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AGROECONOMIC EVALUATION OF DIFFERENT TYPES OF POTATO PLANTING MATERIAL FOR THE SPRING SEASON IN EGYPT, 1989 [1]

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ABSTRACT

The use of seedling tubers as an alternative source of planting material for Egyptian potato farmers was evaluated. The first and second generation (g1 and g2) seedling tubers were compared with farmers own seed. Yields and net returns to farmers using g1 seed were below that of farmers seed while g2 seed gave yields and net returns superior to farmer seed. These results are consistent with an earlier similar study.

I. INTRODUCTION

The potato is an important vegetable crop in Egypt, planted on about 86,000 ha with a production of about 1.68 million tons in 1988. Several imported and local varieties are planted in Egypt. The average annual quantity of potato seed required for the Spring, Autumn and Winter seasons is about 200,00 tons, of which about 45,000 tons are imported from Western Europe for use in the Spring season. The rest is locally provided from the production of the Spring season whether produced by the individual farmers or through the government program of producing improved seed for planting both in the Autumn and Winter seasons.

Due to the high cost of imported seed tubers and of locally produced improved seed, there is interest in alternative sources of planting material. Recent applied research by the International Potato Center (CIP) has shown that it is possible to produce seedling tubers from true potato seed in Egypt. Seedling tubers are the small (<20g) tubers produced from closely planted seedlings from TPS (El Bedewy et al., 1987). Limited amounts of seedling tubers produced in Egypt have been distributed to farmers by CIP.

A sample of the farmers who received seedling tubers during the Winter season of 1988/89 were surveyed to check the feasibility of seedling tubers as an alternative seed source (Crissman et al., 1990). The evaluation showed that second generation (g2) seedling tubers gave relatively higher returns per hectare than first generation (g1) seedling tubers or the farmers' seed tubers. A first generation seedling tuber is the tuber produced directly from the TPS seedlings. Second generation seedling tubers are the production from the very small first generation seedling tubers.

II. OBJECTIVE

The objective of this study is to continue, during the Spring season of 1989 the evaluation of the use of seedling tubers in farmers' fields begun by Crissman, et al, (1990). The principal comparisons are the yield performance and net returns to farmers using three distinct types of seed, g1 and g2 seedling tubers, and farmers' local seed.

III. METHODOLOGY

There was only a small amount of seedling tubers available for distribution. Thus the study sample was limited to 10 producers in 10 sites located in the districts of Kafr El Zayat, Tanta, Elmahalla Elkobra, and Samannoud. The sample is not random and represents producers who are willing to adopt a new technology. There were 7 g1 and 4 g2 plantings of seedling tubers and 11 plantings of traditional varieties giving 21 observations. The seedling tubers were progeny of Serrana x DTO28 and Atzimba x DTO28. The farmers' seed included the varieties Draga, Diamont, King Edward and Alpha

Data were collected from the farmers on their farms using a questionnaire during four visits from January to May, 1989. Data collected included physical inputs and their costs. Farm prices were used in calculating costs of inputs, while opportunity cost was applied when inputs were owned. Since the seedling tubers were not available for sale in the market the price for g1 was set at $.57/kg based on the estimates in El Bedewy et al. (1990). Since g2 seedling tubers may be farm produced (see Crissman et al 1990), the cost of g2 was set equal to the cost of seed tubers available in the market.

Production and yields were estimated for each progeny and variety by harvesting three random blocks of one m2 each and averaging the production and extrapolating this to a per hectare basis.

IV. RESULTS AND DISCUSSION

Production Inputs

Egyptian potato farmers are generally diversified vegetable producers and rely on human and animal labor, and mechanical power for production activities (Table 1). Irrigation is provided by mechanical pumps. Chemical and animal fertilizers and chemical pesticides are used. Compared to the previous study, the sample farmers made relatively more use of mechanical power for land preparation but most other activities were similar.

The participating farmers generally seeded the g1 seedling tubers at higher than the recommended rate of 600 to 700 kg/ha due to doubts about using the very small size tuber (5-20 g), a size which is usually associated with virus-infected seed. The seeding rate recommendations come from preliminary on-station research. Yields for all category seed were higher than in the previous study of the Autumn season. This may be an effect of the participation of different farmers as well to the physiological age of the seed. It is also notable that the Spring crop was harvested at 125 days while the Autumn crop was early maturing and harvested at 115 days.

