاف صادرات میوه خشک در افغانستان. DAI امید و آراست که در ظرف مدت دو موسم تولیدی ( تابستان ۱۹۹۱ و زمستان ۱۹۹۲ ) که شامل این قرارداد میباشد. یک مارکیت مناسبی برای زرآلوی خشک افغانستان دستیاب شود پشتیبانی موسسه DAI منحصر به دو موسم تولیدی که شامل این قرارداد است میباشد به منظور رسیدن به این هدف DAI ( ) قرار ذیل موافقت دارند.

الف : DAI

۱ - DAI تا حد اکثر ( ) کاندید را که از طرف ( ) معرفی گردد تربیه خواهد کرد. این پروگرام تربیوی جمع آوری، پروسس خشک کردن و بسته بندی زردالو خواهد بود. تخنیک عرضه به مارکیت و طریق بهتر تولید این میوه هم در این پروگرام شامل میباشد. هرگاه در جمع اشخاص معرفی شده در موقع شمول در کورس و یا در جریان کورس ثابت گردد که یک تعداد آن لیاقت و استعداد انجام وظیفه مدنظر راندارند از استخدام این اشخاص معذرت خواسته میشود و آنها مسترد خواهند گرید.

2. The candidates, once chosen, will work in the same manner as agricultural extension agents with farmers, training them to be able to grow apricots efficiently and dry them according to international standards. After the initial stages, candidates may act as commission agents for the exporters in procuring and gathering dried apricots. Their selection therefore should be based on their capability to perform these activities. This also requires that they come from apricot growing areas and be living in these districts.

3. DAI will reimburse as detailed below the expenses related to the implementation of this program during the first year, and 50% of such expenses in the second cropping year season. These expenses include suitable wages to the candidates, cost of material and equipment required, per diem and travel of the candidates. One motorcycle will be made available to each successful candidate for mobility in his area of work. Transportation costs of travel to Pakistan and reasonable cost of transport of equipment within Afghanistan will also be reimbursed.

۲ - بعد از تکمیل کورس موقعیکه این اشخاص برای استخدام انتخاب شدند و وظیفه شان مشابه به وظیفه یک مامور ترویج زراعت خواهد بود. یعنی با زارعین منطقه در تماس بوده به آنها طریق بهتر تولید و تربیه زردآلو و تر تیب خشک کردن آنرا به سنتدرد بین المللی می آموزانند. بعد از مراحل ابتدایی این کاندید ها بحیث کمیشن کار برای صادر کننده کان میوه خشک در خریداری و جمع آوری زردآلوی خشک هم کاری خواهند کرد. بنا براین انتخاب این اشخاص باید به اساس استعداد شان برای انجام چنین وظیفه صورت گیرد، در عین زمان مهم است که این اشخاص در مناطقی زندگی داشته باشند که در آن تولیدات زردآلو وجود دارد.

۳ - DAI - مصارف مربوط به تطبیق این پروگرام را که ذیلا شرح گردیده، در سال اول بصورت کامل و در فصل دوم به اندازه ۵۰٪ فیصد خواهد پرداخت. این مصارف شامل اجوره مناسب برای مستخدمین، مصارف مواد و لوازم مورد ضرورت خواهد بود. هم چنین مصارف سفریه این مستخدمین پرداخته میشود. یک عراده موتر سائیکل بدسترس هر یک از مستخدمین برای منظور رسیده گی به وظیفه، در ساحه مسؤلیت او گذاشته خواهد شد. مصارف سفر به پاکستان و مصارف معقول حمل و نقل سامان در داخل افغانستان هم پرداخته میشود.

4. It is agreed that Rs. 54000 per candidate per year will be paid to \_\_\_\_\_ to cover wages and Rs. 24000 for operation and maintenance of each assigned motorcycle. This amount will be paid in quarterly installments during the year to \_\_\_\_\_, who will be required to submit proper receipts from each candidate confirming salary payments. Proper receipts confirming operating costs may be required of each motorcycle.

۱ - موافقت شده است که سالانه مبلغ (۵۴۰۰۰) کددار به منظور تادیات بهتر مستخدم (کاندید) در مقابل حق الزحمه و (۲۴۰۰۰) کددار به منظور فعالیت و حفظ و مراقبت موتور سائیکل ها پرداخته میشود این مبلغ به چهار قسط در جریان سال به ( ) که اسناد مربوط را پس از امضا هر کاندید گرفته پرداخته خواهد شد. از ( ) تقاضا میشود که رسید اصولی و مستند مصارف فعالیت موتور سائیکل را ارائه نماید.

