

## **1. Introduction**

The peach demonstration orchards are the first of a series to be planted in the PHD Centre of Herat. The aim of the DO is to provide a means for the extension of improved techniques of orchard management, as well as grounds to deliver technical training. This document refers to the design, lay out and establishment of the 2007 Urdu Khan peach Demonstration Orchards. A detailed orchard management document including calendars and operations will soon follow.

### **Methodology**

The process of design of the DOs started with a field survey of several peach orchards in the Injil and Gozara districts, undertaken by a team of PHDP staff during the second week of February 2007<sup>1</sup>. The team discussed in a special workshop the main problems revealed at the survey and the possible alternatives to offer improved management systems under the conditions of the area.

## **2. Peach orchards survey**

### **2.1 Typology of orchards**

The surface of most orchards in the area is around one jerib. Orchards are enclosed by high mud walls (around 3m high) with access doors and most of the times they are integrated into a household compound. Alfalfa is normally grown as intercrop, and watering is by flood. Cows or sheep grazing the alfalfa among the peaches are common. They play an important role in household economy.

### **2.2 Varieties**

In all visited orchards, farmers declared to have two varieties: Late and Early. Probably both denominations design different clones of a same variety group. In different districts, nurseries plants of early clones are named as Pish Ras, Zod Ras or Bahari and for the late group Pas Ras, Dir Ras or Tir Mohi.

### **2.3 Problems detected**

#### **2.3.1 Tree density**

Most orchards present plant spacing between 1 and 3 meters. The two most common lay outs are. 1 x 3 m<sup>2</sup> and 2 x 3 m<sup>2</sup> accommodating 3333 and 1666 trees per hectare. Maximum peach tree life of six-year was recorded in 2x3 m<sup>2</sup> plantations. Trees planted at 2 m x 3 m recorded low fruit yield per tree with a cumulative yield over a six year period of 33 mt//ha declared by farmers

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<sup>1</sup> The team included: Professor Giordani of the University of Florence, Professor Samedi, of Kabul University and PHDP Germplasm expert, Iqbal PHDP germplasm development expert to be. Juan Trives, Project Horticulturist, Abdeulrahman Pashtunwal, Mazar Field Horticulturist, Ghaus Mohammed, Kandahar Field Horticulturist, Moheb, Field Horticulturist Herat and the Herat MoAI PHDP team headed by Noor Ahmad.

## **Disadvantages of high density of peach**

The high density implies first a higher cost of establishment. The high competence between trees reduces yield. Plant protection operations are difficult to perform due to the lack of space. The tree also tends to grow vertically searching for light. There is not either adequate fertilising practices.

### **2.3.2 Tree height**

One important consideration is tree size. Many gardeners prefer large trees because they think they would provide more fruit. It is difficult to manage and harvest peach fruit from large trees and it is difficult to climb on the peach trees to harvest fruit otherwise they have to shock trees and collect from ground and quality will be reduced. Tree height is also due to high density and lack of pruning. The fruit setting goes higher and higher year after year. Harvesting becomes more expensive and difficult.

Also in a strong wind area as Herat, excessive height increases resistance to wind.

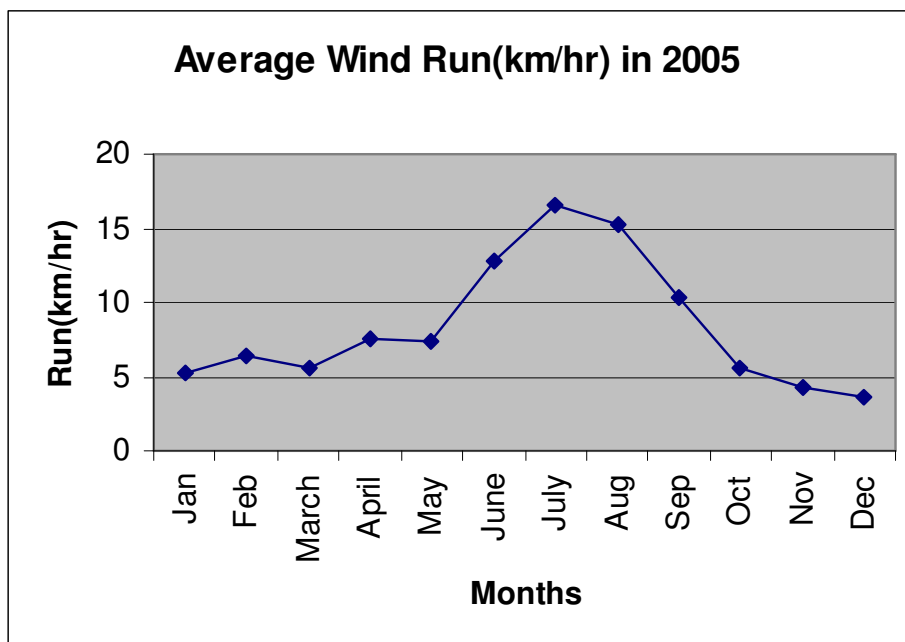
### **2.3.3 Lack of pruning**

Pruning is the skilful balance between shoot growth and fruit production. Gardeners in Afghanistan do not prune because they don't know why they should prune, neither how or when.