Cost of Production

Farmers received seedling tubers and planted them in fields with their own seed tubers and treated all the same. Therefore, except for differences in choice of seed and seeding rates (Table 2), the production technologies employed for seedling tubers and seed tubers are the same. Thus it is difficult to explain the large differences in the various cost categories. The large variation in cost categories may result from the extrapolation of data to a per hectare basis and the small number of observations. Despite this limitation, there are several interesting observations possible. First, due to the seeding rate of almost two tons per hectare, the seed tuber cost is much higher than the costs of seedling tubers. This contributes to an overall lower total variable cost for production with seedling tubers. This is consistent with the earlier study.

Production and Total Returns

Compared to the national average, yields for seed tubers were very good, indicating either good farmers or favorable conditions or both. The yields of farmers' seed tubers exceeded those of g1 seedling tubers by 15% but lagged below the yields of g2 seedling tubers by 10%. The higher cost and lower yield of g1 seedling tubers outweighed the advantage given by the lower seeding rate and resulted in a net return for g1 seedling tubers 12% lower than the farmers' seed tubers. There was minimal difference in prices received for the TPS progeny or farmers varieties indicating good consumer acceptance of the progeny.

Measures of efficiency

Isolating the effect of lower seeding rates by examining the yield per unit of seed planted gives a better indication of the physical performance of seed than simply comparing yields per hectare. Yields per ton of seed planted show that, like the previous study, g1 and g2 seedling tubers dramatically outperform farmers' seed. The performance of the seedling tubers can be attributed to a combination of variety and seed health effects. The g2 seedling tubers are, in effect, a second multiplication under semi-controlled conditions of the production of the TPS seedlings and are larger and still apparently very healthy. The larger size evidently gives a larger number of stems per area, increasing the yield potential. With the present data it is not possible to determine the relative contribution of the individual components but it

can be assumed that the seedling tubers are relatively more healthy than farmers seed and that there is hybrid vigor in the progeny.

In contrast to comparisons of net returns per hectare, cost per unit of output isolates the cost efficiency of the new technology. In this case the only variations in technology are the choice of seed and seeding rate thus the measure become an indicator of the contribution of seed type to efficient production. In this comparison the seedling tuber technology is clearly more efficient than seed tuber technology. Comparing the seedling tubers, despite the higher cost and lower yield of g1 seedling tubers the unit cost was lower than either of the other types of seed.

The g2 seedling tubers have been assigned a price equal to that of farmers' local seed on the assumption that these seed would be produced from farm-based nurseries. However if the g2 seed were to be produced by a centralized seed program it is logical to assume that the prices asked would be higher. If g2 seed prices are assumed to be equal to g1 prices the seed cost would increase by over 13% but would still leave the net returns of g2 over 20% greater than seed tubers.

IV. SUMMARY

This study continued the evaluation of seedling tubers as an alternative source of planting material for Egyptian potato farmers. Aside from the choice of planting material and seeding rate, the production technology for seedling tuber-based production is similar to that of seed tuber-based production. Yields per hectare of g1 were slightly lower while yields of g2 were well above seed tubers and over 34% above the national average. G2 seedling tubers gave net returns per hectare exceeding those of seed tubers by 23%, a margin sufficiently large to attract farmers to the technology.

Many results of this study were consistent with the earlier study. The yields of all classes of seed improved from the season before. The continued high performance of g2 seedling tubers merits further study. This generation of seedling tuber, a by-product resulting from a need to utilize undersize g1 seedling tubers, appears to be a promising seed source for farmers. In Egypt the seedling tuber-based seed system is being developed as a high-volume enterprise. Such an enterprise should be able to sell to farmers the undersized g1 seed for further multiplication or handle the multiplication itself. Alternatively, should TPS ever become widely available for sale directly to farmers, given the experience of Egyptian farmers in handling horticultural crops with small seeds, it is logical to assume that they could also devise and manage an on-farm seedling tuber-based seed system.

V. REFERENCES

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Table 1. Potato production input use per hectare, Egypt Spring Season, 1989.