5. DAI will monitor candidates activities inside Afghanistan through its resident staff or visiting monitors. DAI will report to \_\_\_\_\_ any undesirable behavior or poor performance by candidates. A repeat of unsatisfactory performance by the same candidate will not be tolerated; \_\_\_\_\_ will be asked to be dismiss the candidate and DAI will cease payments for such candidate's stipend.

۵ - DAI حق خواهد داشت که فعالیت مستخدمین را در داخل افغانستان توسط مامورین ساحوی و یا مفتشین مرکزی خود مراقبت نماید DAI حرکات غیر مناسب و یا اجراء ناکافی کاندید ها را به ( ) راپور خواهد داد. اگر اجراء غیر تسلی بخش از طرف کاندید تکرار شد. چنین عمل قابل تحمل نبوده در آنصورت DAI پرداخت معاش آنرا متوقف و کاندید مذکور برطرف خواهد کردید.

6. During the term of this agreement \_\_\_\_\_ will have custody of the motorcycles assigned to its candidates. \_\_\_\_\_ will make sure that the motorcycles are used properly and for the purpose they are assigned. In the event any motorcycles are found to be missing \_\_\_\_\_ agrees to replace the motorcycles or pay the full replacement cost.

Motorcycles must be returned to DAI in the same condition as they were received except for normal wear and tear.

7. The trainees will bring samples of the dried apricots to Pakistan, and DAI will arrange to send these samples to potential markets. Expenses involved in shipping the samples, travel and market development will be paid by DAI in both cropping seasons.

۶- در موعده اعتبار این موافقت نامه ( ) مسؤلیت محافظت و مراقبت موتور سائیکل هایراکه به کاندید ها داده شده به عهده خواهد داشت. ( ) متوجه خواهد بود که موتور سائیکل ها به نحو درست و برای هدفیکه داده شده است استعمال گردد. در صورت مفقودی موتور سائیکل ( ) موافقت دارد که عوض موتور سائیکل مفقود شده، موتور سائیکل مشابه و یا قیمت کامل آن را بپردازد.

۷- مستخدمین این پروگرام نمونه های زردآلوی خشک زارعین همکار خود را به پاکستان خواهند آورد، DAI به نوبه خود این نمونه ها را به مارکیت های بالقوه دنیا خواهد فرستاد. مصارف تهیه و انتقال این نمونه ها به بازار های دنیا از طرف DAI پرداخته میشود. این مصارف که شامل فرستادن این نمونه به بازار های مناسب، مصارف سفر، انکشاف و دستیابی مارکیت از طرف DAI پرداخته میشود.

## PART B. \_\_\_\_\_ (Second party)

قسمت ب - ( ) (پارتی دوم)

1. \_\_\_\_\_ will introduce up to (7) candidates to be trained by DAI in Pakistan. Training will take place in Peshawar and Quetta. From this number, it is estimated that (5) will fulfill necessary criteria to continue with the program, and (2) will be dropped.

۱ - ( ) به تعداد (۷) نفر را به موافقه DAI انتخاب و به DAI معرفی مینماید که تحت تربیه گرفته شوند، تربیه این چنین اشخاص در پشاور و کوئته پاکستان صورت می گیرد. از جمله این اشخاص غالباً (۵) نفر آن شرایط استخدام را پوره کرده خواهند توانست و تعداد متباقی آن (۲) در اخیر پروگرام تربیوی مسترد خواهند شد.

2. Trainees are preferred who come from the apricot growing areas and they must know the locality very well.

۲- ترجیح به کاندید های داده میشود که از مناطق تولید کننده زردآلو باشند و به ساحه که در آن کار خواهند کرد آشنائی کامل داشته باشند.

3. Trainees should have sufficient basic education to grasp the content of the training and be able to demonstrate good extension leadership. They should be able to work with and train farmers and apply their skills in efficient production of apricots.

۳ - کاندید ها باید بقدر کافی تعلیم اساسی داشته باشند که مواد پروگرام تربیوی را بدرستی اخذ و یاد گرفته بتوانند هم چنین شخصیتی داشته باشد که دارای اوصاف رهبری در ترویج زراعت باشد. آنها باید لیاقت همکاری با زارعین را داشته باشند و از معلومات خود در تولید هر چه بیشتر زردآلو استفاده کرده بتوانند.

4. Candidates should be available as necessary to attend any meetings, or in-service training, in Afghanistan or Pakistan as reasonable times and places that suit the program requirements for DAI.

۴ - کاندید ها در موقع ضرورت برای سهم گیری در پروگرام های تربیوی و مجالس چه در افغانستان و چه در پاکستان در مواقع و محل مناسب دائر میشود حاضر کردند که این متوافق به موازین پروگرام DAI میباشد.

5. The above items and conditions are understood and agreed.

۵ - شرایط مذکور کاملاً فهمیده شده و به آن جانبین موافقت دارند.

