

Potential of Jujube Cultivation in Sindh

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Abstract: This paper is based on primary data collected from the randomly selected Jujube growers in Hyderabad district. Analysis indicated that most of the growers do not know the advantages of the timely and adequate use of inputs. The use of chemical fertilizer and labour appear to be limited by the resources poor farmers. There are numbers of jujube varieties grown in the study area, white gola is most popular and harvested earlier than other varieties, results fetches good price. Growers received yield between 290 to 470 mds ha⁻¹, with an average of 380 mds ha⁻¹. Based on the study results, it can be concluded that jujube cultivation has great potential in Sindh, due to better net returns to growers, than the other crops grown in the study area.

Key words: Jujube, economics, Sindh

Introduction

The jujube, locally called as ber, is an indigenous fruit of China and the South Asian subcontinent. It is produced in several temperate regions such as India, Pakistan, China, Syria, Malacca, Australia and Malaya. This fruit is grown in parts of Afghanistan, Iran and sub-tropical parts of Russia. China is one of the most important country for jujube cultivation, where it is known as "Chinese dates". Several hundred varieties of jujube are available in China some of them are seedless. Jujube is considered to be one of the major fruits in China, because people buy it for good luck. The tree of this fruit is very hard, drought-resistant and can thrive in poor alkaline tracts without much irrigation and care, and is recommended for soils where other fruit trees can not survive.

In Pakistan, jujube has been successfully cultivated in Hyderabad, Khairpur, Multan, Sargodha and Lahore districts. In Sindh, the area and production of jujube has increased significantly during 1997-98 to 2001-2002. Data indicates that the area under jujube has increased from 708 to 1210 ha and its production has increased from 3716 to 5395 metric tons during the same period (Govt. of Sindh, 2001-02). It is mainly cultivated in Hyderabad and Khairpur districts. In Hyderabad, Tando Jam and Tando Allahyar are major area for jujube production. Many varieties are grown likes soofi, kheerol (chambeli), sanghri and gola. Gola is most popular variety and it has two kinds, the green (leemai) and the golden (white). White gola is harvested earlier than other varieties.

This fruit is mostly consumed in fresh, but his other forms such as dried, candied, pickled, squish and juice is also used. Various Yunani medicines contain jujube extract, which is said to be blood purified and also helps digestion. The powder and decoction prepared from the roots are effective in case of fever, ulcers and old wounds. The stem bark is considered to be a

remedy for diarrhoea. It is highly nutritious fruit depending upon variety, the fruit pulp may contain 0.20 to 0.80% acidity at fully ripe stage. It contains 70 to 165 mg ascorbic acid per 100 gms of pulp, which is much higher than the vitamin-c content of citrus fruit, as a well known source of this vitamin. Jujube fruit is also very rich in vitamin -A, containing nearly 80 ug of B-carotene per 100 gms of fruit. The fully ripe jujube fruit contains 0.9% protein and 12.8% carbohydrates, the highest level found on fruit. The reducing sugars are also quite high and amount to 3.1 to 10.0%, respectively. The mineral contents are calcium, phosphorus and iron. Jujube fruit excel even apple and oranges. This study was planned to conduct detailed investigation on cost of cultivation of jujube in Hyderabad Sindh with the following objectives.

Objectives

- To determine average per hectare cost of production incurred by producer.
- To investigate the physical productivity per unit area of jujube and to estimate the returns realized by the growers.
- To compute the average per unit net return.
- To determine the input output ratio involved in the production of jujube.

Information Source

The information for this research was derived primarily from in-depth semi-structured interviews with key informants, met during the course of separate survey of jujube growers, conducted as part of a broader investigation of the performance of farming system in Sindh. Jujube survey in Musa Khatan and Tando Qasir area in Hyderabad Sindh was purposely carried out, because of the concentration of jujube fields and deemed sufficiently representative study area. An exploratory survey was conducted of jujube growers and some members of fruit growers association who become 'key informants' met on several occasion and with whom relationships based on trust were established. The officers from the relevant department i.e. Agri. Extension, Research, Horticulture, Directorate of Agriculture Marketing and economics also provide important information. Given the largely purposive selection of key informants the accuracy and representativeness of the information gained cannot be formally validated. However, all assertions made in this paper were verified by cross checking from at least three or more sources.