High branches often break due to the weight of the fruit. Diseases invade these trees and it is difficult to spray fruit in these conditions. Also the quality potential of the fruit is not exploited and the orchards have an excess of vegetative development,

### **2.3.4 Wind**

Herat province has 120 days of strong wind that affect yield of trees. Direction of wind is North to South. Most peach orchards are closed by mud walls (3 meter). There is not habit to have windbreaks between rows of trees.



### 2.3.5 Irrigation and Intercropping

Gardeners are obtaining water for irrigation 50% from public channel and 50% from private shallow wells. They are watering as flood irrigation. Watering of orchard is very expensive for gardeners as they have to pay as much as 40% of their revenue for watering expenses. Beside the peach trees they have to water the alfalfa intercrop.

Alfalfa is the only crop use for intercropping in fruit gardens in Herat and farmers don't know about new crop for intercropping with fruit trees. The watering schedules are determined by the alfalfa needs, with flooding with excess water, in amounts always exceeding the needs of the peach crop, and not being adapted to the period in which the fruit tree has especial requirements for water.

Alfalfa is kept for 7 years with 6 cuttings per year. So fertilizing needs are determined by alfalfa requirements. The fruit orchard is expected to use the leached nutrients in deeper soil areas.

### 3. Alternatives to orchard management

Following the above analyses, the design of the DO will concentrate in offering alternatives to 4 main factors:

1. Plant spacing
2. Tree training
3. Intercropping
4. Water management

#### 3.1 Plant density

The DO propose two alternative plant distances (3m x3m and 4m x 4m) as well as two training/pruning methods. Alternative value crop intercropping and irrigation systems will be introduced.

### **3.2 Tree training**

Fruit trees need pruning for two primary purposes: to establish the basic structure and to provide light channels throughout the tree so that all the fruit can mature well. But the primary reason for pruning is to ensure good access to sunlight and a balance between vegetative development and fruit production. Training a tree that is open to the light, and easy to care for and to harvest, is the main consideration.

The training systems that will be integrated in the DO are the Open Center and Central Leader ones both tested with the two different plant spacing

**The Open Center** pruning is well adapted to the peach trees that have a spreading habit. Peach is usually pruned as open center trees. In this system, at planting the tree is headed at the point where the future main branches will be established, and three to five of the branches are selected to form the main limbs, or scaffolds. Any limb will always be the same height above ground where it branches out from the trunk, no matter how large it gets. Ideally scaffolds should be spaced evenly around the trunk and be of approximately equal vigor, but the more vigorous branches can be trained outward using spreaders to shape the basic framework of the tree in its first and second years.

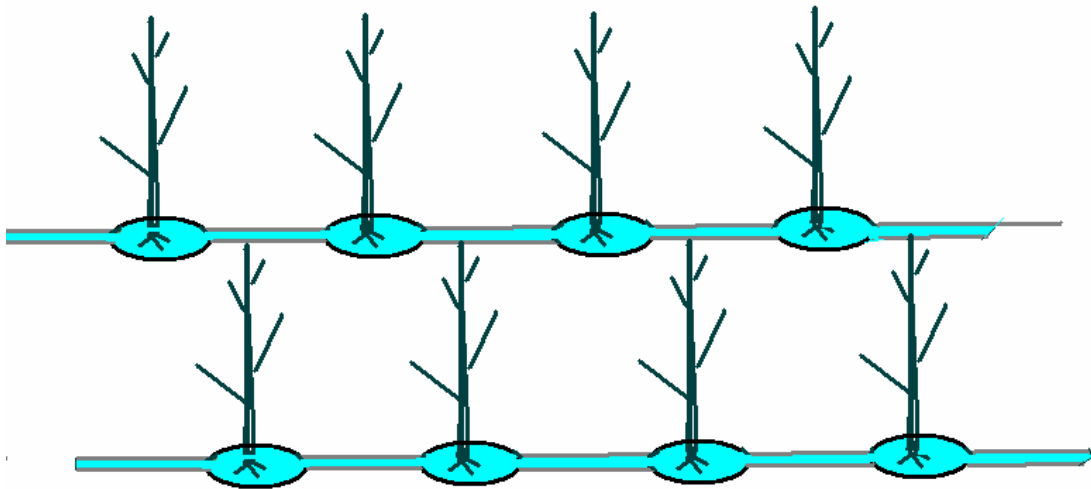
**The Central Leader** is well adapted to trees that have a naturally upright growth habit. In this form, one main shoot is allowed to grow up in the center of the tree. We will select two or three branches arising from this "central leader" that are pointing in different directions. We will locate the lowest branch at least 50cm from the ground. Cut the selected branches back keeping the lowest ones longer than the upper ones. The main stem is cut at about 1m in height. Keep all selected branches almost horizontal. Remove the narrow angled competing shoots from the top of the central stem and those near the tips of the side branches and keep the lower branches longer than the upper ones.