For: Development Alternatives,  
Inc.

( ) به نماینده گی از DAI  
تاریخ

\_\_\_\_\_

( ) به نماینده گی از  
تاریخ

Date: \_\_\_\_\_

For: \_\_\_\_\_

Date: \_\_\_\_\_

**APRICOT PROJECT CONTRACT**

Translated from Persian into English.

To: The Area Development Officer of Logar Province

To secure self-sufficiency in the quantity of fruit seedlings needed for future planning, we must establish nurseries throughout the country. To achieve this goal, qualified farmers are invited to establish two nurseries in their respective provinces. The procedures and conditions for establishing such nurseries are as follows.

1. Farmers interested in establishing a nursery should have previous experience in establishing nurseries and training fruit seedlings. The chance for inexperienced farmers will be given only if there are no experienced farmers in the specified area.
2. The selected farmer is hired as an employee of the ARS office with a maximum salary of Rs. 1,500 per month.
3. Two other co-workers are hired by this farmer with a maximum salary of Rs. 1000 per month.
4. Seed, simple agricultural tools such as shovels, cultivators, pesticides, chemicals, sprayers and pruning equipment should be made available to them.
5. In the first year ten jerib of land should be tenured for nursery land and a contract signed with the owners. The requirements for the contract are.
  - a. The owner of the land must provide irrigation water for the nursery.
  - b. The owner of the land cannot apply his own plan on the land or claim ownership until the program expires. The land is the sole property of the district office until the end of contract.
  - c. The contract is valid from first of Akrah, 1368 to Hamal 15, 1371 (Nov 1989-March 1992).
  - d. This contract can be renewed and extended by the approval of an ARS officer. If the ARS officer intends to extend the contract, the land owner has

- no right to deny and the accepted condition of the contract will remain unchanged. The ARS office will notify the land owner of its decision regarding the renewal and extension of the contract one month before the expiration date.
- e. The owner will receive his land in its original condition at the end of the contract period.
  - f. The payment for land tenure is fixed and is 80 seers of wheat per jerib per year and the amount is to be paid in the first day of sunbula each year.
  - g. Size of area, number and quality of seedlings grown in the nursery are listed and prepared by the Rural Development Division which should be applied and followed. Accordingly these details are sent in the beginning of the working plan. Further directions will be discussed in detail in the winter training program arranged in Peshawar.
6. The cost of seedlings taken from a nursery should be estimated according to their current value as an income of the nursery. These seedlings will be the property of the rehabilitation office. Although no money is charged while submitting the seedlings their cost is estimated according to the seedling costs common in the area, and recorded and accounted as income of the nursery.
  7. The income of the nursery exceeds the salary and expenses paid to farmer. When a farmer finds it more profitable to operate independently of the rehabilitation office, he can resign from ARS and do so, if the expenses made on the nursery can be compensated by the total income of the nursery. If the income of the nursery has not yet met its expenses, he should keep on working in the nursery until the nursery income compensates the expenses of the rehabilitation office.
  8. Periodically central and district expert officers will check and evaluate the nursery's performance. If it does not show any significant progress and its output is less than the input, the nursery activity in that area will be terminated and employees of the nursery will be dismissed in proper time. If you can find two persons who can meet the above conditions, you can hire them before time is wasted and also arrange for land and other necessities.

The persons have to comply with the following program.

- o Ten jeribs of the mentioned land should be irrigated, plowed and made ready for planting as soon as possible. The person using his oxen for this purpose

- o Eight seers of bitter apricot stones should be acquired and planted in four jeribs of land before frosting period. These stones are to be planted by hand in the rows. The distance between rows should be 80 cm and the distance between the seed within the row should be 1.5 cm. The seed are placed 2 cm deep in the hills with their tips pointing downward.
- o In addition, two seers of bitter almond stones should be acquired and planted in one jerib of land as pointed out for bitter apricot above.
- o One seer of apple seeds should be purchased and planted in 600 m<sup>2</sup> of land. Apple seed is also planted 7.5 cm deep in rows with the distance of 1.5 cm apart from each other. Even though the right spacing of seeds by hand is difficult and time consuming, it is necessary. In practice, specified distances may vary frequently.
- o The remaining land will be planted in spring with guidelines furnished during the winter training course. The land must be prepared and planted before it gets too cold for tillage operations. If action is not taken promptly, a whole year will be lost.

