

**Case Study:**

**Estahbanat Rainfed Fig System**

**Iranian Agricultural Heritage System**

**Globally Important Agricultural Heritage Systems (GIAHS)**

December 2011

**Ministry of Jihad-e-Agriculture**

**Agricultural Planning, Economic and Rural development Research Institute**

## **1. General Information**

System' name : Estahban Rainfed Fig Orchards

Country : Islamic Republic of Iran

Total Area: 1 648 000 km<sup>2</sup>

Requesting Agency/Organization: Ministry of Jihad-e-Agriculture, Agricultural Planning, Economic and Rural Development Research Institute

Other Government partners

- Jihad-e Agricultural Organization of Fars Province
- Estahban Fig Research Station
- Estahban Fig Production Cooperative Firm

Location : Fars Province, Estabanat Township

System: Estahban Rainfed Fig Orchards

Total Area Covered: 22005 hectares

## **2. Description of the Agriculture Heritage System**

### **Introduction**

Figs are originated from the southern region of Arabia and gradually developed into the Mediterranean region. Based on historical evidences figs are planted 4000 Bc in Egypt.

Many different species are grown in Iran. Fars is one of the major producer of figs, about 75 percent of the total land area are cultivated for figs. Fig production in the Fars area are located mostly in steep slopes since time immemorial has kept the system alive and a sustainable heritage for the past and future generation.

The important areas of figs production in Estahban Township are Estahban plains, Khaneh Kat, Roniz and Eage. Other areas are located in between Sahlabad and Geshm Ghavi, at the foot slopes and in the land areas where there are possibility of rain water harvesting and retaining soil moisture.



Fig 1: A view of fig orchard in Estahban

Based on 2005 figures, the area under fruit bearing orchards in Estahban area is about 22,950 hectares, which covers 54 percent of the total rainfed area for fig production in the Fars province and about 5.4 percent of the world's figs cultivated area.

### **The indigenous and traditional knowledge system**

Traditional knowledge on management of figs is important. Particularly regarding planting, irrigating, maintaining and harvesting and other agricultural practices. These are considered to be valuable experience for other fig producers in Iran.

Although the traditional agricultural practices including planting and harvesting and rehabilitation, had undergone many changes, but still the fig orchard establishment, irrigation and maintenance of fig orchards are carried out through traditional systems.



Fig 2: Unsuitable land converted to orchard



Fig 3: A view of Estahban orchards in summer time



Fig 4: Water harvesting for fig irrigation in winter season



## Historical background

In history, Estahbanat was called Farsname Naseri. It is rooted from Pahlavi Word of “Seteh” and suffix “Ban” which mean grape orchard and place for keeping grape. However, during the last decades the name was changed to Estahban, which is known as Sabenat or Saboonat in the local dialect.

The old remains of the region include hunting stones and tools belonging to pre historical era, found in 1892 around Bakhtegan Lake, like those under stone pillars of Persepolice belonging to Achaemenian period.

The oldest written document which relates to building the Estahban Fort, belong to Deylamites settled in the Fars. Other documents include Mahfarkham, Chahartagh, Mobarakabad, Emarat sahlabad, Qeshm ghavi, Ashghaft gulbar Firetemples, old remains of De,deh village known as “lost city” and Kofar Fort are among old remains of the area.

## Status of Estahban fig in Iran and in the world

The area under figs cultivation in the world is estimated to be 453622 hectares with a total production of 1183248 tons fresh fig (FAO, 2009). Area under figs cultivation in Iran in 2010 was 55480 hectares with a total production of 162699 tons of fresh fig (during normal rainfall).

The area under figs in the Fars province in 2010 was estimated as 45500 hectares with a production of 370000 tons of dry figs. During the same period, the area of fig orchards in Estahban was about 22950 hectares with a production of 17000 tons of dry figs, constituting 57 percent of the area and 53 percent of the production of Fars province, 43 percent of



Fig 5: Some fig products

cultivated area and 59 percent of the production of fig in the country. As compared to the world, the Estahban constitute about 5.3 percent of the area and 6.5 percent of the world production of figs.

