COST OF SEEDLING TUBERS PRODUCED FROM TRUE POTATO SEED IN THE SPRING SEASON IN EGYPT, 1989

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Abstract

Cost of producing seedling tubers-small tubers from densely planted TPS-in plastic house-protected nursery beds in four sites during the spring season 1989 in Egypt are measured. Average yields were 7.7 Kg/m^2, an improvement over previous levels. Peat moss and plastic were the most important single cost items as they represent about 44% of the total cost. The cost of TPS was 2% of total costs . The cost of producing one ton of seedling tubers was $ 571 and the results indicated that the cost of planting material on a unit area basis can be reduced by 48% by using seedling tubers vs traditional seed tubers.

INTRODUCTION

Potato is one of the major world Food crops ranking fourth in importance in the world after wheat, maize and rice. In Egypt it is an important vegetable crop with both area and yield increases contributing to a large and steady growth in production during the 1980s.

The lack of good seed tubers is a significant constraint to the Further development of the potato sector in Egypt. Importing seed potatoes from Europe has become prohibitvely expensive and locally produced seed is high cost (Crissman *et al,*

1991). Hence intensive technological efforts are under way to develop planting material in the form of seedling tubers from true potato seed (TPS) as an alternative seed potato system (El Bedewy *et al.* 1987). Seedling tubers are the small tubers (<20/g) produced from closely planted seedlings from TPS.

Research conducted by Engels and Schwenkel (1989) indicated that under Egyptian conditions, it is possible to sow TPS in nursery beds under semicontrolled conditions.

MATERIALS AND METHODS

Four trials were carried out at four sites during the spring season 1989. The sites were the Research Station of the International Potato Centre at Kafr El Zayat, the station of the Agricultural Producetion Orgainzation at Kurashia, Both in Gharbia governorate, the Agricultural Research Station at Etay Elbaroud in Behaira governorate and the Research Station of potato Growers cooperatives at Taweela in Dakahlia governorate. For all sites except the CIP station, this was the first experience with seedling tuber production. Technical consulting was provided to the other sites by CIP staff.

Five hybrid TPS progenies were planted. These progenies, all produced in Chile -were Serranax DTO-33, Serrana x DTO 28, Serrana x LT - 7 , Atazimba x LT - 7 and Atzimba x DTO 28. During January 17 - 23, the TPS were sown in nursery beds consisting of a sand and peat moss mix in the top 3-4 cm with the rest soil nitrogen, potash and phosphate fertilizers were applied as reommended. Insecticides and fungicides were used to protect the plants as needed. Irrigation was done by sprinkling cans, especially in the early stages after planting and sprouting, and later in some sites, by flooding . Plastic tunnels were used to protect the seedling against low temperatures during the first two months after planting . Harvesting was done manually from May 25 to June 1, giving a period from planting to harvest of about 127 days.

In this study [1] costs are estimated. A questionnaire was used to record actual costs of various items at the four sites during several field visits from January to June 1989 . Costs included variable and fixed costs.

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(1) The efforts of Ali Rizk and his colleagues are gratefully acknowledged for the collection of data used in this study.

RESULTS AND DISCUSSION

Cost Items

Costs were recorded for all farm operations. Data on production inputs were recorded, in both physical and monetary terms. Hours of human labor and their costs were calculated using the prevailing wages for each operation in all sites. For machinery, actual working hours were recorded and the local rates of rent were used for costs. Actual amounts of fertilizers, insecticides and fungicides used in each site were recorded and their costs were calculated based on the pervailing prices at local agricultural cooperatives. The seeding rate was based on recommendation developed by CIP at Kafr El Zayat and the TPS cost was based on estimates of Monares and Achata (1988).

Monares and Achata (1988), in a study of experimental production of hybrid TPS in Chile, found highly variable costs, but based on production during three seasons, average cost of the hybrid TPS was estimated at US $ 336/kg. This price includes a 2% marketing cost but does not include any additional mark up above actual costs.

