Financial Feasibility Study of Bananas Tissue Culture Commercial Production in Egypt

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Abstract:
Tissue culture is a viable alternative for the production of agricultural commodities, high yield and quality therefore; the efficiency of targeted research study is to apply the method of tissue culture bananas and methods of raising the efficiency of production, with recognition of feasibility study.

The most important results of this study can be summarized as follow:
1- The net present benefit was positive under all the five proposed conditions which mean the profitability of the banana tissue culture commercial production.
2- The benefit/cost Ratio at 8% and 12 % of the discount rates, was more than 100% which means that the banana tissue culture commercial production is a profitable project for young unemployed youth.
3- The IRR was more than the opportunity cost under all the five proposed conditions of this study and this proves the high profits that can be gained from this project.

Key words: Banana, tissue culture, commercial production, Feasibility study, IRR,

Introduction
Banana is an important fruit crop in Africa and in Egypt, due its great economic importance as well as nutritional value and high availability throughout the year. Recently the use of tissue culture in propagating banana increased remarkably, as it is considered the only known method to eliminate viral diseases and one of the modern breeding methodologies for many vegetables and fruit crops. Nowadays in Egypt, Banana is one of the most important crops that are bred in a manner tissue culture, which is characterized by a great deal in increasing the quantity produced of the crop (Aboul-Nasr, 2013). In addition, it adds to product quality and excellence through a great deal compared to the traditional method, which is highly exposed to nematode infections, and viral diseases. The fedden (4200 m²) production ranges 14-25 tons of a tissue culture manner compared to the traditional way, which has a yield per
fedden 8-14 tons. The most important banana varieties deployed in Egypt, which are bred in the laboratory, are Jrndnan, Williams and Williams Zeaf class (Khalid, 2010).

**Problem of the study:**
Banana production by traditional agriculture faces many of weaknesses, mainly reducing the amount of production of the crop, as well as the spread of pests and diseases. In addition to the low quality of the crop output, productivity fluctuations from year to year per fedden, and hence the deficit in the supply of the crop as well as the high price. This has led to the tendency to look at other agricultural methods to increase production of the crop, including the method of tissue culture.

**Objective of the study**
Since tissue culture is a viable alternative for the production of agricultural commodities, high yield and quality therefore, the efficiency of targeted research study is to apply the method of tissue culture bananas and methods of raising the efficiency of production, with recognition of feasibility study.

**Data source:**
This study was based on field data to the technique of tissue culture bananas, from the Green Valley laboratory of banana tissue culture production, Hadiek Elqopa, Cairo, Egypt on February 2013 (Aboul-Nasr, 2013).

**Methodology:**
Two kinds of measurements were used in this study which was undiscounted and discounted measurements (Suzan et al., 2008). Further, sensitivity analysis of the project was done under uncertain expectations. Five suggested unexpected conditions could face this project and its impact of profitability (Ali, 2005; Thanaa, 1997) and (Allah, 2000). These conditions are as follow:

- Increasing the total costs by 10% with constant of other parameters.
- Decreasing the profit by 10% with constant of other parameters.
- Increasing the total costs by 10% with decreasing the profit by 10% at the same time.
- Increasing the total costs by 20% with constant of other parameters.
Increasing the total costs by 20% with decreasing the profit by 10% at the same time.

This study suggests some points that are shown in Table 1, these points are as follow:

- The life span of project is 10 years.
- The discount factor which use in the central bank at 2012/2013 is 7%.
- The depreciation at the last year of project calculated based on 5% from value of the inputs which used.
- The price and volume of inputs and outputs are remain during life span of project.
- 100 jars of banana plant are use at one cycle.
Table 1: Some economic indicators of banana tissue culture commercial production.

<table>
<thead>
<tr>
<th>Items</th>
<th>Indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Life span</td>
<td>10 years</td>
</tr>
<tr>
<td>Interest rate</td>
<td>7%</td>
</tr>
<tr>
<td>Number of starting banana plants</td>
<td>100 jar</td>
</tr>
<tr>
<td>Number of jars to be produced</td>
<td>10000 jar</td>
</tr>
<tr>
<td>Price of starting banana exported jars</td>
<td>$ 100</td>
</tr>
<tr>
<td>Sale price of one jar</td>
<td>$ 1.4</td>
</tr>
<tr>
<td>Depreciation</td>
<td>5%</td>
</tr>
<tr>
<td>Capital costs</td>
<td>$ 8350.2</td>
</tr>
<tr>
<td>The annual working capital</td>
<td>$ 7721.25</td>
</tr>
<tr>
<td>The total working capital</td>
<td>$ 77212.5</td>
</tr>
<tr>
<td>The total costs</td>
<td>$ 85562.7</td>
</tr>
<tr>
<td>The total benefits</td>
<td>$ 151211</td>
</tr>
<tr>
<td>The net benefits</td>
<td>$ 65648.3</td>
</tr>
</tbody>
</table>

Source: Collected and calculated on February 2013, from field study data form the Green Valley laboratory of banana tissue culture production, Hadiek Elqopa, Cairo, Egypt.