### 3. Biophysical Characteristics and Natural Features

#### Geographical location

The Estahban township is located at east of Fars province, at a distance of 175 km from Shiraz. It is bounded from north by Bakhtegan Lake and Nireez township, from south by Fars township, from west by Shiraz and Darab townships.

Geographically it is situated at 28° and 50" to 29° and 28" north latitude, 53° and 35" to 54° and 29" east longitude. The area covered by it is about 1994 km<sup>2</sup> and its average elevation from sea level is about 1767 meter.



Fig 6: Position of Estahban in Fars province

It is surrounded in the west, south and to some extent in the north by high mountains.

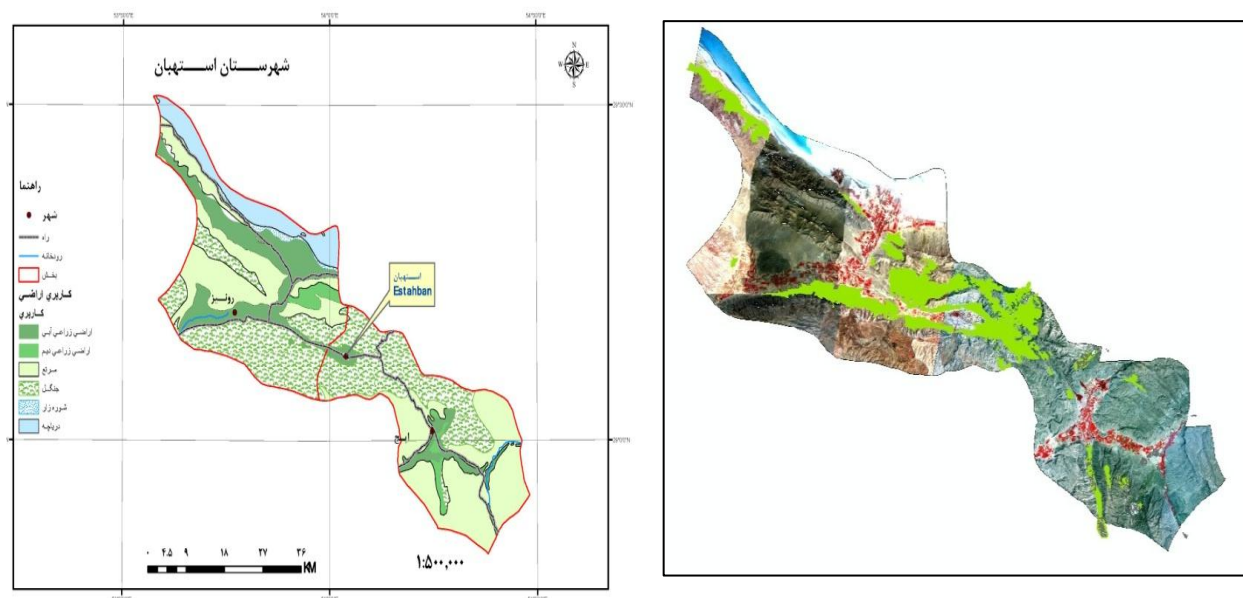


Fig 7: Land use map of Estahban

## Weather

**Temperature:** The average annual temperature is about 14.9 degree Celsius and maximum temperature recorded is 42 degree Celsius, but only for few days it increases to above 37 degree Celsius. Increase in temperature during late August and September above normal temperature (i.e., 30-35), may deteriorate the production. The young trees are sensitive to cold weather (less than -3). Based on observations, the minimum temperature in December and January may drop to -8 degree Celsius for a few days and in one case it dropped to -10 degree Celsius, which caused serious frost bits and considerable damage and losses to the trees.

The young trees are more sensitive to frost of less -3 degree Celsius , particularly during October and December. In addition, if in winter season temperature drops to -9 degree Celsius it can cause total failure of three.

## Humidity and rainfall

**Rainfall:** The annual average rainfall is about 354 mm with minimum and maximum of 92 and 739 mm respectively.

**Humidity:** The average relative humidity is 45 percent, but it decreases during fruit maturing and harvest period. Potential evaporation is 1830mm and in general the weather is arid and favorable relative humidity for fig is about 25 percent,

above which fungi diseases may develop and also it may cause more cracks on fruits.