Resource Valuation

Production of farm commodities involves numerous relations between resources and commodities. Some of these relationships are simple while others are complex but according to Heady (1964) they all provide the tools by means of which problems of production can be analyzed. The production function expressed the way in which output are produced by inputs and the way inputs cooperate with each other in varying proportion to produce any given output of products. A production function can be expressed in form of:

$$Y = f(x_1, x_2, x_3, x_4, \dots, x_n)$$

Where Y = Output

X = specific factor of production or resources

The production function has been used to analyze the data collected from the jujube producers. The various resources or output as entered into the production process was evaluated at the prevailing market price. The cultural operations were considered the basis to quantify various inputs.

Land Inputs

The land inputs were measured on the basis of area planted under various crops at the selected diversified farm. The main component of land input included the rent of land, irrigation charges and usher tax. Market rate of leasing out one hectare of land for growing various crops as prevalent in the area were considered as an appropriate criteria to compute rent of land inputs for various crops.

$$Liph = (As \times Cr) + (As \times le) + (As \times ut)$$

Where Liph = Land inputs per hectare for specific crop

As = Area sown under specific crop

Cr = Contract rate per hectare use of land

le = Irrigation charges rate

Ut = Usher tax rate

Labour inputs

Labour inputs include machine use, manual and animal labour. The hiring of tractor along with implements and bullock pair including plough or leveler were calculated at rates prevailing in the area. Therefore, labour inputs as employed to grow various enterprises were estimated on the basis of opportunity cost principle. The following formula was used to calculate the labour inputs.

$$Lis = (Mh \times Hc) + (BwD \times Hc) + (MWD \times Wr)$$

Where Lis = Labour inputs for specific activity

Mh = Machine hour

Hc = Hiring charges

BWD = Bullock work days

MWD = Man- work days

Wr = Wage rate

Capital inputs

The capital inputs used in the various enterprises were seed, farmyard manure, fertilizer, insecticide and pesticide sprays. The actual expenditure as incurred by the respondents on

these capital inputs was investigated from farmers and means were computed for all the farmers. The following formula was used to compute capital inputs for various crops raised on the selected farms.

$$Cph = (Q_s \times Pr) + (Q_m \times Pr) + (Q_f \times Pr) + (Q_f \times Pr) + (Ppe)$$

Where

Cph =	Capital inputs per hectare	Q _s =	Quantity of seed used for various enterprises
Pr =	Price per unit weight	Q _m =	Quantity of manure applied
Q _f =	Quantity of fertilizer	Ppe =	Actual expenses on plant production
AS =	Area sown under various enterprises		

Production Practices of Jujube

The prime and basic objective of the growers is to get higher yields through adopting the proper management practices and production technology. Production of any commodity depends on the combination of different inputs and resources allocation. The main purpose of this analysis is to describe and analyze the jujube production system. The emphases have been laid on qualitative and quantitative analysis of production practices adopted by the jujube growers and identification of technical and socioeconomic factors in jujube production. The basic data collected in the study is presented hereunder.

Land Preparation

Land preparation is considered the initial task for any crop cultivation. A good land preparation is necessary for proper and rapid growth of the crop. Land preparation varies from one grower to another. It was found that most of the growers prepare their land with one gobbler plough, followed by 2-3 cultivators per acre. It was also observed that 81% of the respondents leveled their land before planting of Jujube trees.