**FRUIT TREE NURSERY WORK CALENDAR**

<u>Activity</u>	<u>Dates to be Performed</u>	<u>Year(s)</u>
Seed sowing	Nov 15 - Nov 30	1992/93
Seedling transplant	Feb 15 - Mar 31	1992/93/94
Apple rootstock transplant	Feb 15 - Mar 31	1992/93/94
Plant apple layer	Feb 15 - Mar 31	1993/94
Earth up layers	As Required	1993/94
Dig up layers	Feb 1 - Mar 31	1994
Budding (T)	Aug 15 - Oct 31	1992/93/94
Budding (chip) 1	Aug 15 - Nov 15	1992/93/94
Budding (chip) 2	Mar 1 - Mar 31	1993/94
Remove tape	5-10 weeks after budding	1992/93/94
Cut back stocks (T & chip (1))	Feb 1 - Mar 15	1993/94
Cut back stocks chip (2)	Apr 21 - Apr 30	1993/94
Lift trees	Nov 15 - Dec 15 Feb 15 - Mar 15	1992/93/94 1993/94
Prune budwood trees	Jan 15 - Feb 15	1992/93/94
Fertilizer	As required	1992/93/94

APPENDIX V

Pesticides	As required	1992/93/94
Irrigation	As required	1992/93/94
Weeding	As required	1992/93/94
Green manure	June 21 - Sep 15	1992/93/94

Dates will require adjusting according to provinces and climate.

ACKU

FRUIT TREE BUDDING

Can you bud the following rootstock?

Apple  
Apricot  
Peach  
Almond

Which method of budding can you do?

T  
inverted T  
chip bud

How many rootstocks can you bud in one hour?

10, 20, 30, 40, 50, 80, 100

How many buds can you insert in one day?

200, 300, 400

Do you have a budding knife? yes/no

Have you ever budded in a commercial nursery? yes/no

For how many years have you budded fruit trees?

1, 2, 3, 5, 8, 10 or more than 10

How many buds can you tie in one hour?

50, 80, 100

How many buds can you tie in one day?

300, 400, 500

How long do you leave the tie before cutting it?

1, 3, 5, 7, 8, 12 weeks

What time of the year do you bud?

March/April, June, September/October

## NURSERY MANAGEMENT GUIDELINES

(quoted from Ulster Gazette)

### Site

The site for the nursery should be as level as possible and have good quality agricultural soil. Soils with a high proportion of gravel or sand should be avoided. The recent history of crops at the site should be known in order to avoid growing fruit trees after fruit trees as this can lead to very poor growth in the second crop of trees. Avoid cities which are liable to flooding. The nursery should be secure from wandering goats and sheep and it may be necessary to employ a chowkidar to guard what will become a valuable crop.

### Soil

In tree nursery operations it is essential to maintain continuous growth if seedling rootstocks are to grow large enough to be budded ten months after sowing the seeds. Most sites where it is proposed to grow nursery trees can be improved by digging in animal manure at a rate of up to 5 tons per jerib. The manure should be well rotted and be dug in one month before sowing. Where animal manure is not available a green manure such as clover or alfalfa can be used. This can be sown in June, cut once, fertilizer applied and dug in October.

It is always difficult to make recommendations for the application of artificial fertilizers without an analysis of the soil however as general rule a pre-sowing application of Sulphate of Potash, 50 kg per jerib and a phosphate fertilizer such as SSP, 50 kg per jerib will help to maintain the fertility of the soil. Nitrogen in the form of Urea or Sulphate of Ammonia is best applied as a side dressing to the rows of seedlings or budded rootstocks in March/April. A second application may be necessary in late July/August depending on growth and local growing conditions.

The aim should be steady continuous growth. The rows of seedlings or trees should be regularly walked to ensure that the nurseryman is aware of the growth or lack of growth.

The acidity or alkalinity of soils is measured by pH with a pH of 7 being neutral. A pH of between 6.5 and 7 is best for fruit trees whether in the nursery or the orchard. Many of the soils in Afghanistan are alkaline with Ph's between 7 and 8 and this can be seen in the nursery when the top leaves of young apple trees turn yellow almost white. If this is likely to be a problem then Iron Sulphate should be incorporated in a 10 cm band on either side of the row. Should this not have been done then Iron Sequestrene can be applied either side of the row when the symptoms appear.

Weeds should not be allowed to grow in the nursery as they will only do so at the expense of the nursery trees with which they will compete for the available water and nutrients. They should be kept under control by hoeing or spraying with a weed killer.

### Water

A supply of clean water is essential for good nursery tree production. Water with a high level of salts can produce toxic problems and reduce growth.

Irrigation should be carried out regularly, not erratically. During hot dry weather it may be necessary to make supplementary applications.

It is good management practice to irrigate before sowing seed, before transplanting seedlings and before budding. These particular applications should be made at a time to leave the soil damp but the surface dry enough for walking and working on.

