

Egyptian Experience in Planting Jojoba

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The experience began when Middle East Saudi Newspaper published an article on Tuesday, May 7 1985 on Jojoba plant. The article writer, Nabil Abou Khatwa, mentioned that as Arabs we complain that most of our lands are deserts, with limited water and high temperature and that there is a remarkable difference between morning temperature and evening temperature. However, there are certain high-value types of plants that fit it this environment, and Jojoba seedling is on the top of these plants. The annual profit of one hectare (2.4 Feddan) of Jojoba could reach US\$ 120,000. Since then, Jojoba experience had started through the following:

- 1) Gathering information on Jojoba and on plantation in new lands, indicating that plantation in new lands required new ideas.
- 2) Subscribing in a scientific magazine on Jojoba titled "Jojoba Happenings".
- 3) Subscribing in Jojoba Growers Association.
- 4) Gathering and studying researches done on Jojoba plantation and industrialization in various countries and identifying reasons behind successes or failures in planting Jojoba all over the world.
- 5) Gathering researches of the nine international conferences conducted on Jojoba plant, staying abreast of latest developments in Jojoba plantation, and identifying uses and applications of Jojoba seedlings' products.
- 6) External visits to various countries that plant Jojoba to discuss advantages and disadvantages and form a complete idea about Jojoba plantation.

The outcome of all studies, visits, and scientific discussions with experts all over the world indicated that for Jojoba plant to be successfully introduced to a certain country, it should first be tested on a limited scope from four to six years. This is to assure that the climate of this country and its environment are suitable for Jojoba. Also it assists in identifying best irrigation and fertilization methods, and economically studying those methods and comparing them with other methods used in other countries to determine how competitive they are in the international market.

The first attempts to cultivate Jojoba in Egypt began in 1976 with no success. In 1985 Food and Agriculture Organization (F.A.O.) adopted five years research and development program to introduce Jojoba in Egypt and other Middle East Countries, as a new crop including adoption principles stages of proper new crop adoption. The results were not up to expectations due to failure of producing high yield shrubs by vegetative propagation as well as lack of agrotechnical know-how.

A new pioneer project was established in 1990 to plant Jojoba, and open new markets for its products. In May 1991 9 Feddans were planted by seeds in rows, distant between each row 2.5 m. and 1.5 m. between each plant in the row. The following layout represents the form, which consist of four fields each 5.14 Feddans. The Jojoba field contains about 6000 shrubs each watered by 4 liter/hour dripper. The sub main line is 4 inch pipe and the main is 6 inch pipe coming from a well pumping 100 m/h.

The Jojoba Feddan requires in summer / spring 50 - 70 liter/week and in winter / autumn 10 - 30 liter/week. Thus the standard Jojoba water requirement per Feddan (800 shrubs) is about 1600 m/year. This means that Jojoba plant can be classified as a low water requirement plant. In Australia, a research program was conducted in 1970 studied the way Jojoba control water use. The results showed that the transpiration rate of Jojoba leaves under conditions experiencing very dry air (high vapor pressure deficits) was less than 10% that of standard crop plants and its water use efficiency was most twice that of wheat. Also Jojoba plant can survive without irrigation for more than 6 months.

The wild nature of Jojoba makes it one of the best crops which can be planted in Toshki or East Owaynat, especially Jojoba origin is Sonoran Desert (South West Arizona and California, Northern Mexico, and Baja California) where temperature during summer days reaches 46 degree in shadow. Also the large added value from Jojoba products (oil, meal, and hulls) to economy (raw material for many industries) is another advantage to plant Jojoba in Egypt. The net income from one Feddan of Jojoba in the fourth year (first yield) expected to be (1800 - 2000 LE), and in the eighth year (6000 - 8000 LE) with the current oil prices, this means that the income of one cubic meter of water is $1800/1600 = 1.125$ LE with the fourth year, and in the eighth year $7000/1600 = 4.37$ LE.

So, if we compare the income of cotton, which is 0.5 LE per cubic meter with Jojoba (1.125 - 4.37 LE), we can realize the importance of Jojoba.

Conclusion

The forthcoming new agriculture projects in Toshki, East Owaynat, and Sinai will add more than 1.5 million Feddans of reclaimed land to our green area. Our water resources are limited, so we have to:

- a- Enhance our irrigation systems for better utilization of water.
- b- Find new water resources (brackish water and treated water.... etc).
- c- Change our plantation pattern and adopt new crops plants, which utilize less water and a rewardable income.