Planting Method

The plant-to-plant distance should be 25 feet to maintain the 35 to 40 plants in one acre. If the land is not ready for planting keeps the budded plants in the shade and apply irrigation through sprinkler time to time for 2 to 3 days, when the land comes in condition, then first of all put the plants near the ear marked spots, specially in one plot. After that dig the pit from the center and fit the plant in the pit, the plant should be erect, not too below or above the surface. Put the soil and fix the budded plants in the center of the pit. In this way all the plants should be fitted, then immediately irrigate the area with irrigation water. 3 to 4 irrigation turn should be given at the interval of 3 to 4 days.

Propagation Method

Jujube can be propagated through seed, root cutting, grafting and budding. Generally the seed collected from fully ripen fruits are viable although in many cases seed treated by H₂SO₄ their stratification with sand, keeping in warm place, or extraction of seed by breaking the hard shell helps in early germination. Seedling may be germinated in small containers to four-leaf stage

and may be planted in the field at a distance of 10-12 meters between them. Budding is considered useful for the development of new varieties. The jujube seeds are sown in the field at desirable distance and budding is done since success in transplanting of seedling is difficult. Whip grafting has been practiced successfully for jujube. Both ring and shield budding can be done successfully during July, whereas, only shield budding is more feasible during August-September. Budding during March, April gives very little success, as there is little sap flow in the mother plant.

Planting time and Varieties

Time of planting is an important factor for its rapid and successful growth. Crop sown on proper time, gave best germination. The best time for planting and budding are first February to March and second is during monsoon from August to October. There are many varieties like soofi, kheerol (chambeli), sanghri and gola. Gola is most popular and is of two kinds, the green (leemai) and the golden (white). White gola is harvested earlier commonly grown in the area. It was investigated that 75% respondents planted the gola Variety, and 10% planted soofi, kheerol (chambeli) and sanghri variety.

Weed Control

The weed control is an important practices in the initial stage of the crop. The growers generally practices three weeding. Removal of weeds is necessary to keep the orchard clean; weeding also conserves moisture and reduces the depletion of nutrients. The orchard should be kept clean by removing wild species of jujube as it acts as an alternate host to fruit fly and powdery mildew. For this purpose ploughing immediately after pruning and second ploughing should be done to remove weeds. In this way garden will remain clean free from diseases.

Fertilizer

It was investigated that growers did not follow the recommendations made by agriculture department and mostly used fertilizer on their own experience. Tables 1 indicate that majority 44% growers applied below recommended dose of urea and 33% applied the recommended dose. The same pattern was found in DAP, in which 3% growers applied above recommended dose, and 40% applied recommended doze of DAP and 42% applied below recommended dose of DAP.

Table 1: Application of Fertilizer in Jujube Orchard

Doze	Urea		DAP	
	Number	% age	Number	% age
Nil	6	6	-	-
Below recommended dose	44	44	42	42
Recommended dose	33	33	40	40
Above Recommended dose	2	2	3	3
Total	85	85	85	85

Source: Survey data, 2002-03

Pesticide

It was found that growers had applied 2 to 3 pesticide sprays to control insect, pests. It was investigated that 25% respondents did not apply any spray, whereas, 20% applied 2 spray and 40% 3 sprays during the year 2003.

Pruning

Pruning is an important practices to keep proper shape and form of Jujube plant. The jujube fruit is borne in the axil of leaves on the growing shoots of the current year. Therefore, full pruning is necessary to induce a good healthy growth to provide maximum fruit bearing. The best time of pruning is mid May to mid June. It is advisable to complete the pruning before mid June, when the plant sheds its leaves and goes to rest.

Harvesting

The harvesting of jujube starts when the fruit reach the marketable stage. Delay in harvesting particularly in season makes the fruit unsuitable for the market. The jujube tree flowers in May to June and again in December to January depending upon variety. Jujube fruit is ready in February and March when no other fruit is available in the market. It takes about 3-4 months to mature its fruit. The yield of grafted trees is heavy and regular too. The skin of the fruit must mature to get better market prices. During harvesting and picking, it must be ensured that fruits are not damaged. The harvested fruits may be stored in a shady place to keep its freshness. It is difficult to adjust its harvesting according to the price situation in the market.

