Banana-Growing tissue and its Impact on the Economic Return per Fedden in Egypt

Khaled S. M.[a]; Fatma Ahmeed Shfique[b] and Monia Bahaa El-Din Hassan[b].

[a] Department of Plant Nutrition ,[b] Department of Agricultural Economics, National Research Centre, Egypt.

Abstract: Due to the great economic importance of banana crop, which emanates from the fact that it is characterized by a high nutritional value, nice taste and flavor compared to other fruit crops, availability in the market during most of the year, and easy handling and storage, the current study focused on exploring the potentials for expanding the cultivated areas and improving the quality of banana crop. Qalyoubia Governorate was selected to represent banana production under traditional system, and Nubaria region was selected to represent banana production under both traditional and tissue culture systems. The study used percentages to estimate the relative importance of banana production areas and other economic variables. The study concluded that banana grown by tissue culture outperformed banana grown under traditional farming at the level of all the studied economic variables, where average profit from tissue cultured banana reached 591% the profit realized from traditionally produced banana. Furthermore, it was found that tissue cultured banana is better in terms of shape, taste, and nutritional value, in addition to obtaining a crop that is free of viral diseases. Therefore, the study recommended providing support to expand in tissue culture banana production as a substitute for traditional production in order to raise the productivity thus exports of Egyptian banana. [Nature and Science 2010;8(10):267-273]. (ISSN: 1545-0740).

Key words: Agriculture tissue - traditional agriculture - growing bananas - the economic importance - capital costs - the profit

1. Introduction:

Banana is an important fruit crops in Egypt, due its great economic importance as well as nutritional value and high availability throughout the year. Recently the use of tissue culture increased remarkably, as it is considered one of the modern breeding methodologies for many crops, vegetables and fruit. Banana is the most important crop is bred in a manner tissue culture, which is characterized by a great deal in increasing the quantity produced of the crop, in addition to product quality and excellence through a great deal compared to the traditional method, which is highly exposed to nematode infections, especially in the roots. The fedden production ranges (14-25 tons) of a tissue culture manner compared to the traditional way, which has a yield per fedden (8-14 tons), in order to select a high-yield plants before breeding by tissue culture. The most important banana varieties deployed in Egypt, which are bred in the laboratory, are Jrndnan, Williams and Willaims Zeaf class.

Problem of the study:

Banana production by traditional agriculture Faces many of weaknesses, mainly reduced 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 applying the method of tissue culture bananas in a manner comparable with traditional agriculture and methods of raising the efficiency of production in a manner tissue culture, with recognition of the most important problems facing the production of this style and empowered to find solutions to those problems.

2. Data source and methods

Research was based on field data to the technique of tissue culture bananas, from the villages Um-Saber and Omar Makram in El-Nubareya representing new land, where is ranked first in terms of area planted with bananas between the governorates of the Republic. The land area is cultivated bananas by about 38% of the total area of Banana Republic in 2008, the total banana production by about 46% of the total production of banana republic. As well as the villages of Mit-Attar, al-Ramla in Qaliubiya Governorate, which represents banana cultivation in the traditional manner, where only the cultivated area by about 6% of the total

production of the Republic represents about 1% of the total production of banana republic.

The samples were taken from 80 farms consisting of 40 farms each province, 20 farms apply the system of tissue culture bananas and twenty farms apply the traditional method for the same crop. The questionnaire is designed to include the area under cultivation, agriculture and transactions, the costs of production requirements in the style tissue agriculture and traditional agriculture. Moreover the cost of agricultural operations for crop production methods and comparison of specifications in production methods and the problems and obstacles for each type implanted tissue agricultural method. The study used some methods of descriptive and quantitative analysis to estimate the profitability of banana planted fedden for each of the two methods of agriculture.

Method of banana tissues culture cultivation

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 nutrients is made up of nutrients needed by plants and is done under conditions of complete sterilization and utensils, including content from the medium and plant material known as the farm tissues and farms are saved in nurseries can be controlled temperatures and lit in accordance with the requirements of the appropriate plant.

