PROFITABILITY ANALYSIS OF GRAPES ORCHARDS IN PISHIN: AN EX-POST ANALYSIS

SYED MOHAMMAD KHAIRO, MAQSOOD AHMAD and EHSANULLAH KHAN

Balochistan University of Information Technology Engineering and Management Sciences, Quetta, Pakistan

ABSTRACT

The study presents an ex-post analysis of long-term investment decisions for grape production in the district Pishin, Pakistan. The ex-post analysis offers the true worth of farmer’s long term investment decisions for grape production. A total of 100 grape growers were interviewed to compute the long-term cost of production and financial feasibility. The total production cost estimate indicates that 16 percent were investment costs while the remaining 84 percent were the operating costs. The cost model indicates that operating costs for grape increase with age as the crop inputs and management increases with the passage of time. Among all operating costs, the irrigation water was the major cost constituted about 21% of the total costs followed by fertilizer (nitrogen, phosphorus, potash), which contributed about 13% of total costs. The contribution of Farm Yard Manure was about 10% of the total cost. In addition, the cultural practices, which include weeding, spraying, pruning, layering and soilning, were about 27% of total cost. The long term economic analysis indicates that grapes orchards are found to be highly profitable with healthy rate of return (38%), positive net present value (Rs. 379,287) and benefit-cost ratio (4.82), which is larger than one. To test the robustness of the investment sensitivity analysis was carried out under different costs and benefit assumption. The sensitivity analysis indicates that grape still offers considerable returns indicating the robustness of long term investment. The long term investment analysis shows that investment in grapes orchards has an attractive return provided that orchards are properly managed in the light of advice of agriculture experts. Moreover, considering the grapes water requirement, which is much lower than other fruits such as apple, apricot and plum, it could be the most efficient crop to grow.

Key Words: Grapes, Profitability, Pakistan, Pishin

INTRODUCTION

Grapes (Vitis vinifera) of family Vitaceae is one of the most popular fruits in the world and is grown in temperate as well as sub-topical climates. Grapes are best grown in all types of climates and soils where the production of other deciduous fruits is restricted. It can be grown well in cold and dry climates in valleys in high elevations. A soil having low water holding capacity sandy loam is the best for its growth. In Pakistan, its cultivation is restricted to upland areas of Balochistan, and northern hilly tracts of Punjab and NWFP. The province of Balochistan contributes 98 percent to the national grapes production in Pakistan (GoP, 2006).

A number of varieties of grapes are grown in upland areas of the province. The most famous are, Haita, Kishmishi, Shundokhani, Sahibi and Shekhali are commonly grown popular commercial varieties in Quetta, Pishin, Killa Abdullah, Mastung, Kalat, Loralai and Zhob districts.

The grape is a short duration maturing fruit. While comparing with other deciduous fruits, it has larger quantity of carbohydrates and is the best source of energy. The fruit is consumed both fresh and in a dried form called as Manaka and Kishmish. Despite Balochistan being the premier place for grapes production, the marketing infrastructures and relevant issues are the main hurdle in increasing grapes production and farms incomes.

Grapes growing are basically an economic and resource allocation decision. An orchard planting is not only the planting of trees on a piece of land but it requires incessant care and application of necessary inputs round the year. Growers have to choose whether they should devote their limited resources including land, labor, capital and machinery to plant grapes orchard or they should exploit these resources for other fruits or crops. There is limited information on financial feasibility of long-term investment in fruit orchards in Pakistan in general and in Balochistan in particular. There is also scarcity of consistent and literal information among farmers, market traders,
investors and policy makers about the investment worthiness of fruit orchards. Therefore, this paper is an attempt to find out and analyze the financial worthiness of long-term investment in grapes orchards in Balochsitan province.

MATERIALS AND METHODS

This study is mainly based on primary data however; some secondary data were also obtained from different sources. Primary data were directly obtained through a well-structured and pre-tested questionnaire from grapes growers while secondary data were collected from libraries, government departments and other relevant sources. To support the primary data personal observations and informal surveys were conducted at different levels of the study.