Yield

The yield of jujube varied from farm to farm and from plant to plant. There are number of reasons for yield variation i.e. soil variation, land preparation, attack of insect-pests and diseases. It was estimated that the yield of jujube ranged from 290 mounds to 470 mounds with an average of 380 mds ha⁻¹. It was also examined that there are number of factors, which help to increase the production of jujube, 50% respondents reported by using quality seed, 07 and 28% reported good variety and balanced fertilizer.

Price

There is a wide variation of price received by the jujube growers. The prices in early season are higher than the mid and late session but some times prices in early season become much lower than mid or later session. During the study it was found that the sale price of jujube in the early session was Rs.580/ 40 kg and Rs.420/40 kg in mid session and Rs.200/40 kg in late season.

Economic Analysis

The economic analysis describes the methods used in analyzing economic behavior and the application of inputs, the results obtained to solve economic problems (David, 1979). Economic analysis deals with the cause and effect relationship of economic phenomena. It aims to formulate statement or principles as to what is true or correct under assumed condition.

Economic analysis explains, for example how price is determined under conditions of competition or monopoly, why business fluctuations occur, and what forces promote or retard economic growth (Thomas; M. J, Brennan. 1975). The question whether the business was run profitably or not is determined by an analysis of the enterprise, which is called economic analysis. The objectives of economic analysis are to verify the use of various inputs of production and income obtained. There are many economic measures to determine the profitability of farm business. Yet none of them is perfectly suitable for all-purpose. Some criteria are most suitable to derive certain conclusions. The most important criteria, which are commonly used to analyze efficiency of agricultural enterprise, are calculation of net return and determination of input-output ratio. These criteria were used to determine the economic efficiency of jujube cultivation in selected area of Sindh during 2003.

Jujube cultivation is an economic and resource allocation decision; it is not only to grow on the piece of land, but also to take proper care and application of inputs i.e. fertilizer insecticides and pesticides throughout the season. Growers have to decide whether they should allocate their scarce resources (Land, Labour, Capital and Machinery) to grow jujube or they should utilize these resources for other crops, taking account of both fixed and variable costs.

Fixed Costs

The fixed costs of jujube were estimated by calculating all the costs incurred from initial land preparation until it starts harvesting. The main costs involved are land development, labour and machinery costs. The land development costs included ploughing, planking, leveling and lay out of the field. The land rent, government taxes and markup on the fixed capital have been included in the fixed costs. The wages of permanent labour and repair of farm equipments and other miscellaneous costs were considered as fixed costs (Norman *et al.*, 1985).

Variable Costs

The variable costs consists of production practices, input costs including FYM, fertilizer and pesticides. The wages for hired labour for irrigation, interculturing, spraying, harvesting and transportation and other management practices have been included in the variable costs. These costs are known as working capital, defined as capital requirement to fund the production cycle (Nix, 1979).

The Variable costs are those costs, which are specific to an enterprise and vary with its scale. The variable cost consists of land management, crop inputs, Fertilizers, Pesticides and Irrigation. In addition payments for hired labour for crop production activities. The variable cost varies from farm to farm, from one producer to another and from one crop to another crop, because some producers hire labour for harvesting, picking and others engage family labour.

Marketing Costs

Marketing costs are those expenses, which are incurred by the growers when agricultural commodities move from producing area (farm gate to the market). This is term frequently used to designate expenditures incurred from the time of commodity leave the farm gate till it

reaches the wholesale market. Marketing costs include cleaning, grading, packing and transportation charges. The marketing costs of jujube varied according to the distance of market.