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 strains of virus.

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 appropriate time, in March and September of each year to have flowers in the month of July and August, the crop is ready for harvest in mid-October at this time be a high price in the domestic market.

1. The use of tissue culture as a quick means of reproduction and a high production of plant

For strain, followed by vegetative reproduction in several ways, including planting bulbs and tubers, Alchormp, Madadat Alrizumatt and roots and the formation of the mind and the spin-off vaccination, add to that a new technique of tissue culture cells.

2. Pathogen free plants

Is obtained from the virus-free plants using this technique in several ways, including:

a. Shoot tip culture
b. Use the exact immunization
c. Initiation of nuclear embryo

3. The genetic improvement of crops

a - can be adopted a method of tissue culture to overcome the obstacles that impede the production of new varieties, a goal sought by plant breeders.

b - If possible, isolate the embryos genus at an appropriate time and develop the appropriate medium can be obtained on embryos, which suffer from the phenomenon of infertility endospermic a great goal for plant breeders.

c - Using tissue culture and cell suspensions can plant breeder in laboratory to deal with a large family, be easier for him a very important election and can elect to many recipes such as disease resistance and resistance to salinity, drought and others.

d - This new technique is known as a technique of genetic engineering and cultivation of the endospermic crosses sexual and quality when you want to transfer the prescription from plant to plant, another work that is impossible using traditional methods.

4. Production of pharmaceuticals and other natural products

The active ingredient Can be extracted from some plants (such as basil, mint) to produce aromatic oils, and by growing tissues or different members of those plants to get on the fabric of lime to be drawn from the active material without the need to cultivate the plant as a whole and thus can provide plots of land required to grow these plants and the provision of effort for the cultivation of the plant as a whole and the provision of the effort required to extract these materials from the plant is full and that is very useful in economic terms.

5 – Cultivation in a proper time:

It is the month of March and September of each year for payment of flowers in July and August

and the crop is ready for harvest from mid-October and this time the price is high in the domestic market.

Varieties deployed in Egypt, which are bred in the laboratory:

1- Jrndnan:

A short-stem varieties with a stem length of 2.5 meters and weighs about 25-35 kilograms Allsoppatp and needs braces and a salt-affected category and has recently spread reclaimed land and the advantage of the fruits with high quality.

2 - Alolliams:

A species with a long leg about 3 meters and weighs about 25-35 kilograms Allsoppatp and needs leg braces and is characterized by large size fruit and high quality.

3 - Willaims. Zeaf

A species with a long leg about 3-4 meters, also weighs about 25-35 kilograms Allsoppatp by the fertilization and cultivation of suitable land in the new light and with low salinity is characterized as the fruit of large size and high quality.

Steps stages of agriculture in the style of agriculture in the tissue banana:

1 - Start-up phase (Almrseetm).
2 - Stage of replication.
3 - Phase of rooting.
4 - The stage of regionalization.
5 - Stage of education

1 - Start-up phase (Almrseetm).

Grow Almrseetm (0.05 -1.3 cm) and that part free from the virus and because the rate of cell division Almrstimip greater than the rate of division and multiplication of the virus, as well as the Summit Almrstimip are natural sites for the production of IAA, which impedes the spread of the virus, as well as the process of metabolism very active and the virus can be doubled within the cells and, finally, there is no connection receptacles that allow the virus to move through from one cell to another.

In this stage Alchormat is cut to the appropriate size and then placed in a beaker of 60% Clorox + 40% distilled water + 0.3 g Mercuric chloride with its status on a shaker for 30 minutes and empty the beaker of disinfectants and then placed by distilled water and washing is done 3 cycles of washing the good so as to eliminate completely the effects of disinfectants, which are then the process of agriculture within the neighbor and put each part vegetable (Mrseetm) inside the tube or his neighbor's small, and after planting movement of these neighbors to a room of growth and placed in complete darkness for three weeks with a temperature of 28 ° c.