This study was undertaken in Pishin district of Balochistan which is famous for grapes production in Balochistan. A sample of 100 grapes was selected in Pishin district. The survey work for this study was conducted in September 2006. Budgets were estimated for costs and returns from grapes production as for the economic analysis i.e., estimation of gross margins and investment appraisal analyses the estimates about cost of production are required. In this regard, the cost of various inputs used in production and value of various products obtained need to be clearly defined. The methodology adopted to estimate various costs in production is as under:

**Estimation of Various Costs**

Cost and revenue analysis of various crops requires consideration of several elements. The total cost of production is the sum of fixed and variable costs. The fixed cost of grapes was estimated by calculating the initial establishment costs until its start fruiting. The main costs involved are land development, planting material labor, machinery and land rent. The fixed costs were considered as the initial capital investment (Norman, 1985). The variable costs of production contain land leveling, FYM, fertilizer, irrigation, and pesticides. Also labor for irrigation, inter-culturing, hoeing, spraying, farmyard manure and fertilizer application, pruning and other management practices. These costs are known as working capital defined; as the capital required funding the production cycle (Nix, 1979). The various costs incurred were estimated as follows:

**Land leveling**

The prevailing tractor rental rates for land leveling were used irrespective of the ownership of the tractor.

**Farm Yard Manure (FYM)**

FYM costs include FYM value, and its transportation as well as spreading expenses following Chaudhry, *et al.*, 1992 and Ahmad, *et al.*, 1993.

**Fertilizer**

The prevailing market prices were used to compute cost of fertilizer applied and the transport charges were also added to compute overall cost of fertilizer application.

**Irrigation**

Tube well was the main source of irrigation. So, the rate at which tube well water was transacted (i.e. market rate) was used irrespective of the fact whether the farmer owns or does not own his tube well (Ahmad *et al.* 1993).

**Plant Protection**

The actual prices paid by the farmer on purchase of chemical plus spraying cost were used as plant protection cost.

**Labor**

The labor used in various agricultural operations including application of FYM, fertilizer, pesticides and irrigation and cultural practices like weeding, pruning and hoeing etc. was estimated by multiplying the time required for one operation multiplied by the number of operations that activity be performed. The standard operation time for one operation of every activity (specified in Chaudhry, *et al.* 1992) was used to specify the time required for
one operation of the activities. Market or hiring wage rate was used to cost all types of labor used in grapes production.

**Interest or Mark-up**

Markup at the rate of 12 percent on the relevant cost items was used.

**Land Rent**

The prevailing market rate of land rent per acre was used as the opportunity cost of land for an alternative use.

**Benefits/Yield of Grapes**

The physical output of the main product and its market price was used for computing the value of output.

**Long Term Investment Analysis**

The discounting methodology was used to evaluate the cost and return in perennial crop like grapes orchards because growing fruit trees is a long-term investment activity. The first few years of grapes involve only costs and no return. A basic approach is to estimate the annual net present worth by discounting both future costs and returns (Ahmad et al. 1993).

Generally, grapes trees do not start bearing fruit till the 4th year of their life. The reasonable production starts from 10 years after plantation and will be improving for more than 100 years. The revenue from grapes was obtained by the sale price of the physical product in the market.

In orchards where expenditure involved and profits obtained spread over a number of years, the flow of future costs and returns are also important. The following three significant techniques considering the time value of money over the life of investment were used:

i. Net Present Value
ii. Internal Rate of Return (IRR)
iii. Benefit-Cost Ratio Analysis

**Net Present Value (NPV)**

NPV of an investment is the sum of the present values for each year’s net cash flow (or net cash revenue) less the initial cost of investment. The equation for finding the present value of an investment is:

\[
NPV = \sum_{K=1}^{n} \frac{AK_{(1+i)^K}}{(1+i)^K} - A_o
\]

Where, NPV is net present value,

\[
\sum_{K=1}^{n} \frac{AK_{(1+i)^K}}{(1+i)^K}
\]

is sum of present value of future net cash flows,

and \(A_o\) is the initial investment.

**Internal Rate of Return (IRR)**

The actual rate of return on an investment with proper accounting for the time value of money is IRR. It is the discount rate that makes the present value of net cash revenue just equal to zero. The equation for finding IRR is

\[
IRR = \sum_{K=1}^{n} \frac{AK_{(1+i)^K}}{(1+i)^K} = A_o
\]

Where, IRR is the internal rate of return

\[
\sum_{K=1}^{n} \frac{AK_{(1+i)^K}}{(1+i)^K}
\]

is sum of present value of future net cash inflows,

and \(A_o\) is the initial investment or sum of expected cash outflows.
Benefit-Cost Ratio Analysis