**PLANT DENSITY**

1 hectare	=	10000 sq m
1/5 hectare	=	1 jerib = 2000 sq m

When planning the rates of sowing seed or planting rootstocks in a nursery, allowances have to be made for pathways, irrigation bunds and headlands and these can reduce the available planting area by approximately one fifth. Thus 2000 less 1/5 or 400 equals 1600 sq m available for planting.

At 7.5 cm between plants and 60 cm between rows the density of plants will be 1600 sq m divided by 7.5 x 60 sq cm = approximately 36,000 plants per jerib.

The seed of stone fruits, apricots, peach and almond can be sown directly at this density the sowing taking place from the middle to the end of November. The seed should be soaked for twenty four hours before sowing and then sown into land which had been previously irrigated. The seedlings should be ready for budding September/October of the following year. When the seedlings are 20 cm high they should be undercut with a sharp spade to cut the tap root. This produces a better root system and makes subsequent lifting much easier.

Apples are budded on either seedling or vegetatively produced (clonal) rootstocks.

**Seedling rootstocks**

Apple seedling rootstocks take about two years to produce rootstocks fit for budding from seed. The most usual practice is to sow the seed in fairly dense rows in a nursery bed, grow them for one year then transplant them in rows in the nursery for budding.

Apples grown on seedling stocks are usually vigorous and slow to come into crop.

**Clonal rootstocks**

These are produced either in stoolbeds or by layering in trenches. Trench layering has been shown to be an effective method of producing clonal rootstocks in Quetta with soil and climatic conditions similar to those found in Afghanistan.

Figure 1.

- Dig a trench 30 - 40 cms wide and 10 cms deep.
- Plant well rooted 1 year old rootstocks, 45 - 60 cms long of improved rootstocks such as MM 106 at an angle of less 20 degrees so that they lie along the center of the trench.
- Plant well rooted 1 year old rootstocks, 45 - 60 cms long of improved rootstocks such as MM 106 at an angle of less 20 degrees so that they lie along the centre of the trench.

Figure 2.

- Peg the stems of the rootstock down so that they make contact with the bottom of the trench.
- Cover the stems with 2 cms of soil (rooting will be improved if the soil removed is mixed 50:50 with well rotted animal manure).

Figure 3.

- Earth up the shoots at intervals as they grow keeping the top 8 cms clear.
- Cease earthing up when the ridge reaches 25 cms.

Figure 4.

- In the February/March of the year after planting remove the soil and cut the rooted shoots at the old stem. Do not allow the roots to dry out.
- Transplant good quality rootstocks for new trench layer production.
- Transplant the layer for budding.
- Discard the old layer bed.

Fig. 1.