An annual cost to operate a plastic house was calculated based on depreciating the productive life of the components and the labor cost to construct the house. Calculation of land rent was based on the prevailing annual market rent at each site, adjusted for the period the sites was actually occupied. Cost of storage for the harvested seedling tubers was calculated based on an average cost of storing a metric ton of seedling tubers in a refrigerated storage and a nawalla , the traditional ambient temperature on- farm storage. Refrigerated storage costs $ 31.70 / ton/ month, storage in the nawalla costs $ 11.9 /t/mo , giving an average cost of storage of $ 21.8/t/mo. Presprouting treatment to initiate sprout growth consists of putting the seedling tubers in trays and placing them in diffused light conditions until sprouts begin to emerge , the costs are for the chitting trays and the labor involved. Cost of management and supervision was calculated on the basis of the average salary of the agricultural officer and the part of his time devoted daily to supervise this activity as one of his responsibilites in the research station. The salaries and wages of the administrative personnel and support staff were also assigned as costs, based on the share of the area of the station utilized in producing seedling tubers and the time the space was occupied.

An interest rate of 16% was applied to the amount of capital invested. This

rate is approximately equivalent to the foregone opportunity of depositing the capital at the bank at the time of the study . Interest was calculuted only for nine months. which is the period required for producing the seedling tubers plus the storage period needed until planting time the next season.A detailed listing of the quantities and costs of the various inputs averaged across the four sites is provided in Table 1. Summarized totals for each site are provided in Table 2.

Production Costs

Seedling tuber production requires relatively little capital investment with the plastic houses accounting for less than 28% of total costs. Variable production costs account for just under 60% of total costs and are dominated by materials costs. Interest represents all the remaining costs.

Interestingly , the share of TPS in total costs is minimal . Increasing the cost of TPS from $ 336 to $ 1, 200/kg (approximately the cost of a kilogram of hybrid tomato seed in Egypt) would increase its share of total cost from 2% to only 7% . In comparison , peat moss and plastic, respectively accounting for 26% and 18% of total costs are the largest two cost items . Under Egyptian conditions, developing low cost alternatives for these two items would have a much greater impact on reducing total costs than changing TPS prices.

Yields

Average yields for each plastic pouse were estimated by randomly selecting three blocks, each one meter square. production from each block was weighed and average yield per square meter was calculated. Total production from the 18 plastic houses was 2.55 tons. With an average yield among all sites of 7.7 kg/m^2 (Table 2), the yield of seedling tubers continued to improve from past experience in Egypt. El Bedewy and Crissman (1991) reported yields averaging 6kg /m^2 , thus the reported yields represent a 22% increase from previous levels.

However, there were significant differences in yields among the sites. This was due to different progenies and differences among the sites. For instance, the low yield at Kurashia may be related to the poor drainage system and some flooding of nursery beds.

Cost of Producing a Ton of Seedling Tubers

On average, a ton of marketable seedling tubers costs $ 571 (Table 2) . Note

Table 1. Itemized costs (in `US dollars) of producing seedling tubers from true potato seed (TPS) in spring season, 1989).