The objective of this stage is to get the farm pollution-free sterile fungal, bacterial and plant part is a high quality. M.S mediums are used in addition to growth regulators (sucrose and agar). This stage offset by many of the problems of pollution (fungal - bacterial), the brownish color from phenolic materials, internal bacterial contamination.

2 - Stage of replication.

The objective of this stage is the rapid numerical increase of embryos and shoot, which eventually lead to an increase and multiply side shoots. Encouraging the side shoots in this stage by using cetoknyn, it helps to cell division and the formation of side shoots. Plants are transfered every three weeks with a maximum range of six movements. At each transfer the following procedures were happen:

1 - Tiwiesh (Stock slipper), 2- Cleaning Rule, 3 - construction of Rule and 4 - Alclasp of 3 to 4 buds. If we assume in theory that the rate of doubling = 3, and the transfer of plant number 5 movements = 3^5 = 243 plants or 6 gears 3^6 = 729 plants, so then move it to the growth chamber at a temperature 25 to 27 ° c and lighting 9-12 hours. One of the problems facing this stage, are Spontaneous bacterial contamination as well, the phenomenon of the glass mutation.

3 - Phase of rooting.

This stage includes the preparation of the target plant for suitable transferring to the soil. The method of successful breeding using tissue culture technique is to prepare well these plants rooting where the proportion of Auxins at this stage increase and decrease in the medium or never add cytokinines.

Examples of auxins

1 - Indole Acetic Acid. IAA.
2 - Indole Butyric acid, IBA.
3 - Naphthalene Acetic acid, NAA.

In this stage plant separates into individual plant and remove the yellow leaves with clean base and put plants in jar and be divided by length (long - medium - short) in each group so that it contains form 8 to 11 plants in each jar block. Then, transferred to growth chambers at a temperature of 25 to 27 ° c and lighting 9-12 hours. One of the problems that facing this stage also is the spontaneous bacterial contamination.

4 - The stage of Localization

First stage: This stage is the final process in plant tissue cultures procedure. The plants to be transported from agar medium in the lab have to be with certain conditions, including:

1 - The plant height of 3: 5 cm.
2 - The plant tags of 3: 5 sheets.
3 - The plant should be with hair roots.

The plant will be eliminated from the agar medium and a good wash with tap water to eliminate any traces of agar and then placed in the plant fungal disinfectant bath (Bnlit - Rbzulks) 1 g / liter for half a minute and thus have been processing plants in this phase.

Second Stage: After processing plants in the first phase is grown directly so as not to lose moisture and wilted by the following process:
1 - Preparing plastic pots with 5 cm in diameter and placed the mixture consisting of well-washed sand 1: 2 peatmoss.
2 - Each plant is grown in the pot should not exceed the length of the sand covered more than 0.5 cm.
3 - Put plants growing in pots, plastic in the greenhouse in particular, a greenhouse of has a plastic covered with 12 m * 4.5 m dimension and the tables of compound bows are covered with clear plastic and there are Sprinkles gun inside and outside the brackets for irrigation and increase the percentage of moisture until reaches 100%. There are also Thermometers for measuring temperatures of small and great, so no more than in summer for 30 ° C inside the greenhouse, as there are electric heaters on the surface of desks, at the bottom of the plant to raise the temperature during the winter months so that not less than 25 ° C, this green house can have ten thousands plants per batch.
4 - Leave these plants under the plastic cover with the use of irrigation for a period of 5 sec / half hour in order to maintain high humidity and temperature appropriate and not open the plastic cover for a period of 20-25 days.
5 - The new composition of roots Start after week and there were a total radical becomes good after a month.
6 - After 25 days, beginning the process of hardening and the lid opens gradually, starting from 0.5 hours a day, and that the cover is removed completely with increasing periods of sprinkle irrigation.
7 - After making sure that the configuration of the total root, fertilizer added to plants by foliar use of compound fertilizers (NPK).
8 - After a period ranging from 35-45 day it becomes the length of the plant about 12:15 cm, the view of new cards and here is ready to transfer in the large greenhouse.