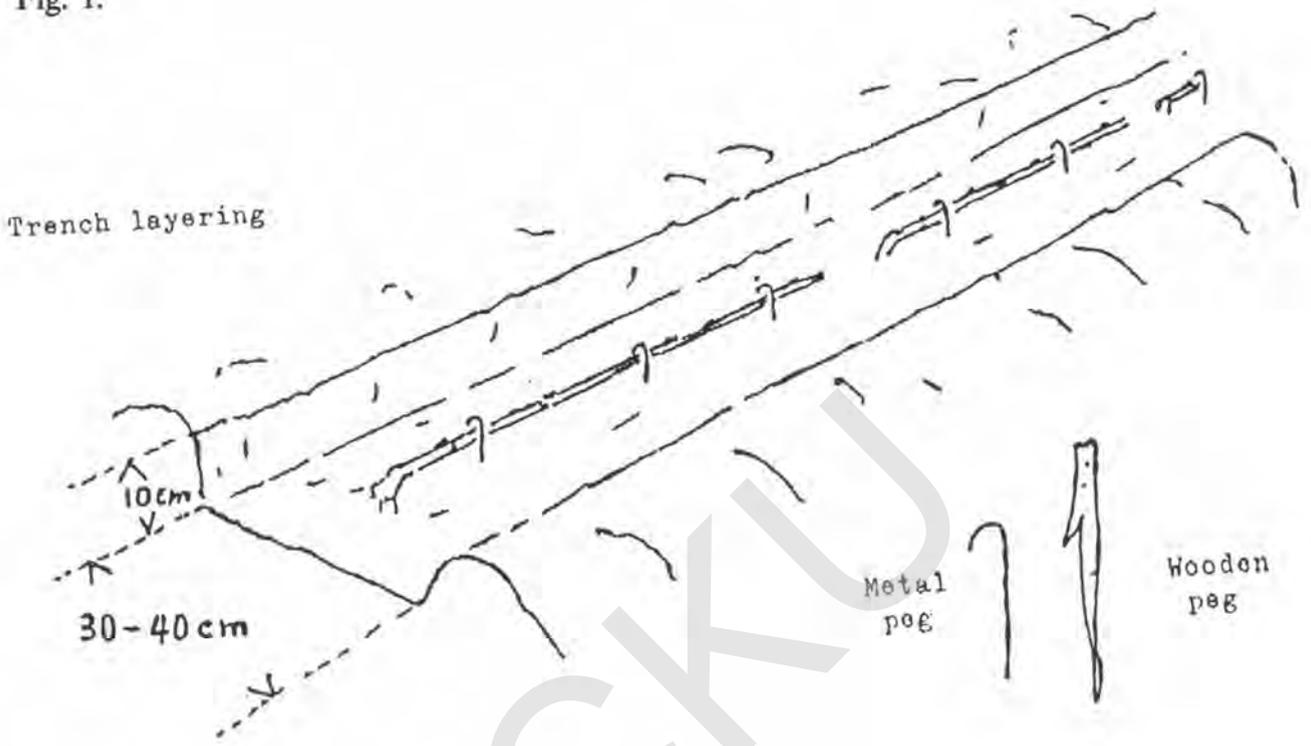


Fig. 2.

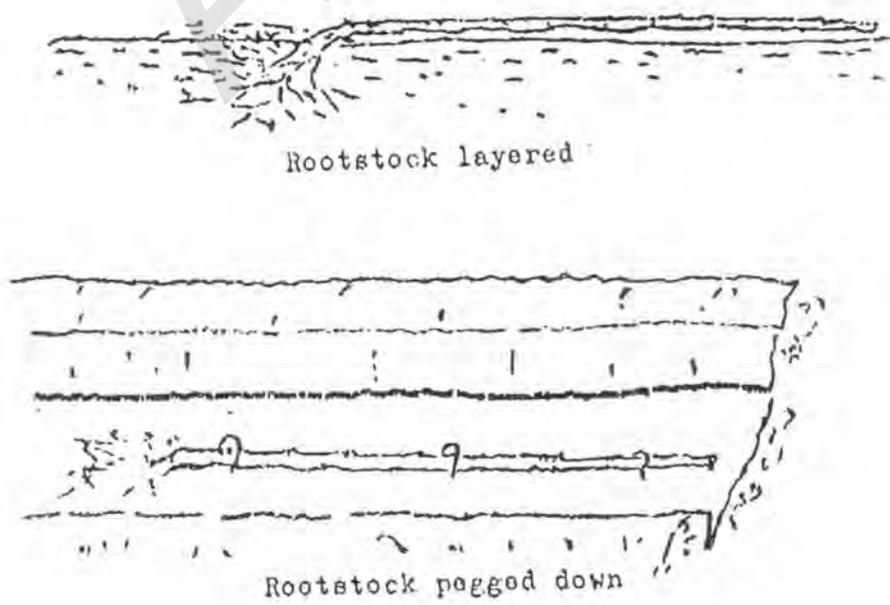


Fig 3.

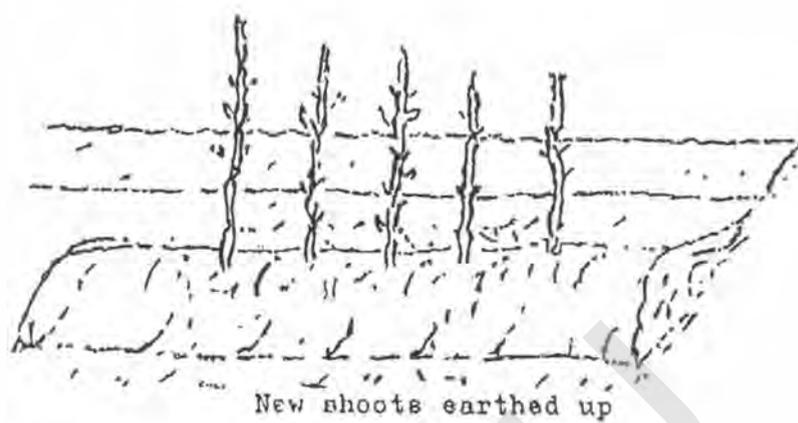
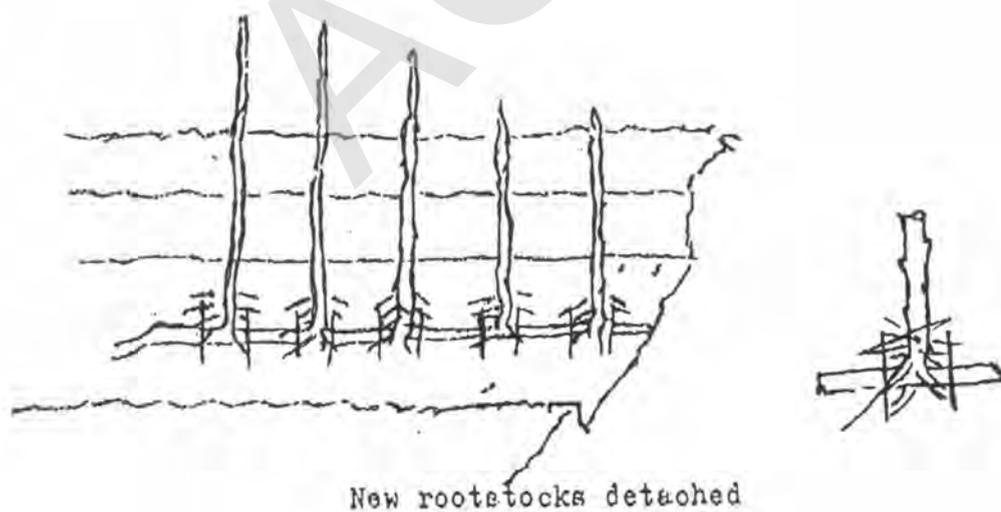