Tissue culture and the intended objectives

Tissue culture means the cultivation of plant tissue growth of cells, tissues or parts of various plant in glassware and sometimes plastic containing medium which is made of nutrients and other supplements needed by plants and is done under aseptic conditions under complete sterilization. The jars are kept in a growth room under controlled temperatures and light in accordance with the requirements of the appropriate plant. Figure 1 Illustrates the time table for banana explants in the tissue culture laboratory and this helps in understanding the time, the costs and the number of plants per period.

Figure 1: The time table for banana explants in the tissue culture laboratory.
Advantages of tissue culture:

1. Small size of the portion used in reproduction.
2. Cultivation takes place under sterile conditions, under the environmental conditions, "heat and light is adequate."
3. Free plants resulting from the diseases.
4. Easy to maintain these plants and stored until needed.
5. This technique in breeding is characterized by increasing the production yield and quality with lower production costs compared to traditional methods.

Objectives of tissue culture:

1. A quick way for breeding and production of excess plants.
2. Get free virus strains.
3. Genetic improvement of crops.
4. Production of some chemical therapeutic and natural materials.
5. Easy transfer of seedlings and availability throughout the year.
6. Homogeneity in plant growth and timing of flowers and fruits.
7. Cultivate in inappropriate time.

Results of the Study

Results of undiscounted measurements:

Table 2 illustrated the results of the financial study of banana tissue culture by using undiscounted measurements. The payback period is about 3 years and this is considered short period to cover the investment costs. It also can be seen that proceed for unit of outlay has reached 7.9, which means that every dollar invests in this project can get a net revenue about $ 6.1. This table shows also that the average annual proceeds per unit of outlay is about 180.1%.
Table 2: Results of the financial feasibility of banana tissue culture commercial production by using undiscounted measurements.

<table>
<thead>
<tr>
<th>The measurement</th>
<th>The result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Payback period</td>
<td>3 years</td>
</tr>
<tr>
<td>Proceed for unit of outlay</td>
<td>7.9</td>
</tr>
<tr>
<td>Average annual proceeds per unit of outlay</td>
<td>180.1%</td>
</tr>
<tr>
<td>Net income</td>
<td>$ 65648.3</td>
</tr>
</tbody>
</table>

Source: Collected and calculated on February 2013, from field study data form the Green Valley laboratory of banana tissue culture production, Hadiek Elqopa, Cairo, Egypt.

Results of discounted measurements:

Table 3 illustrated the results of financial study of banana tissue culture by using discounted measurements. The present value of benefit, of investment, of working costs and of total costs were $ 41747.9, $ 7731.3, $ 51809.5 and $ 59541 respectively. The benefit/cost ratio was about 170% and this illustrate that the tissue culture laboratory for producing banana plants project has a high profitability. It was found also that net benefit /investment ratio (NB/I) is about 1310% and this ratio illustrate that the value of net benefit was almost 13 folds the value of investment. This indicates the high profitability of this project. By calculating net benefit/working costs ratio (NB/WC) which was about 195.5%, the profitability is so clear. Further, the internal rate of return (IRR) was 10.2%, which can be compared to the interest rate which was about 7% to prove the profitability of this project. In other words, this project can gain 3.2% more than the opportunity cost (the interest rate).
Table 3: Results of the financial feasibility of banana tissue culture commercial production by using discounted measurements calculated at 8% discount rate.

<table>
<thead>
<tr>
<th>The measurement</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>The present value of benefit (PVB)</td>
<td>$101288.9</td>
</tr>
<tr>
<td>The present value of costs (PVC)</td>
<td>$59541</td>
</tr>
<tr>
<td>Net present value of net benefit (PVNP)</td>
<td>$41747.9</td>
</tr>
<tr>
<td>Benefit /cost ratio (B/C)</td>
<td>170.1%</td>
</tr>
<tr>
<td>The present value of investment (PVI)</td>
<td>$7731.3</td>
</tr>
<tr>
<td>The present value of net benefit /investment ratio (NB /I)</td>
<td>1310.1%</td>
</tr>
<tr>
<td>The present value of working capital (PVWC)</td>
<td>$51809.5</td>
</tr>
<tr>
<td>The present value of net benefit /working capital ratio (NB /W)</td>
<td>195.6%</td>
</tr>
<tr>
<td>Internal rate of return (IRR)</td>
<td>10.200%</td>
</tr>
</tbody>
</table>

Source: Collected and calculated on February 2013, from field study data form the Green Valley laboratory of banana tissue culture production, Hadiek Elqopa, Cairo, Egypt.