Activity	Variable Input				
	Labor Days	Animal Hours	Tractor Hours	Irr Pump (hrs)	Motor Sprayer (hrs)
Land Prep	4.3		10.2		
Planting	18.8	28.8	10.2		
Irrigation	9.8	9.5		53.8	
Fertilization	24.0	10.5	27.1		
Weeding	16.4				
Disease Control	8.1				27.8
Harvesting	53.3	39.3	10.2		
Total	134.7	88.1	57.7	53.8	27.8

Table 2. Yields, Returns and Costs of Potato Production in Egyptian Pounds per Feddan, Egypt, Spring Season, 1989 [1]

	Seedling Tubers [2]		Seed Tubers
	g1	g2	
Number of Observations	7	4	10
Returns to Variable Inputs:			
Seed Rate (kg/f)	807.1	1547.6	1942.6
Seed Price (LE/kg)	.57	.365	.3657
Seed Cost	4601.05	564.87	709.05
Machinery Cost	96.43	44.98	111.48
Fertilizer Cost	168.61	278.24	172.50
Pesticide Cost	119.37	203.00	140.01
Labor Cost	36.20	60.67	99.33
Animal Cost	8.39	9.00	28.16
Total Variable Costs	889.47	1160.76	1260.53
Interest [3]	59.30	77.38	84.03
TVC plus interest	948.77	1238.14	1344.56
Yield (t/f)	24.8	32.4	29.3
Output Price (LE/t)	93.21	101.85	99.12
Total Revenue	2331.61	3300.42	2904.22
Net Returns to Variable Costs	1362.84	2062.28	1559.65
Measures of Seed Efficiency			
Yield (t/t seed)	33.1	23.0	15.2
Costs/unit Prod	38.26	38.22	45.88

Notes:

[1] One L.E. = $.42 and 1 feddan = 0.42 ha.

[2] Seeding tubers were Serrana x DTO28 and Atzimba x DTO28. Farmers's seed included Draga, Diamont, King Edward and Alpha.

[3] Interest on variable costs is charged at 16% for 5 mo.

Appendix Table 1. Potato production input use per feddan, Egypt Spring Season, 1989.

Activity	Variable Input				
	Labor Days	Animal Hours	Tractor Hours (hrs)	Irr Pump (hrs)	Motor Sprayer
Land Prep	1.8		4.3		
Planting	7.9	12.1	4.3		
Irrigation	4.1	4.0		22.6	
Fertilization	10.1	4.4	11.4		
Weeding	6.9				
Disease Control	3.4				11.7
Harvesting	22.4	16.5	4.3		
Total	56.6	37.0	24.3	22.6	11.7

Appendix Table 2. Yields, Returns and Costs of Potato Production in Egyptian Pounds per Feddan, Egypt, Spring Season, 1989.[1]

	Seedling Tubers [2]		Seed
	g1	g2	Tubers
Number of Observations	7	4	10
Returns to Variable Inputs:			
Seed Rate (kg/f)	339.0	650.0	815.9
Seed Price (LE/kg)	1.36	.87	.87
Seed Cost	461.04	565.50	709.83
Machinery Cost	96.43	44.98	111.48
Fertilizer Cost	168.61	278.24	172.50
Pesticide Cost	119.37	203.00	110.01
Labor Cost	36.20	60.67	129.33
Animal Cost	8.39	9.00	28.16
Total Variable Costs	890.04	1238.82	1261.31
Interest 3	59.33	77.43	84.09
TVC plus interest	949.37	1238.82	1345.40
Yield (t/f)	10.4	13.6	12.3
Output Price (LE/t)	221.93	242.50	236.00
Total Revenue	2308.07	3298.00	2902.80
Net Returns to Variable Costs	1358.69	2059.18	1557.40
Measures of Seed Efficiency			
Yield (t/t seed)	33.1	23.0	15.2
Costs/unit Prod	91.28	91.09	109.38

Notes:

1 One L.E. = $.42 and 1 feddan = 0.42 ha.

2 Seeding tubers were Serrana x DTO28 and Atzimba x DTO28. Farmers's seed included Draga, Diamont, King Edward and Alpha.

3 Interest on variable costs is charged at 16% for 5 mo.