Items and Operations	All sites		Percentage share
	quantity	total cost (s)	
Total area (m^2)	436.8		
Planted area[1] (m^2)	330.0		
Variable Costs			
Labor (man/days)			
Land preparation	2.8	5.57	0.5
Sowing	9.2	17.99	1.7
Irrigation & Fertilization	8.7	16.71	1.5
Hilling & Weed Control	13.4	26.46	2.4
Plant Protection	2.3	4.33	0.4
Harvesting	17.8	31.42	2.9
Post - harvest	8.7	13.8	1.3
Total	62.9	116.38	10.7
Mechanical Operations (hrs)			
Plowing Hoeing	0.3	1.01	0.1
Hoeing	2.1	1.81	0.2
Irrigation	11.0	4.93	0.5
Transportation	6.7	11.54	1.1
Sprinkling	5.5	3.44	0.3
Total	25.6	22.73	2.2
Materials			
Peat Moss (kg)	672.0	285.96	26.4
Sand (m^2)	0.6	1.33	0.1
Nitrogen (20.5% a.i.) (kg)	23.3	1.24	0.1
KO_2 (48% a.i.) (kg)	9.1	0.24	2
P_2O_2 (15.5% a.i.) (kg)	132.0	4.27	0.4
TPS Seed (gm)	75	22.67	2.1
Herbicides & Fungicides		23.72	2.2
Total		339.43	31.3
Rent for nursery beds		12.07	1.1
Management and Supervision		65.13	6.0
Post - Havest		55.52	5.1
Storage		18.00	1.7
Pre - planting		13.52	6.8
Total		629.26	58.1
Total Variable Costs			

Table 1. (Continued)

Items and Operations	All sites		Percentage share
	quantity	total cost (s)	
Fixed Costs			
Steel rods (5 year life)		75.12	6.9
Plastic (3 year life)		194.26	17.9
Rope (1 year life)		14.39	1.3
		12.96	1.2
Total		296.73	27.4
Sprinkler can (5 year life)		4.43	0.4
Chitting Trays		36.17	3.3
Total Fixed Costs		337.33	31.2
Total Production Costs		966.59	89.3
Interest (16% annually for 9 mo)		115.99	10.7
Total costs		1082.58	100

Note : 1. Total area differs from planted area due to allowance for walkways.
2 . A dash indicates a percentage share < .1%
Source : Own Survey.

that the remainder of the seedling tubers not considered marketable are not considered as a loss but can be used again as seed for nursery production of the second generation of seedling tubers . That value as seed has not been accunted for here . Though exact recommendations are not yet finalized, the current suggested average seeding rate for seedling tubers is 650 kg/ha. Thus the seed cost is $ 371/ha (L.E. 872) for seedling tubers . During the spring season 1989, a survey of farmers found their costs for tuber seed at $ 709/ha (L.E. 1666) (Sabaa *et al* , 1991). Seedling tuber costs are approximately 52% of seed tuber costs , an important savings for farmers.

REFERENCES

Table 2. Cost (in US dollars) of producing seedling tubers from true potato seed at four sites in Egypt, spring season, 1989.

Items	Kafr El Zayat	Kurashia	Etay Elbaroud	Taweela	Average 100m2
Number of houses	8	6	2	2	-
Total area (m^2)	264.0	110.4	31.2	31.2	-
planted area (m^2)	192.0	90.0	24.0	24.0	-
Progenies planted[2]	1,2,3 4,5	2,5	2	2,5	
variable costs					
Labor	59.94	36.13	8.65	11.67	35.27
Machinery	15.19	2.66	4.33	0.55	6.89
Materials	201.16	87.16	22.96	28.28	102.89
Rent	5.53	4.21	1.33	1.00	5.32
Management	34.44	14.40	8.14	8.14	19.74
Post-Harvest	49.91	11.95	5.23	6.93	22.30
Total	365.67	156.51	50.64	56.57	192.41
Fixed costs					
plastic Houses	213.26	50.26	18.21	19.43	91.27
Other	24.31	5.88	2.57	3.41	10.94
Total	237.57	56.14	20.78	22.84	102.21
Interest	72.39	25.52	8.57	9.53	35.15
Total Cost	675.63	238.17	79.99	88.94	329.77
Yield (kg/m2)	8.9	4.6	7.5	10.0	7.71
Total prod. (kg)	1,711	414	181	140	771
Marketable seed (kg)	1,283	310	130	180	578
Cost /unit ($/ton)	395	575	442	371	571

Notes:

1. Progenies are ; 1) Serrana x DTo 33 2) Serrana x DTo 28 3) Serrana x LT-7 4) Atzimba x LT -7 5) Atzimba x DTO 28

Source : Own Survey.