All this will lead us to change our calculation pattern of income. In the 20th century we were calculating the income per Feddan because the land was the rare factor, and the water was available free or with a very limited cost. In the 21st century, we have to calculate the income per one cubic meter of water because the land is available and the water is the rare factor.

Jojoba Identification

Agriculture is one of the main corners of the Egyptian economy. Egypt has several competitive advantages when utilizing the new desert land with minimum quantities of water with the suitable climate to produce raw material for industrial purposes.

Jojoba is considered one of the most practical and scientific solutions for desert plantation in Egypt. Hot summers, warm winters, desert soil, minimal water, and great salinity tolerance. Lesser possibilities for infection, lesser need for fertilizers, and generous financial income, are certainly most encouraging to plant Jojoba in Egypt.

Jojoba originally grows south west of the United States of America and northern Mexico. An evergreen wild shrub that could live for more than 100 years. A full grown shrub is 2-4 meters high with a 15 meters long root. It produces a peanut-like seed with a thick brown coat. Jojoba seed can yield up to 60% pure oil chemically classified as liquid wax that gives it a great advantage as natural oil for industrial purposes, which also make it environmentally safe. Additionally, the meal remaining from seed pressing contains 30% protein that consists of 17 amino acids, 7 of which are essential amino acids. After treatment, the meal becomes suitable for utilization as cattle/fish feed and /or organic fertilizers.

Plantation

Jojoba is normally planted by seeds or seedlings in sandy, well-drained soil. The plants are lined up in 3-4 meter wide lanes and are spread every 1.5-2 meter in a row.

Best plantation is from March through October. A single acre would normally have an average of 525-930 seedlings, 10-15% of which are males fit for pollination and the rest are females fit for production.

Irrigation

It is most preferable that Jojoba is irrigated by dripping to minimize water consumption, growing grass, and facilitate collection. A plant maximally utilizes 50-70 liters of water weekly in summer and 10-30 liters in winter.

However, when irrigated by flooding, a plant would need watering 12-15 times per year.

A mature shrub would survive for a whole year without being watered. Jojoba particularly tolerates salinity up to 3,000 p.p.m. without any impact to the yield.

Salinity of 3,000-10,000 p.p.m., would negatively affect the plant.

Care and Service

Jojoba plants need little organic fertilizers in the first 4 years of plantation. Minimal chemical fertilizing could be added to irrigation water. Grooming is only necessary in the fourth year in order to facilitate collection. There are no known insect pollinators other than accidentals because Jojoba is a wind pollinated plant. Preventative or corrective disease/insect spraying is rarely needed.

Production

Seedlings can be expected to flower in the fourth year with an average of 250-350 grams of seeds per tree. Fully-grown trees could produce up to 1-3 kilos of seeds per tree during the eighth year. An acre with 700

females produces an average of 1 ton of seeds. Production increases proportionally with the life cycle of the plant.

Flowers form in the winter and after pollination grow until they are mature seeds in July. The seed skin dries, shrinks, splits and hundreds of seeds drop on the soil below where they can be collected. Seeds can be left uncollected for several months or get stored for several years without any impact on the oil that resists oxidation even under harsh conditions. Jojoba is typically hand collected and is vacuumed in large farms.

Utilization

Jojoba is the ideal substitute for the oil of the Sperm whale. It is classified as an oil seed crop. The seed-oil is used in lubricants, cosmetics, pharmaceuticals, and as a replacement for sperm oil in manufacturing of inks, varnishes, waxes, detergents, resins and plastics. Jojoba oil also filled in as additives to motor oil, transmission oil and differential gear oil. The ability of the oil to withstand high temperatures and carry away large amounts of heat from gear systems was a definite plus for aircrafts. It boils at 398 °C, it is anti-oxidant, it does not become rancid, and can be stored for 25years.

Marketing and Sales

It the fourth year, one acre produces approximately 200 to 300 kilograms. Seeds are sold for industrial purposes at \$3 to \$4 per kilogram, an average of \$600 per acre /year. By the eighth year, production reaches 800 to 1,200 kilograms that are sold for \$2,500 per acre/year at minimum. It is worth mentioning that the cost of planting Jojoba is significantly lower than planting any similar crop.