5 - Stage of breeding:

Preparing a greenhouse covered with mesh Seyran rate of 63% shade and irrigated with sprinkle irrigation, the plants transferred to it with the following procedures:
1 – Preparing plastic bags with capacity of 5 kilograms by mixing 2:1 (sand: ptimus).
2 - The small plants growing in pots transferred to bags with caution to prevent rupture of the roots.
3 – Adding compound fertilizers to these plants after week once every week at 5 g / plant for a month. Then become twice a week for another month, spraying on the leaves.
4 - These plants stay in green house a period ranging from 90-125 days where, it reached a length of 40-50 cm; at this stage the plants are ready to transfer the farm.
5 - During this period, the plants are spraying every two weeks by insecticides such as mlaithon resistance to aphids.
6 – The existing plants should be noted to eliminate any plants showing differences in shape or color of the leaves or plant height in order to avoid mutations so do not give plants not comply with the class.

One of the problems that facing this stage, the emergence of mutations that must be disposed of quickly and definitively, which occur as a result of the greed of some producers and increasing the number of hops (during replication), leading to variations in the plants.

Advantages and shortcomings in the plant tissue in a manner:

Tissue culture banana crop is facing with several obstacles, including pollution, fungal, bacterial, which consider the most serious problems facing Growers plant tissue in bananas, so the study recommends the need for caution from various pollution sources, both the output of the central plant or farming tools and equipment used in the preparation of the medium. As well as, avoid contamination resulting from the lack of good sterilization for chormp at the beginning stage (starting). Also banana has a yellow summit of developing the output of the lack of calcium in the medium, treatment of this phenomenon must be increased concentration of calcium in the medium with the increase in gas exchange in containers of Agriculture. As well as reducing the phenolic material in the medium which, responsible for the composition of brown tissue and working to reduce the plant part so that a small part File-hosting is being exposed to reduces oxidation. In addition, the use of antioxidants either soak parts of the plant in it or added in the medium, or both with the use of PVP in the beginning stage starting soak plant parts in it. As well as the use of citric acid the beginning stage by soak the plant parts in it, and should reduce the concentration of salts in the medium, particularly

nitrogen which entering in the composition of many plant hormones (hormones - amino acids - enzymes - Auxins - Alcetochinin). The use of active coal helps in reducing phenols by adsorbing. The importance of the medium in reducing phenolic substances causing the composition of brown hormones should be removed from the medium first because it works to increase the phenols. Must also overcome, the phenomenon of mutation, resulting from the greed of some producers and increasing the number of hops (during replication), leading to variations in the plants, such as tightening the control of workers in transport operations. To overcome the phenomenon of the glass plant, which refers to the presence of a defect in Physiology (Plant Physiology), which of the symptoms and the presence of abnormalities in the leaves of the plant leads to yellowish color (the tissues are watery due to the increase water uptake). Must increase the calcium in the medium because the deficiency leads to the emergence of the phenomenon, with the removal of benzyl adenine BA (Alcetochinin) from the medium to work to reduce this phenomenon, as that increased agar concentration in the medium reduce this phenomenon, but reduces the rate of replication.

The banana crops are infected in Egypt with many diseases and pests through the various stages of growth, such as viral and fungal diseases and nematodes. The viral diseases are the most serious of these diseases, including disease reflect the summit, which is transmitted by an insect (*Pentalonia nigronetvosa*), the plant was evacuated to the plant proper and the seriousness of this disease is limited in that the plants affected does not bear fruit, could easily spread the disease through an insect from the banana, there is no chemotherapy but to get rid of it by remove plant and burn it. The insect can not be seen easily on plants because its presence in the sheaths of leaves. The initial symptoms appear after 40 days and be clear after 50 days of injection of the virus in plants by aphids, and left the virus as a result of increased high-speed plants infected plants and vice versa. we can not save any plant if someone is injured a member of the Jura. To combat this disease must be the following:

1 - Election of the cultivation of seedlings intact.
2 - Preventing the importation of banana seedlings from contaminated areas are ill or infected insect Aphids.
3 - Use of pesticides, specialized in the fight against aphids and should be a regular spraying every 10 days and take into account the arrival of spray solution to areas that are hidden by the insect in the plant.
4 - The elimination of sources of infection to death of infected trees and burning them, after a spraying process.
5 - Periodic inspection of the plants.
6 - Cutting the infected plants to small pieces and burn off the farm.