**Wind:** The average wind speed is about 15 km per hour and its maximum value varies from 25-30 km per hour. Wind speed may prevent pollination process by interrupting movement of Blastophaga bees.

**Soil:** Existence of gravelly alluvial deep soils in the Estahban plains and flood waters from upstream high lands, provides favorable condition for uptake of water by soil and retaining moisture. Figs can be grown in different soils including light texture sand, loamy sands, loamy clay to heavy clay soils. It can even grow in relatively saline and alkaline soils of PH 6 to 7.8 of good drainage.

The best soil for fig production is a combination of clay, sand and silt (in equal quantities) with good drainage. Soils with 1.2 meter depth are suitable for figs cultivation. Figs can be also raised in slope lands.



Fig 8: Fig cultivation in fertile lands and water harvesting

In Estahban figs are grown in lands with slopes ranging from 40 to 80 percent. Figs are also tolerant to soil salinity.



No chemical fertilizer is used for growing figs, but every year the soil under the trunk is replaced with fertile soil, and therefore, the fig products are considered organically grown.



Fig 9: Replacing old soil with new fertile soil



Fig 10: Soil replaced with good soil

#### **4. Contribution of Fig Orchards in Livelihood of the Estahban Inhabitants**

Based on the 2006 Census, there are 16656 household in Estahban township with a population of 67875 people, out of which 46798 were inhabited in urban areas and 21077 people in the rural areas. In other words, about 68.9 percent and 31 percent were residing in urban and rural areas respectively.

The gender ratio of the population of Estahban township was 104.9, indicating that there were 104.9 men for 100 women. This ratio for urban and rural areas was 104.5 and 105.87 respectively.

The gender ratio of the population in urban and rural areas is an indication of low rate of migration. The main reason for low migration is job opportunity for the people in the area. Historically, the main jobs for majority of people inhabited in the area have been agriculture and animal husbandry. Existence of about two million rainfed fig trees cultivated in an area of about 22000 hectares in plains and foot hills of the region, is an indication of active populations engaged in agriculture.

As it was mentioned earlier, there are 22000 hectares of fig orchards in the area, which act as the source of livelihood for 5500 holdings. Average size of land ownership is 4 hectares of fig orchard. The minimum and maximum land ownership are 0.5 and 100 hectares respectively.

Table 1- Population data

No. of households	16656	Area of rainfed fig	22005 ha
Population	67875	No. of utilizers	5500
No. of urban households	11723	Average area	4 ha
Urban population	46798	Maximum area	100 ha
No. of rural households	4933	Minimum area	0.5 ha
Rural Population	21077		

As the chain of production is considered, about 90 percent of the population is engaged in different agricultural practices, packing, processing industry, marketing and handling and sale of products.



Fig 11: A fig processing unit in Estahban

## 5. Indigenous Knowledge in Fig Raising

### Planting

Traditionally figs are cultivated in the northern slope of land, where there is less sunshine, conserve more soil moisture and reduce evaporation. Figs which grown in the dry and seasonal rivers are healthier. Also, figs grow faster at the foot hills in comparison to plain areas, as they are protected from winter cold and more moisture is retained in the soil.

At the end of winter, and before the emergence of buds, a suitable land is selected for planting figs. Then holes of rectangular shape 50cm × 100cm and depth of 130 cm are dug. The bigger the hole, the faster will be the growth of plant. The distance between holes is usually 10 meters. Traditionally for selecting a suitable land of fertile soil in uncultivated lands, farmers collect some soil from the land, put it in a handkerchief and rub it by hand, if more soil is stuck to the handkerchief, they believed that the soil is more fertile and produces whiter figs which are good quality figs. By experience they make smaller mouth and bigger bottom of the hole.



The common practice for multiplication of fig is by planting cuttings. Healthy and young cuttings of about 75 cm are cut from a branch of healthy and productive fig trees and laid in a wet soil. Then the cuttings are covered by soil and a stone is laid near it as a sign. After few days, the stone is removed and the soil over the cutting is loosen by stirring it by a small iron spit, so that buds can grow faster. The hole is again covered by a hollow conic shape of stones and then covered with soil to protect the cuttings against frost and harmful insects.