Fig 4.



## BUDWOOD

The availability of competent budders and sufficient budwood can affect the output of trees from a nursery. A one jerib nursery would require 36,000 buds. The effective budding period (September/October) is approximately one month. One budder budding at a rate of 400 buds per day would take 90 days working full time to bud 36,000 rootstocks. The number of budders must be increased if the work is to be completed in the available time of 30 days.

Traditionally budwood is obtained from fruiting orchard trees, but trees which are producing fruit do not always produce budwood especially if they have not been pruned. Budwood should only be taken from trees with a good record of fruit yield, color etc., and of known and acceptable varieties.

Nurserymen should always be on the lookout for improved types of fruits especially apricots for drying.

To ensure a supply of budwood prune existing trees fairly hard in January/February to encourage new growth. See Figure 5.

Plant trees to be grown specifically for budwood production in or near the nursery.

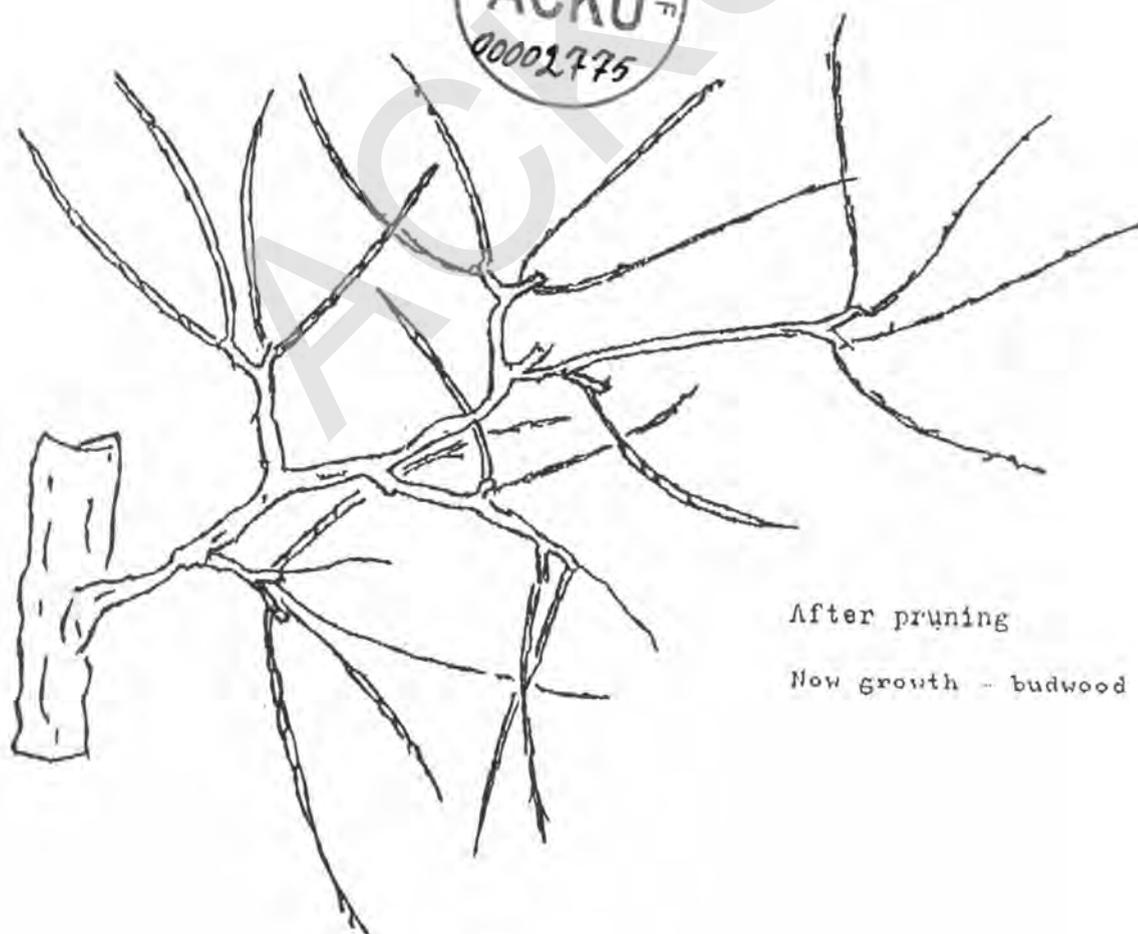
Buds are regarded as ready for budding when the petiole or leaf stalk can be snapped off cleanly from below the bud. If it tears the bud, the bud is not ready for budding. This often happens with immature buds at the top of the budstick.