The banana mosaic disease:

Which is caused by a virus that affects a number of plants, crops Cucurbita family, that transported by insect *Myzus persice* from peaches. This disease causes in banana production decline by about 7%. To combat this disease, you must:

1 - Remove the weeds that grow inside the banana farm.
2 - Not to plant vegetables in the banana plantations.
3 - Chemical spraying constantly using chemical pesticides.
4 - Remove the infected plants and purified unfair lime neighborhood, extinguished by and let this gore exposed to the sun for not less than three months before replanting.

3. Results of the Study:

It is clear from Table (1) the cultivated area, productivity, production of bananas grown two methods of traditional agriculture and tissue culture. The selection of the governorates of Qena, Giza, Menoufiya issued ranked first in terms of area planted with bananas governorates of Upper Egypt, Central, Lower Egypt, respectively, and planting their bananas in the traditional manner, as well as selecting Nubariya representative of the banana-growing by tissue culture. It is seen from the table that, the total area cultivated crop for the three governorates, representing some 16 679 fedden. While, the cultivated land area with banana in the province of Nubaria by tissue culture 17 534 fedden, an increase of about 855 fedden for the three governorates of the previous reference to them an increase of about 4.9%. As can be seen from the table reduced the cultivated area in banana plantations around the traditional 7.1%, 11.6% and 22.03% for each of the governorates of Qena, Al-Giza, Menoufiya, respectively. While the proportion of fruitful area for banana tissue culture in Nubariya about 100%. As can be seen from the same table that the yield per feddan in the traditional manner for the three governorates, ranging from 14-15 tons / fedden. As for the counterpart tissue culture has reached double about 30 tons per fedden in the province Nubareya. While, the total amount of banana production in the three governorates around 209 999 tones, while the amount of tissue culture banana-producing province, some 526 020 tons Nubareya increase amounted to about 86.7%.-Naira Y. S. (2002(4).

Table (1) The area, productivity and total production of bananas grown by the two methods of traditional agriculture and tissue culture of the most important provinces of Egypt in 2008

Governorates	Total area (fedden)	Fruitful area (fedden)	Productive	Production (ton)	Propagation	Farm age
Upper Egypt (Qena)	6918	6430	14	91980	Traditional	**3 years**
Middle Egypt (Giza)	3580	3166	14	44534		
Lower Egypt	6181	4819	15	73485		
Nubaria	17534	17534			**Tissue culture**	**5 to 6 years**

Source: Ministry of Agriculture and Land Reclamation Sector - Economic Affairs - Central Department of Agricultural Economics - Department of Statistics records - unpublished data for the year 2008-2009**.**

1- Economic comparison between the two methods of traditional agriculture and tissue culture bananas:

As illustrated in table (2), the productivity of the banana crop by traditional methods ranging from 8-14 tons, double the state of agriculture in the tissue to about 15-25 tons, and in many cases to 30 tons. This may be due to the use of modern methods of breeding and the use of improved varieties with high productivity, as well as the use of water Requirement with optimal irrigation and fertilization, which lead to increased productivity. As can be seen from the table, the average variable costs per fedden concluded the value of seedlings, the cost of transporting seedlings, human labor, automated, nitrogenous fertilizers, potassium, phosphate, farmyard manure and petty cash amounted to about 12 941 pounds in the case of traditional agriculture and about 16 823 pounds in the case of tissue culture with an increase of 30% for the traditional counterpart. While the average total cost per fedden to 16 932 pounds/ fedden in conventional agriculture compared to 21 979 pounds per fedden counterpart tissue. The average rate per ton of bananas grown in a manner traditional agriculture about 1437 pounds versus 1868 pounds for his grown agricultural method tissue, The table shows that the cost per ton implanted in the traditional way amounted to about 773 pounds versus 1017 pounds for his tissue and the average profit per feddan planted in the traditional manner to 6159 pounds versus 1017 pounds for his tissue. From the above mentioned it is clear that the cultivation of banana tissue culture exceeds than its conventional counterpart by nearly 30%.