### **Post cultivation practices**

In late April, all unwanted plants and remaining of weeds and bushes, which in local language are called “lajam” are eradicated and removed manually. The collected residuals may be used as roofing of huts.



**Fig 12: Crop and weed residues are used for covering hut roofs**

## **Irrigation management**

As figs are grown in sloppy lands and holes are dug along the slopes, macro catchments (basins) are created perpendicular to the slopes for collecting rain water. Estahban figs are rainfed crops and their growth depend totally on rainfall. Therefore, water harvesting is a traditional practice for irrigating plants. If the land is too steep, soil over the holes are removed and filled with stones. Then stones are covered and supported at outer parts by soil, so that an elliptical shape is created under the tree. The size of it depends on the size of the tree, larger the tree, larger will be the area of structure.

In contrary, if the land is not steep, no need for this stony structure and the raised position for collecting rain water is created by soil. Nevertheless, for collecting more rain water, two walls of each three meters long will be constructed at an angle of more than 90 degrees and less than 180 degrees, it resembles like a human being who is stretching his hands beseeching for God's mercy.

## **Pest control management**

Fig stem borer is an important pest in the region. This pest is easily identified by the farmers. Usually, young tree of 5-6 years old are tolerant to this pest and do not require any measure for controlling the pest. Pest control requires high skill and experience and it is done manually without any use of chemicals. The tools for eradicating stem borer is comprised of two spits of wooden handles , one with head and the other with flat head. The sharp one is used for pulling out the pests in the deeper parts of the stem. For doing it, it is necessary to remove about 35 cm of soil around the trunk of tree, to find where the pest has entered into the tree. To prevent any injury to the tree, digging soil must be carried out carefully, because the damaged location will be a location for easy entrance of worms. Removing the pests is usually after harvesting in mid October or November.





Fig 13: Manual control of fig stem borer



Fig 14: Manual control of fig stem borer

## **Pollination**

Estahban figs are dioecious plants, having separate male and female plants. Local people do not call male a fig tree, because its fruit is not eatable. The shape of male and female trees are the same, but female bears fruit once a year, and male produces fruit three times a year (spring, fall and winter ). The spring fruit is used for pollination and is an appropriate place for ovipositing and growth of *Blastophaga Psen* bee. Bees are active for five days, therefore, pollination is done three times and each time for five days. Time of pollination depends on the weather conditions, but traditionally it starts seventy days after the new year (20<sup>th</sup> March) and takes 15 to 20 days.

As shown in the figure for pollination process, small holes are made at the bottom of empty cans or similar small containers, so that bees can easily pass through the holes. Then, they are filled with some fruits collected from male trees and they are hanged from the female trees. The best time for pollination is early morning, when the weather is not warm. To avoid fruits to be dried, the cans should be hanged under the shadow of leaves.





Fig 15: Fruit of male tree collected in cans for pollination



**Fig16:** Rain water harvesting for soil moisture conservation

### **Fig cultivars**

Five fig varieties are grown in the area, namely; Sabz, Siah, Shah, Aghaei, Roonoo, Alooei and Barg Chenari. Sabz variety covers 95 percent of orchards.



## Harvesting

Late September is harvesting period. Figs are harvested manually by the owners of orchards and their families. Figs are collected in three different stages, namely Pachin (first time), Chin (second time) and Palaki (third time). The collected figs are transferred to a basket, then to a rectangular shape container, which a pair of it (twig basket) can be loaded on animals.

For drying figs under sun, a square raised land, which its size depends on the amount of products, is selected, preferably in front of the hut. In addition, it is fenced with stones and in order to prevent sticking fruits on soil, the land is covered by white sands collected from the river. But nowadays, they cover the land with cement, which is cleaner and easy to collect dried fruits.



Fig 17: Hut constructed of local material for accommodating farmers and his family during the harvesting period



Fig 18: Cement platform for collecting and drying figs

## Classification and grading system of dry figs

Dry figs are classified according to their quality, but there are different grades for different quality of figs. The best quality fig has got light yellow color, with 3 to 4 cracks on it. Generally best quality figs are known as A grade, but also it is called double A or tripple A by different processors.