It is defined as “ratio of present value of the streams of benefits to the present value of streams costs” (Case, 1996). Cost and revenue analysis of various crops requires consideration of several elements. The total cost of production is the sum of fixed and variable costs. The fixed cost of grapes was estimated by calculating the initial establishment costs until its start fruiting. The main costs involved are land development, planting material labor, machinery and land rent. The fixed costs were considered as the initial capital investment (Norman, 1985).

\[
\text{Benefit cost Ratio} = \sum_{K=1}^{n} \frac{A_K}{(1+i)^K} \frac{1}{A_0}
\]

where,

\[
\sum_{K=1}^{n} \frac{A_K}{(1+i)^K} \text{ is sum of present value of future net cash flows}
\]

\[and A_0 \text{ is the initial investment or sum of expected cash outflows.}\]

RESULTS AND DISCUSSION

Cost of Production of Grapes

Like in other enterprises both fixed and variable costs are involved in grapes production. The details of various costs and their share in total cost are presented below:

Initial Fixed or Investment Costs

Establishment of vineyard is a long term investment made by the farmers. Here the farmers put their resources not for an early return as in other annual crops but after four years the orchards starts bearing and the return. Fixed or investment costs included costs on land preparation, trenches making for grapes, pits and planting. Table I and II show the investment activities and costs incurred in the initial few years.

Operating/ Variable Costs

The variable or operating costs included costs on irrigation, fertilizer, FYM and other cultural practices. Table I and II show the operating activities and variable costs incurred in the entire period of 60 years.

Quantity and Share of Different Inputs used in Grapes Production

The data given in table II shows the average share of all inputs in grapes production and their percent share in total cost of production. Of the total production costs about 16 percent costs were investment costs while the remaining 84 percent were the operating costs. As grapes are irrigated by tube wells so the irrigation cost was the major cost item constituted about 21 percent of the total costs followed by fertilizer (nitrogen, phosphorus, potash) 13 % and FYM 10 %. While the other cultural practices which include weeding, spraying, pruning, layering and soiling etc. included about 27 % of total costs. A glance at various cost items shows that almost all costs increases with the increasing age of orchard as the crop requirement increases. The share of different inputs in total cost of production almost remains the same in the entire life span of grapes orchard.
**Table I. Grapes yield and inputs (per acre)**

<table>
<thead>
<tr>
<th>Year</th>
<th>Unit 1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11-20</th>
<th>21-30</th>
<th>31-40</th>
<th>41-50</th>
<th>51-60</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yield</td>
<td>kg</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Inputs</td>
<td>acre</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Investment costs</td>
<td>rupees</td>
<td>600</td>
<td>675</td>
<td>689</td>
<td>702</td>
<td>716</td>
<td>731</td>
<td>745</td>
<td>783</td>
<td>798</td>
<td>814</td>
<td>830</td>
<td>872</td>
<td>916</td>
<td>961</td>
</tr>
<tr>
<td>Land preparation</td>
<td>rupees</td>
<td>600</td>
<td>675</td>
<td>689</td>
<td>702</td>
<td>716</td>
<td>731</td>
<td>745</td>
<td>783</td>
<td>798</td>
<td>814</td>
<td>830</td>
<td>872</td>
<td>916</td>
<td>961</td>
</tr>
<tr>
<td>Pitting and planting</td>
<td>rupees</td>
<td>600</td>
<td>675</td>
<td>689</td>
<td>702</td>
<td>716</td>
<td>731</td>
<td>745</td>
<td>783</td>
<td>798</td>
<td>814</td>
<td>830</td>
<td>872</td>
<td>916</td>
<td>961</td>
</tr>
<tr>
<td>Grapes plants</td>
<td>rupees</td>
<td>600</td>
<td>675</td>
<td>689</td>
<td>702</td>
<td>716</td>
<td>731</td>
<td>745</td>
<td>783</td>
<td>798</td>
<td>814</td>
<td>830</td>
<td>872</td>
<td>916</td>
<td>961</td>
</tr>
<tr>
<td>Land rent</td>
<td>rupees</td>
<td>600</td>
<td>675</td>
<td>689</td>
<td>702</td>
<td>716</td>
<td>731</td>
<td>745</td>
<td>783</td>
<td>798</td>
<td>814</td>
<td>830</td>
<td>872</td>
<td>916</td>
<td>961</td>
</tr>
<tr>
<td>Operating costs</td>
<td>rupees</td>
<td>600</td>
<td>675</td>
<td>689</td>
<td>702</td>
<td>716</td>
<td>731</td>
<td>745</td>
<td>783</td>
<td>798</td>
<td>814</td>
<td>830</td>
<td>872</td>
<td>916</td>
<td>961</td>
</tr>
<tr>
<td>Irrigation</td>
<td>unit</td>
<td>24</td>
<td>24</td>
<td>24</td>
<td>24</td>
<td>24</td>
<td>24</td>
<td>24</td>
<td>24</td>
<td>24</td>
<td>24</td>
<td>24</td>
<td>24</td>
<td>24</td>
<td>24</td>
</tr>
<tr>
<td>Nitrogen</td>
<td>kg</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Phosphorus</td>
<td>kg</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Potash</td>
<td>kg</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>11</td>
<td>19</td>
<td>20</td>
<td>25</td>
<td>25</td>
<td>30</td>
</tr>
<tr>
<td>FYM</td>
<td>kg</td>
<td>1000</td>
<td>1100</td>
<td>1210</td>
<td>1331</td>
<td>1460</td>
<td>1615</td>
<td>1780</td>
<td>2000</td>
<td>2200</td>
<td>2420</td>
<td>2662</td>
<td>3000</td>
<td>3600</td>
<td>4500</td>
</tr>
<tr>
<td>Hoeing</td>
<td>acre</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Weeding</td>
<td>acre</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Spraying</td>
<td>acre</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Pruning</td>
<td>acre</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Other</td>
<td>rupees</td>
<td>1000</td>
<td>1050</td>
<td>1103</td>
<td>1158</td>
<td>1216</td>
<td>1276</td>
<td>1340</td>
<td>1407</td>
<td>1477</td>
<td>1551</td>
<td>1629</td>
<td>1710</td>
<td>1796</td>
<td>1886</td>
</tr>
</tbody>
</table>
### Table II. Financial budget of grapes production (Costs and Returns)