Appendix Table 1. Itemized Costs (in L.E.) of producing seedling tubers from true potato seed (TPS) in spring season, 1989).

Items and Operations	All sites		Percentage share
	quantity	total cost (s)	
Total area (m^2)	436.8		
Planted area (m^2)	330.0		
Variable Costs			
Labor (man/days)			
Land preparation	2.8	13.10	0.5
Sowing	9.2	42.27	1.7
Irrigation & Fertilization	8.7	39.28	1.5
Hilling & Weed Control	13.4	62.19	2.4
Plant Protection	2.3	10.17	0.4
Harvesting	17.8	73.84	2.9
Post - harvest	8.7	32.64	1.3
Total	62.9	273.49	10.7
Mechanical Operations (hrs)			
Plowing Hoeing	0.3	2.37	0.1
Hoeing	2.1	4.25	0.2
Irrigation	11.0	11.59	0.5
Transportation	6.7	27.12	1.1
Sprinkling	5.5	8.09	0.3
Total	25.6	53.42	2.2
Materials			
Peat Moss (kg)	672.0	672.00	26.4
Sand (m^2)	0.6	3.14	0.1
Nitrogen (20.5% a.i.) (kg)	23.3	2.91	0.1
KO_2 (48% a.i.) (kg)	9.1	0.56	2
P_2O_5 (15.5% a.i.) (kg)	132.0	10.03	0.4
TPS Seed (gm)	75	53.28	2.1
Herbicides & Fungicides		55.74	2.2
Total		797.66	31.3
Rent for nursery beds		28.36	1.1
Management and Supervision		153.05	6.0
Post - Harvest			
Storage		130.48	5.1
Pre - planting		42.30	1.7
Total		172.78	6.8
Total Variable Costs		1478.76	58.1

Appendix Table 1. (Cont)

Items and Operations	All sites		Percentage share
	quantity	total cost (s)	
Fixed Costs			
Steel rods (5 year life)		176.54	6.9
Plastic (3 year life)		456.50	17.9
Rope (1 year life)		33.81	1.3
Labor		30.46	1.2
Total		697.31	27.3
Sprinklery can (5 year life)		10.41	0.4
Chitting Trays		85.0	3.3
Total Fixed Costs		792.72	31.2
Total Production Costs		2271.48	89.3
Interest (16% annually for 9 mo)		272.57	10.7
Total costs		2544.05	100

Note : 1. Total area differs from planted area due to allowance for walkways.
2 . A dash indicates a percentage share < .1%

Source : Own Survey.

Appendix Table 2. Cost (in L.E.) of producing seedling tubers from true potato seed at four sites in Egypt, spring season, 1989.

Items	Kafr El Zayat	Kurashia	Etay Elbaroud	Taweela	Average 100m2
Number of houses	8	6	2	2	1
Total area (m^2)	264.0	110.4	31.2	31.2	30.0
planted area (m^2)	192.0	90.0	24.0	24.0	15.0
Progenies planted[2]	1,2,3 4,5	2,5	2	2,5	
variable costs					
Labor	140.85	84.90	20.32	27.42	82.9
Machinery	35.70	6.24	10.18	1.30	16.2
Materials	472.72	204.82	53.96	66.47	241.8
Rent	13.00	9.90	3.12	2.34	12.5
Management	80.94	33.84	19.13	19.13	46.4
Post-Harvest	116.12	28.10	12.28	16.29	52.4
Total	859.33	367.8	118.99	132.95	452.2
Fixed costs					
plastic Houses	501.16	118.10	42.80	45.66	214.5
Other	57.12	13.82	6.04	8.01	25.7
Total	558.28	131.92	48.84	53.67	240.2
Interest	170.11	59.97	20.14	22.39	82.6
Total Cost	1587.72	559.69	187.96	209.01	775
Yield (kg/m2)	8.9	4.6	7.5	10.0	7.71
Total prod. (kg)	1,711	414	181	240	771
Marketable seed (kg)	1,283	310	130	180	578
Cost /unit ($/ton)	923	1352	1038	871	1341

Notes:1. All costs are in Egyption pounds.