Table (2) Fedden average production, variable costs and the total costs of fedden planted bananas with traditional and tissues culture for the year 2008/2009.

Variable	Method of traditional agriculture*	Method of tissue culture **
Production per fedden Tons	14-8	25-15
Average variable costs per fedden in pounds	12941	16823.3
Average total cost of the pound fedden	16932	21978.9
Average fixed costs of feddens pound	3992	5189.6
Average price per ton pound	1437	1868
The average value of production per	14847	23268
feddan (thousand pounds)	773	1017
Cost per pound	6159	8006.7
Average profit per fedden pounds	1616	2101
The value of the seedlings	1507	1959.1
Human action	5699	7408.7
Action Automatic	1335	1735.5
Nitrogen fertilizers	908	1180
Potassium fertilizers	699	909
Phosphate fertilizer	277	360
Farmyard manure	816	1061
Sundry	83	108

Source: * Fixed costs include the rental value of free price and an irrigation network.
Collected and calculated from field study data for the year 2008/2009
** Method from the traditional villages of Mit-Attar, al-Ramla province of appreciation.
Method of tissue or the villages of Saber and Omar Makram province Nubaria

3.Conclusion:

Comparing the traditional banana-growing by the two methods (traditional and tissues) show an increase in productive space, productivity and production of tissue culture in a manner of about 15.7, 109.8% and 155.5% compared to conventional counterpart as shown in table (3). Comparing the average costs and profits for both methods has been shown that, the average production per feddan implanted tissue has increased by about 81.8% for traditionally grown counterpart. Also increased both the average total cost per ton and the price of about 30% in the case of the use of tissue culture compared with conventional counterpart. While, both the average value of production are increased and the average cost per ton of bananas grown in a manner tissue by 56.7% and 31.7%, respectively, for the conventional counterpart. Despite an increase in average cost per ton implanted tissue. However, the value of production increased as 25%, thus increasing the average profit by 590.8% compared to traditional agriculture as shown by the table (4). The study therefore recommends the need to mainstream method of tissue culture bananas in the remaining governorates. This interesting laboratory for tissue culture and supply of imported seedlings, which may not be able to buy by farms, and supply up-to-skilled labor to use of modern technology. The study also suggests increasing the role of agricultural extension in the new lands (Nubareya) and to raise awareness of modern irrigation methods and use the required efficiency and to secure the highest productivity of the crop. monia Bahaa El Din Hassan (2001)**(3)**

Table (3): fruitful areas, production and productivity cultivated with traditional and tissue culture

Governorates	Fruitful Area %	Productivity	Production (ton)
Traditional agriculture	86.4	14.3	210
Tissue culture	100	30	526

Source: Compiled and calculated from Table (1) study

Table (4): compare the costs and profits per feddan to the technique of growing bananas Traditional and tissues

Variables	Traditional agriculture	Tissue culture	Growth rate%
Average production per feddan	11	20	81.8
Average variable cost	12941	16823.3	30
Average total cost	16932	21978.9	29.8
Average fixed costs	3992	5189.6	30
Average price per ton	1437	1868	30
The average value of production	14847	23268	56.7
Cost per ton	773	1017	31.7
Average profit	1159	8006.7	590.8

Source: Compiled and calculated from Table (2) study

Corresponding author
Khaled S. M
Department of Plant Nutrition
National Research Centre, Egypt.

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