<table>
<thead>
<tr>
<th>Rs./acre</th>
<th>Year 1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11-20</th>
<th>21-30</th>
<th>31-40</th>
<th>41-50</th>
<th>51-60</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revenue</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1500</td>
<td>4500</td>
<td>15000</td>
<td>35000</td>
<td>68000</td>
<td>96000</td>
<td>135000</td>
<td>140000</td>
<td>145000</td>
<td>155000</td>
<td>155000</td>
<td></td>
</tr>
</tbody>
</table>

#### Input costs

<table>
<thead>
<tr>
<th>Investment costs</th>
<th>Average Cost</th>
<th>% of total cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land preparation</td>
<td>12605</td>
<td>840</td>
</tr>
<tr>
<td>Pitting and planting</td>
<td>3000 2000 998</td>
<td>400</td>
</tr>
<tr>
<td>Grapes plants</td>
<td>1000 800 600 0</td>
<td>160</td>
</tr>
<tr>
<td>Land rent</td>
<td>600 675 689 702 716 731 745 783 798 814 830 872 916 961 1009</td>
<td>789</td>
</tr>
</tbody>
</table>

#### Operating costs

<table>
<thead>
<tr>
<th>Operating costs</th>
<th>Average Cost</th>
<th>% of total cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Irrigation</td>
<td>2400 2400 2424 2400 2400 2400 2400 2400 2400 2400 2718 4000 4000 4000 4000</td>
<td>2849</td>
</tr>
<tr>
<td>Nitrogen</td>
<td>0 0 0 360 360 360 420 510 780 780 600 660 750 900 900</td>
<td>492</td>
</tr>
<tr>
<td>Phosphorus</td>
<td>0 0 0 480 480 480 560 680 1040 1040 800 880 1000 1200 1200</td>
<td>656</td>
</tr>
<tr>
<td>Potash</td>
<td>0 0 0 420 420 420 490 595 910 910 700 770 875 1050 1050</td>
<td>574</td>
</tr>
<tr>
<td>FYM</td>
<td>705 1195 1315 1315 1460 1460 1500 1535 1640 1725 1750 1013 1100 888 890</td>
<td>1299</td>
</tr>
<tr>
<td>Weeding</td>
<td>400 400 450 427 450 450 466 650 650 660 750 1325 800 820 830</td>
<td>635</td>
</tr>
<tr>
<td>Spraying</td>
<td>0 670 700 700 838 1414 1598 1262 943 800 853 900 1010 953 965</td>
<td>907</td>
</tr>
<tr>
<td>Pruning</td>
<td>0 600 600 600 700 550 550 800 800 1044 1100 1150 1249 1260 1356</td>
<td>824</td>
</tr>
<tr>
<td>Other</td>
<td>500 1135 2100 1000 1000 1000 1000 765 1089 2509 1230 1290 1068 1000</td>
<td>1179</td>
</tr>
</tbody>
</table>