- 1- Grade A: This is the best quality figs, light yellow whitish in color, with 3 or 4 deep cracks, its seeds are visible. Older the tree and more fertile soil, the better is the quality of fruit.
- 2- Grade B: The cracks in this quality are not deep and the color is less bright compared to grade A.
- 3- Kharmani: Although it is a good quality fig, but since there are no cracks in it, it does not have good market value.
- 4- Kolooki: This type of fig is collected at the last stage of harvesting. It includes a mixed of all types of figs. It is collected in a pot (clay pot) of wide mouth, pressed and covered tightly. It is consumed in winter time.
- 5- Donkey fig: This variety is small and black. It is used as feed for animal (donkey).



Fig 19: A grade fig





Fig 20: A comparison of different grades of dry figs. The red colour (left) are losses



Fig 21: Good quality figs

## Packing and processing of figs

After collecting and drying, the large part of it is sent to the processing units for storing, packing and processing. There are 10 processing and packing plants in Estahban. As it was mentioned there are different grading adopted by different processors and factory owners.

Packing: large amount of figs are packed in 10-12 kg boxes for either domestic consumption or for export. The process is as under:

- 1- Dry fig which is collected in gunny bags in the farm is sent to the processing plant and weighted.
- 2- Then the product is sorted by machines into three groups of big, medium and small sizes. The largest sizes, which are classified as AA grade, include figs of 22 mm in diameter. The medium sizes which are classified as A grade, are those with 22-17 mm diameter. The small size products which are classified as B grade include figs of less than 17 mm diameter.



Fig 29: Different fig products

## **Farmers associations**

The Cooperative of fig gardeners is comprised of 650 members. It is the main entity for the rainfed fig producers, which is active in procurement and supply of machinery and equipments, services and inputs required by the members.

### **Threats, challenges and limitations:**

#### **a- Natural threats**

- Over 50 percent of trees are old and requires re plantation
- The quality and quantity of products depend on the amount and distribution of rainfall, as a result, the recent droughts caused severe damages to the fig orchards

#### **b- Human threats**

- Insufficient investment for executing in time agricultural practices and maintenance
- Construction of earth roads inside the orchards, which encourages development of pests
- Legal problem regarding land ownership and registration, especially state owned lands
- Inappropriate pruning of trees
- Lack of appropriate marketing

### **Impact of drought on fig orchards**

Though the fig is tolerant to water scarcity and drought, but since it is a rainfed crop, it is sensible to prolonged rain water shortage. The recurrent drought associated with frost during the recent year had serious damages to fig orchards (figures 26 through 28)



**Fig 26: Dried fig tree due to drought and frost bits**





Fig 27 Dried fig tree due to drought and frost



Fig 28: Dried fig tree due to drought



## Biodiversity features and wild life diversity

Being situated near the Bakhteghan lake, Estahban area is a habitat for local animals and migratory birds, which migrate during the winter season to the region. The following table shows the animal species inhabited in the Estahban region.

English name	Scientific name	English name	Scientific name
Wolf	Canis Lupus	Ram and Ewe	Ovis orientalis
Iranian Zebra	Equus onager	Leopard	Panthera pardus
Forest Cat	Felis chaus	Boar	Sus scrofa
Wild cat	Felis silvestris	Iranian Squirrel	Sciurus anomalus
Deer	Gazellu subgutturosa	Brown bear	Ursus arctos
Fox	Vulpes vulpes	Ewe and Goat	Capra aegarua
Rabbit	Lepus europaeue	Porcuine	Hystrix indica



Fig 22: Deer in Estahban area

## Birds

English name	Scientific name	English name	Scientific name
Sparrow hawk	Accipiter nisus	Flamingo	Pheonicopterus ruber
Imperial eagle	Aquilaheliaca	Duck	Marmaroneta
Golden eagle	Aquila chrysaetos	Stiff tailed duck	Oxyura leucocephala
Wetland eagle	Aquilaclanga	Lesser white goose	Anser erythaginea
Osprey	Pandion haliaetus	Partridge	Alectoris chukar
Vulture	Neophron percnopterus	Crane	Grus grus
Vulture	Falco cherrug	Bustard	Chlamidotis undulate
Vulture	Falco peregrinus	Nightingale	Luscinia megarhuncus
Falcon	Falco Pelegrinoides	Swallow	Hirundo rustica
Lark	Galerida cristata	Francolin	Francolinus francolinus
Wild pigeon	Columba Livia	Little Owl	Athene noctua
Starling	Sturnus Valgaris	Owl eagle	Bubo bubu
Pelican	Pelekanus Crispus	Magpie	Pica pica