Results of Sensitivity test:

Table 4 shows the results of sensitivity analysis under uncertain expectations of banana tissue culture commercial production. Sensitivity test has been used in this study to show the effect of some changes which could face the project under uncertain conditions and its impact on the profitability of this project. In this study there were five unexpected conditions had been suggested could face this project as following:

First- Increasing total costs by 10%:

1- When the benefit/cost ratio was calculated at 8% of the discount rate, was about 154.7%, while it reached 366.7% at 12% of the discount rate. The previous ratios showed that the profitability was not affected by this condition.

2- The incremental net benefit or the incremental net cash flow was about $35794.2 at 8% of the discount rate, while it was about $287775 at 12% of the discount rate.

3- The IRR under this condition was about 10.2% and by compering this ratio with the opportunity costs of capital (8% interest rate), the profitability was so clear. The payback of the capital costs under this condition was about 3 years and this considered a short period to cover the investment costs.
Second- Decreasing the benefit by 10%:

1- The benefit/cost ratio was calculated at 8% of discount rate, was about 153.1%, while it reached to 150.2% at 12% of discount rate. It was cleared that the profitability under this condition still high and it has not affected by decreasing at benefit.
2- The incremental net benefit was about $ 31619.1 at 8% of the discount rate, while it was about $ 25628.3 at 12% of the discount rate.
3- The IRR under this condition is about 10.2% and by comparing this ratio with opportunity costs of capital (8% interest rate), the profitability was clear, while the payback of capital costs under this condition was about 3 years.

Third- Increasing total costs by 10% with Decreasing of the benefit by 10% at the same time:

1- The benefit/cost ratio was calculated at 8% of discount rate, was about 139.2%, while it reached to 136.5% at 12% of discount rate. Although the total costs increased and the benefit decreased but the profitability has not affected by this condition.
2- The incremental net benefit was about $ 25664.6 at 8% of the discount rate, while it was about $ 20519.8 at 12% of the discount rate.
3- The IRR under this condition is about 10.2% and by comparing this ratio with opportunity costs of capital (interest rate) which is equal 8%, the profitability has been cleared. The payback of capital costs under this condition is about 4 years.

Fourth- Increasing the total costs by 20%:

1- The benefit/cost ratio has been calculated at 8% of discount rate, it was about 141.8%, while it reached to 336.2% at 12% of discount rate. The previous ratios show that the profitability has not affected by this condition.
2- The incremental net benefit or the incremental net cash flow was about $ 29839.9 at 8% of the discount rate, while it was about $ 23935.4 at 12% of the discount rate.
3- The IRR under this condition is about 10.2% and by comparing this ratio with opportunity costs of capital (interest rate) which is equal 8%, the profitability has been cleared. The payback of capital costs under this condition is about 4 years and this considers short period to cover the investment costs.
Fifth- Increasing the total costs by 20% with Decreasing of the benefit by 10% at the same time:

1- The benefit/cost ratio has been calculated at 8% of discount rate, it was about 127.6%, while it reached to 125.1% at 12% of discount rate. Although the total costs increased and the benefit decreased but the profitability has not affected by this condition.

2- The incremental net benefit or the incremental net cash flow was about $ 19710.8 at 8% of the discount rate, while it was about $ 15411.7 at 12% of the discount rate.

3- The IRR under this condition is about 10.2% and by comparing this ratio with opportunity costs of capital (interest rate) which is equal 8%, the profitability has been cleared. The payback of capital costs under this condition is about 5 years.

Table 4: Results of sensitivity analysis under uncertain expectations of banana tissue culture commercial production.

<table>
<thead>
<tr>
<th>The measurement</th>
<th>proposed conditions*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Benefit /cost ratio at 8%</td>
<td>154.7%</td>
</tr>
<tr>
<td>Benefit /cost ratio at 12%</td>
<td>366.7%</td>
</tr>
<tr>
<td>Net present worth at 8%</td>
<td>35794.2</td>
</tr>
<tr>
<td>Net present worth at 12%</td>
<td>28775.0</td>
</tr>
<tr>
<td>Internal rate of return (IRR)</td>
<td>10.217%</td>
</tr>
<tr>
<td>Payback period (year)</td>
<td>3</td>
</tr>
</tbody>
</table>

Source: Collected and calculated on February 2013, from field study data form the Green Valley laboratory of banana tissue culture production, Hadiek Elqopa, Cairo, Egypt.

(*) as stated in the methodology.

From all over the above results a conclusion can be reached as follow:

The net present benefit was positive under all the five proposed conditions which mean the profitability of the banana tissue culture commercial production. Further, the benefit/cost Ratio at 8% and 12 % of the discount rates was more than 100% which means that the banana tissue culture commercial production is a profitable project for young unemployed youth. Finally, the IRR was more than the opportunity cost under all the five proposed conditions of this study and this proves the high profits that can be gained from this project.
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