#### Sub-total Input costs (A+B)

<p>| | | | | | | | | | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>21210</td>
<td>9875</td>
<td>9875</td>
<td>8404</td>
<td>8824</td>
<td>9265</td>
<td>9729</td>
<td>10215</td>
<td>10726</td>
<td>11262</td>
<td>12610</td>
<td>12800</td>
<td>12990</td>
<td>13100</td>
</tr>
</tbody>
</table>
Grapes Production Trend

The Fig.1 shows the response of production to the orchards age. As the grapes orchards become older and older the production increase. However, at certain age the production starts declining. The trend line shows that on average the grapes orchards production increases with increasing rate till it reaches to a mature age of 20 year, produces optimal yield till 50 years and then start declining after 50 years. The grape production response with age could be essentially captured with polynomial production function. The production model fit reasonably well with the age, which can be seen as high $R^2$.

![Grapes production trend](image)

Long Term Investment Analysis of Grapes

Inflation is a fact of life and for long-term investments that may reduce the value of future cash flows. Two approaches are common to measure the effect of price inflation in investment analysis. First, constant prices and the real rate of interest can be used. Second, current prices and the market rate of interest can be used when discounting future cash flows (Selvavinayagam, 1991). For grapes orchards constant prices from 2006 were used. The price data were used from the survey record as reported by the grapes producers. According to (Khushk, 2000) given the instability currently inherent in Pakistan’s economy it is difficult to predict future real rates of interest, so the current market rate of interest has thus been used as the discount rate. The return on investment in grapes orchard was determined and estimated against the current rate of interest on agricultural loans, i.e. 38% per annum.

Investment analysis is the process of determining the profitability of an investment and require four pieces of information: (1) the net cash revenue from the investment, (2) its cost, (3) the terminal or salvage value of investment, and (4) the interest or discount rate to be used (Kay 1986).

The discount rate used is the opportunity cost of capital representing the minimum rate of return required to justify the investment. If the proposed investment will not earn this minimum, the capital should be invested in an alternative investment. If the money is to be borrowed to finance the investment, the discount rate should be greater than or equal to the cost of borrowed capital (Kay 1986).

Net Present Value (NPV)

NPV of an investment is the sum of the present values for each year’s net cash flow less the initial cost of investment. The decision rule in this approach is to accept that investment having a positive NPV, those with negative NPV will be rejected while a zero value makes the investor indifferent (Kay 1986).
The grapes growers reported that subject to grapes saved from epidemic disease and insect pest it starts reasonable production from 10th year after plantation and reaches to maximum production after 20 years. The productive life of grapes according to growers is more than 100 years. Grapes are grown in trenches of 10 to 20 meters size, so intercropping is not practiced. Grapes have a negative cash flow during the first few years of its planting due to: i) No revenue as the grapes starts fruiting after three years and ii). Due to the initial establishment costs of planting orchard. The significant cash flow was obtained after 11 years and showing an increasing trend afterwards. The net present value was Rs. 379,287 at 12% discount.

**Benefit-cost Ratio Analysis**

A second discounted measure of investment worthiness is the benefit-cost ratio analysis. It is obtained by dividing the present worth of the benefit stream by the present worth of the cost stream. The absolute value of the benefit-cost ratio vary with the change in the interest rate, therefore, the higher the interest rate, the smaller the resultant benefit-cost ratio and vice versa. The decision rule of this technique is to accept those projects in which at least the cost of the stream equals the benefit of the stream (1:1). The present analysis shows a benefit-cost ratio 1: 4.82.

**Internal Rate of Return**

The discounted measure of project worth is to find discount rate, normally applied to calculate an investment’s cash flow. It is estimated such that the present value (NPV) of net income stream becomes zero. The decision rule in this approach is to accept that investment having an IRR greater than or equal to the market rate of interest”. The IRR was estimated as 38%.

**Sensitivity Analysis**

Sensitivity analysis was carried out to see the shock absorbing capacity of investment in grapes orchards under different cost and benefit assumptions i.e., increasing costs by 20%, reducing benefits by 20% and both increasing costs by 20% and reducing benefits by 20 % as given in table III. The sensitivity analysis indicates that grape still offers considerable returns indicating the robustness of long term investment.