Cost of Production

Total cost is defined as the fixed costs plus variable costs ($TFC + TVC = TC$) (Bishop *et al.*, 1958). The total cost of production was determined to appraise the input-output relationship. For this purpose all costs incurred in the jujube cultivation including marketing costs are aggregated and presented in Table 2.

Net Return

Net return refers to the residual, which remains for the entrepreneurs after subtracting all costs of production from its gross income. Net return was determined by subtracting average per hectare costs from average income per hectare realized by the growers. The net return of jujube growers is presented in Table 3.

Table 2: Cost of Production of Selected Growers

Component Costs	(Rs./ha)
a) Fixes Costs	
Water Charges	195
Usher	390
Zari Tax	495
Total Fixed Costs	1080
b) Variable Costs	
Ploughing	1482
Land Leveling	494
Land rent	4940
F.Y.M	988
Urea	1050
DAP	1852
Tube Well Irrigation	1600
Pesticide Spray	3335
Manual Weeding	988
Pruning	2232
Labour Costs	36000
(Picking, Packing and grading)	
Total Variable Costs	54961
C) Marketing Costs	
Bardana (Bags)	2128
Loading	608
Transportation	9120
Unloading	608
Commission Charges	12160
Total Marketing Costs	24624
Total (a+b+c)	80665

Source: Survey data, 2003

Table 3: Net Return Received by the Selected Grower

Net Return	Amount
Quantity Sold Mds /ha	380
Price Rs. / Mds	400
Total Output Rs./ha	152000
Total Cost Rs./ha	80665
Net Return Rs./ha	71335

Conclusions and Recommendations

The ultimate object of the present study is to improve the economic condition of resource poor farmers. It is only possible by increasing per hectare yield of jujube crop by encouraging growers to adopt recommended production technologies. It is clearly observed that cultivation of jujube in the Musa Khatan and Tando Qasir in Hyderabad district in Sindh has great potential because there is a better net return from jujube growing, compared to other crops grown in the study area.

In fact, jujube is relatively less perishable fruit and its cost of cultivation is comparatively lower than the other major fruits (i.e. mango, dates, banana and guava). In the absence of efficient marketing system and frequent changes in the export policies, a reasonable profit for growers and fair price for consumers cannot be ensured. Therefore, proper marketing of jujube is a most serious problem, which calls for immediate attention. There is need to establish a sound export policy, especially with Middle East, Iran, China which may help in stabilizing jujube prices.

The fore-going analysis has indicated that improved management practices such as proper land development; timely irrigation and use of adequate inputs are necessary to enhance the jujube production. It was also investigate that most of the growers do not know the advantages of timely and adequate use of inputs. The use of chemical fertilizer and labour appear to be limited by the availability of resources with jujube growers. It is therefore, suggested that proper dose of fertilizers, timely use of pesticide sprays and improvement of management operations are essential to achieve better production.

Recommendations

It is necessary to establish nurseries for the propagation of established and tested varieties under strict technical supervision. As suitable system of quality control, certification of cultivars and resistance to disease and insects, pests will have to be evolved to infuse necessary confidence among growers.

The improved high quality seed is an important indicator to achieve good yield and quality produce and it is only possible by planting of good and healthy plants. Therefore, there is need to select the well-trained staff to carry out the timely planting, timely harvesting, grading, picking, packing and timely marketing to get better prices. There is a need to arrange the training of staff in respect of all management operations. There is a need to improve the existing information system and focus should be given to disseminate the information among growers regarding improved production practices and appropriate use of inputs in jujube cultivation.

There is a need to motivate the growers of Sindh to grow more jujubes to earn high net returns. Given the difficulties in resources and extension services, it may be best to target such

efforts at farm level. There is also a need to increase the soil fertility through the organic and inorganic sources. It is therefore suggested that growers seek guidance from local available resources such as, research stations, extension agents and progressive growers of the locality. The timely and proper application of FYM and chemical fertilizers and pesticide sprays to control the insect-pests and diseases are important to achieve better crop yield.

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