### **3.3 Intercropping**

Saffron will be a good intercropping to introduce for gardeners to sow on peach orchards, being a cash crop will compensate for the loss of animal food in the household due to the elimination of the alfalfa crop. The growing season of of saffron (October to march, do not interfere with the fruit crop). Alfalfa intercropping will be done to allow comparison. We will compare yield of alfalfa with saffron together and we will see which one has more benefit for gardeners.

### **3.4 Irrigation**

As alternative of flooding method for the whole orchard surface a tree basin irrigation method will be introduced, allowing to separate the watering schedules of the fruit crop and that of the intercropping

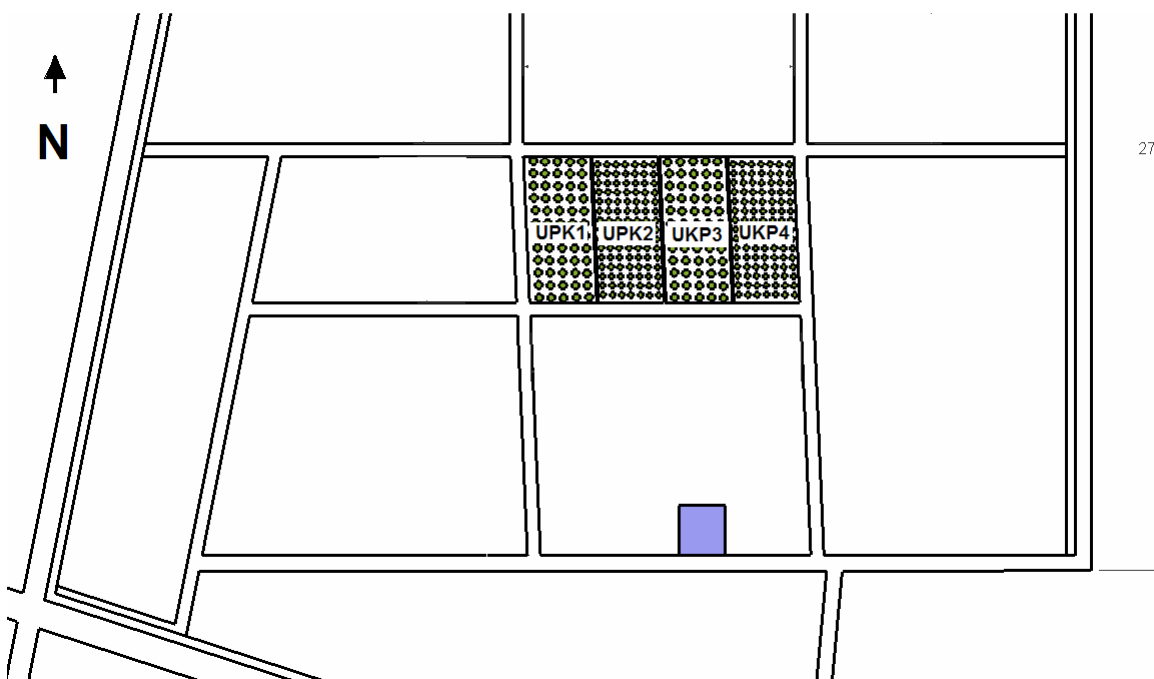


#### 4. Proposed designs

Peach trees spacing related to variety and training system in Urdu Khan Research Station

DO Code	Variety	Plant distance m x m	Training	Plantation pruning methods	Cutting height at planting cm	Inter crop	Surface /m <sup>2</sup>	Number of plants
UKP1	Late	4X4	Leader	A	100	Saffron	1000	60
UKP2	Late	3X3	Open	B	40	Alfalfa	1000	105
UKP3	Early	4X4	Leader	C	100	Saffron	1000	60
UKP4	Early	3X3	Open	D	80	Alfalfa	1000	105

#### 4.1 Field lay out



## 4.2 Plantation pruning

A- Cut saplings 100 cm from soil surface. Cut lateral branches at 2/3 of length

B- Cut saplings 40cm from soil surface. Remove all lateral branches.

C - Cut saplings 100 cm from soil surface. Remove all lateral branches.

D - Cut saplings 80 cm from soil surface Remove all lateral branches.

## 5. Notations.

The following notation will be taken:

- Tree trunk section area. (monthly, sample: 10 trees per block avoiding borders)
- Weigh of pruning wood (Spring, Summer winter: sample: 10 trees per block avoiding borders)
- Yield per orchard (daily)

Productive efficiency for each orchard will be calculated (ratio of cumulated yield per plant to trunk-section area), Cumulative yield and pruning wood per ha will be also calculated.

Phenological notations (dates):

- Beginning of flowering (first flower)
- Full flowering (50 % of flower buds open)
- End of flowering (100 % flower buds open)
- First leaf bud burst 50% of trees with bud burst
- Beginning of compsuption maturity

End of compsuption maturity