<table>
<thead>
<tr>
<th>Scenario</th>
<th>NPV (Rs.)</th>
<th>B-C Ratio</th>
<th>IRR (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benefits decreased by 20%</td>
<td>299,523</td>
<td>4.02</td>
<td>34</td>
</tr>
<tr>
<td>Cost Increased by 20%</td>
<td>359,428</td>
<td>4.02</td>
<td>34</td>
</tr>
<tr>
<td>Benefits decreased by 20% &amp; Cost Increased by 20%</td>
<td>279,664</td>
<td>3.00</td>
<td>31</td>
</tr>
</tbody>
</table>

Several studies have been undertaken in past to analyze the financial viability of long term investment in perennial crops/orchards at international and national level. Their results show almost the same scenario for different fruits as the results of present study. Sharif and Ahmed (2004) analyzed financial viability of long-term investment in citrus orchards in Punjab. They found that the payback period of citrus orchard begins from 7th year, net present value (NPV) was Rs.188, 490 at 12% discount rate and internal rate (IRR) of return was 33% with no-intercropping. However, the payback is 5th and 6th year when intercropped with wheat and barseem respectively. In such case the NPV was Rs185445 and IRR 49%. Another study was undertaken by Khushk (2000) who examined the profitability of long-term investment in guava orchards in Sindh. He found that the payback period of guava is orchard starts from 3 years, NPV at 12% discount rate is Rs.21440 and internal rate of return was 20%. The analysis indicates that 40 years is the optimum economic life of guava orchards. In Balochistan work has also been done on the subject. Khair (2006) examined the financial viability of long-term investment in dates orchards in Mekran Balochistan. He found that the payback period of dates orchard starts from 5 years, NPV at 12% discount rate is Rs.73506 and internal rate of return was 17% while Benefit cost ratio was 1:53. In another study Khair et al. (2002) studied the production practices and constraints in production and marketing of apple in Balochistan. They reported that marketing was most costly activity contributing 49% to the variable cost, followed by the production 45% and intercropping costs 6%. Ninety percent of farmers reported insect and disease problems in their orchard. In the same direction Rashid et al. (2005) analyzed financial viability of long-term investment analysis in apple orchards in Balochistan. They found that the payback period of apple orchard begins from 7th year, net present value (NPV) was Rs. 196016 at 12% discount rate and internal rate (IRR) of return was 16% with no intercropping. While the benefit
cost ratio analysis shown a figure of 1:53. However, the payback is 5th and 6th year when intercropped with wheat and tobacco respectively. In such case the NPV was much more than what is without intercrops.

CONCLUSION AND RECOMMENDATIONS

The estimation of cost of production of grapes and the appraisal of financial feasibility of long-term investment analysis in grapes orchards has been carried out through collecting primary data from 100 farmers. Water was the major cost constituted about 21 percent of the total costs followed by fertilizer (nitrogen, phosphorus, potash) 13 % of total costs and FYM 10 % of the total costs. While the cultural practices which include weeding, spraying, pruning, layering and soiling etc. included about 27 % of total costs. Water being the most scarce production input has been depleting rapidly in the area due to indiscriminate pumping to irrigate the high delta crops like apple, plum, apricot etc. as the ground water table is declining by more than five meters a year. The return on investment in grapes orchard was determined and estimated against the current rate of interest on agricultural loans, i.e. 12% per annum. Because grapes are grown in trenches, no intercropping in young orchard was observed in grapes. The investment analysis suggested that investment in grapes orchard has favorable returns on capital invested. The return on investment was worthwhile with NPV Rs. 379,287, IRR 38% and benefit-cost ratio was predicted as 1:4.82.

The above figures of investment analysis shows that investment in grapes orchards has an attractive return provided that orchards are properly managed in the light of advice of agriculture experts. Grapes being low delta crop have the potential to replace the other high delta fruit crops like apple, plum, apricot etc. to cope with acute water shortage. Keeping in view the high returns from grapes orchards and acute water shortage, it is advisable to plant grapes being a low delta and highly profitable fruit instead of other high delta fruits. There is ample scope to increase the grapes yield per acre many fold which is quite below that of other advanced countries. To increase the yield per acre the growers should be trained about proper orchard management practices (proper use of chemical fertilizers, pesticides, pruning and irrigation) through integrated efforts of research and extension.

REFERENCES