Due to recurrent droughts during the recent year and severe depletion of water inflow to the Bakhteghan lake, migratory birds like Pelican, Flamingo and other birds, are observed only during winter and early spring, when the lake has water.



Fig 23: Partridge habitat in Estahban

## Reptiles

English name	Scientific name	English name	Scientific name
lizard	<i>Varanus griseus</i>	Blind snake	<i>Eryx Jaculus</i>
Snake	<i>Spalrosophis microlepis</i>	Tortoise	<i>Testudo graeca ibera</i>

## The Amphibious

English name	Scientific name	English name	Scientific name
Frog	<i>Fufosurdus annulatus</i>	Tree Frog	<i>Hyla Savignyi</i>

## Plant diversity

Favorable climatic condition and fertile soil in Estahban area, facilitate growth of a diversified range of plants. These plants can be classified in two groups:

### Fruit Crops:

Crops such as grapes, walnut, olive, almond and pomegranate which are grown by farmers for self consumption and are not sold in the market.



Fig 24: Olive trees in Estahban area



## Wild plants

These wild plants grow under canopy of fig orchards and some of them like Persian turpentine and almond (*amugdalus eburnean*) grow as shrubs in the mountains, but most of them are annual and perennial plants, grow under canopy and between fig trees. Some of them have medicinal values, but are considered as weeds and removed from fig orchards.



Fig 25: Pomegranate trees in Estahban



Plant	Scientific name	Use					Type
Ferula	Ferula assa foetida	Industrial	Medicinal		Fodder		Perennial
Persian Turpentine	Pistacia atlantica	Industrial	Medicinal	Food	Fodder	Conservation	Perennial
Pistacia	Pistacia khinjuk	Industrial	Medicinal		Fodder	Conservation	Perennial
Bindweed	ConvolvulusLeiocalychnus	Industrial	Medicinal	Food	Fodder	Conservation	Perennial
Yarrow	Achillea millefolium				Fodder	Conservation	Perennial
Artemisia	Acanthophyllum sp	Industrial	Medicinal			Conservation	Perennial
Corn flower	Centaurea virgata					Invader	Perennial
Broom	Bromus tomentelus				Fodder	Conservation	Perennial
Wild rue	Peganum harmala		Medicinal			Conservation	Perennial
Camel's thorn	Alhagi camelorum		Medicinal		Fodder	Conservation	Perennial
Mercury	Alriplex leucoclada				Fodder		Perennial
Adam's apple	Ebenus stellata				Fodder	Conservation	Perennial
Wild oat	Avena fatua				Fodder		annual

### The medicinal properties of figs in traditional medicine

It is believed that fig possesses a number of medicinal properties inter alia, including :

- It is a laxative and sedatory
- It reduces fever and thirst
- It relieves coronary thrombosis, relieves swelling of splenitis and hemorrhoids
- It is high in calcium content
- It is rich in protein content
- It has anti cancer properties

### Development plan for fig orchards

As part of a development plan for expansion, rehabilitation and replanting the following activities are envisaged in the Estahban area to be carried out through the government support and participation of all stakeholders.

- 1- Conservation and rehabilitation of the existing orchards
- 2- Development of fig orchards in suitable areas by implementing the following activities:
  - developing rain water harvesting and preventing soil erosion by controlling run off, particularly at steep slope areas
  - controlling floods
  - construction of water ponds
  - application of complementary irrigation during drought periods
  - pruning of trees during winter and summer times
  - Painting trees with non chemical and water based paints

- biological control of pests and diseases
- replacing old trees with young ones
- plowing hard pans around the trees
- controlling spring weeds
- adoption of drought tolerant varieties
- development of processing and complementary industries
- marketing and labelling