Keep budsticks cool and damp. Do not allow them to dry out.

Fig. 5.



Before pruning



After pruning

New growth - budwood

**BUDDING**

Most nurserymen use the T bud method either with the T with the cross cut at the top or the inverted T with the cross cut at the bottom. See Figure 6. T budding requires that the sap is flowing in the rootstock. This can limit the period during which budding can take place.

Chip budding (Fig.7) does not depend on the flow of sap and can be used before the sap starts flowing in the spring, during spring, summer and autumn budding and also for a short time after the sap ceases to flow in the autumn.

Fig.6

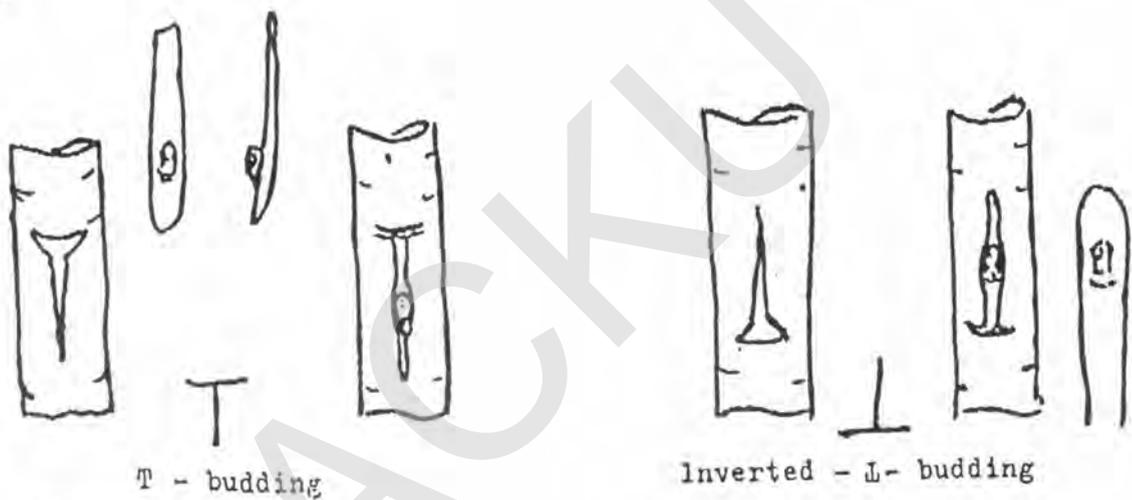
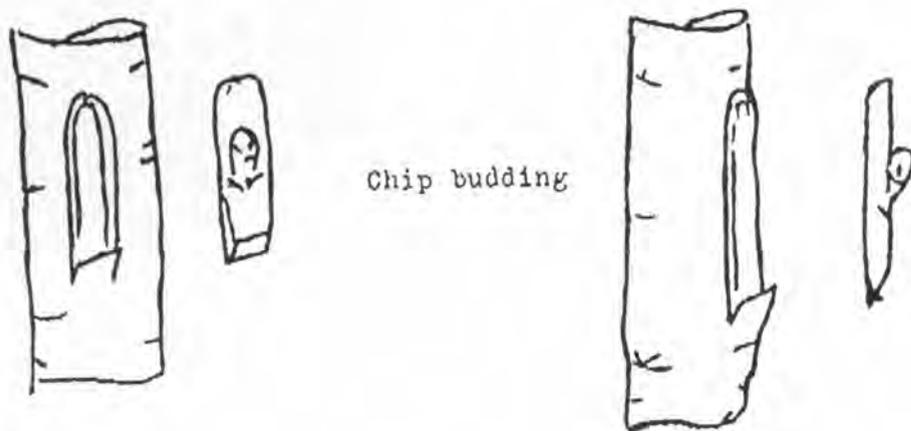


Fig 7.



ACKU