1. Progenies are : 1) Serrana x DTo 33 2) Serrana x DTo 28
3) Serrana x LT-7 4) Atzimba x LT -7
5) Atzimba x DTO 28

Source : Own Survey.

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دراسة تكاليف إنتاج الدرنات الصغيرة الناتجة من البذور الحقيقية للبطاطس خلال موسم الربيع فى مصر من عام ١٩٨٩

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تعتبر البطاطس من أهم محاصيل الخضر في مصر سواء من حيث الاستهلاك المحلي أو كمحصول تصديري ويعتبر ارتفاع تكلفة التقاوي اللازمة لزراعة محصول البطاطس بالاضافة الي انخفاض جودة درنات التقاوي التقليدية من المشاكل الرئيسية التي تواجه إنتاج البطاطس في مصر ، ومن ثم فإن جهودا مكثفة تبذل حاليا لتنمية بديل منخفض التكاليف للتقاوي التقليدية. وقد أظهرت النتائج الأولية لتلك الجهود امكانية استخدام الدرنات الصغيرة الناتجة من البذور الحقيقية للبطاطس كمصدر بديل للتقاوي لإنتاج محصول البطاطس في مصر.

وقد استهدفت هذه الدراسة تقدير تكاليف انتاج الدرنات الصغيرة من البذور ١٠٧٤ الحقيقية للبطاطس لخمسة هجن في أربعة مواقع مختلفة وهي محطة بحوث المركز الدولي للبطاطس بكفر الزيات ، محطة هيئة الانتاج الزراعي بالقرشيه، محطة البحوث الزراعية بإبتاي البارود، ومحطة بحوث الجمعية التعانية لمنتجي البطاطس بالطويله – دقهليه . وقد سجلت تكاليف الانتاج للبنود المختلفة سواء كانت تكاليف مرحلة الانتاج أو تكاليف ما بعد الحصاد ، وذلك باستخدام استمارات إستبيان تم استيفاؤها من المواقع المختلفة خلال موسم ١٩٨٩ من خلال عدة زيارات ميدانية قام بها الفريق البحثي.

أوضحت الدراسة أن متوسط انتاجية المتر المربع قد بلغ حوالي ٧,٧ كجم من الدرنات الصغيرة حيث بلغ جملة انتاج ثماني عشرة صوبه بلاستيكية (مساحتها ٣٣٠ متر مربع) حوالي ٢,٥٥ طن، كما بلغ متوسط تكلفة انتاج الطن من الدرنات الصغيرة حوالي ١٣٤١ جنية (٥٧١ دولار) . ومن بين بنود التكاليف المختلفه فقد مثلت تكلفة كل من مادة البيت موس والبلاستيك النسبة الاكبر حيث بلغت حوالي ٢٦٪ ، ١٨٪ علي التوالي ، بينما مثلت تكلفة البذور الحقيقية للبطاطس حوالي ٣٪ فقط . وبمقارنة تكلفة التقاوي اللازمة للفدان باستخدام الدرنات الصغيرة الناتجة من البذور الحقيقية بنظيرتها باستخدام الدرنات العادية المنتجة بالطريقة التقليدية يتضح توفير حوالي ٤٨٪ من تكلفة التقاوي وحيث أن تكلفة التقاوي تمثل جزءاً كبيراً من إجمالي تكاليف انتاج محصول البطاطس فإن نتائج هذه الدراسة تشير إلي إمكانية تخفيض التكاليف الانتاجية للبطاطس باستخدام بديل للدرنات العادية المستخدمه كتقاوي وهي الدرنات الصغيرة الناتجة من زراعة البذور الحقيقية للبطاطس.