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Analytical Economic Study on the Impact of some Fertilizers on the Productivity of Chervil plant (*Anthriscus cerefolium* L.)

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ABSTRACT

This research aimed to study the production costs for determining the economic efficiency of the unit productivity of Chervil plant, thus, getting the highest net return to that unit. That was done by choosing the best possible blend of production requirements, especially ammonium nitrate and potassium sulphate fertilizers, and studying the extent of their impact on both the fresh and dry weights of the plant. It showed that the best condition, was at adding 105 kg potassium sulfate and 225.67 kg ammonium nitrate where the net return was about 69.410 Egyptian pounds. So, spending one pound of total costs in that case will give 9 pounds net return, reflecting a high economic efficiency of the unit productivity.

Key words: *Anthriscus cerefolium,* ammonium nitrate, potassium sulphate, total costs, net return

Introduction

Anthriscus cerefolium L. is an important plant having many unique compounds and essential nutrients and it has some quantities of essential oil (Zwaving *et al*. 1971; El-Gendy, *et al*. 2015). Although its principal use is as a flavoring agent it has been used in many medical purposes as well (Liopa-Tsakalidi and Barouchas, 2011). In folk medicine, however, the herb was used to alleviate circulation disorders. It is sometimes employed as a 'spring tonic' for cleansing the liver and kidneys, is a good remedy for settling the digestion and is said to be of value in treating poor memory and mental depression. The juice is used in the treatment of dropsy, arthritis and chronic skin ailments (Bremness, 1989), while the root was and is even now employed as a hemanitic or a tonic in Japan and China (Mitsugi *et al*., 1982). Thus, to achieve the most benefit it is necessary to increase the production of this grass.

Generally, there is an agreement, that chemical fertilization is the most important growth- limiting factor. Some research results have shown that nitrogen and/or potassium fertilizer increase the production of plants where each is considered as basic food materials used by plants (El-Gendy *et al*., 2013). And to achieve the objective of the production process it is necessary to obtain the highest net return per unit productivity, helping to identify efficient decision to choose the best blend possible production requirements.

The study of production costs for the crop is one of main topics to infer what achieve unity productivity of economic efficiency, and helps in taking various decisions whether to continue or stop production, in addition to assessing pricing policy encourages continued production and determine the amounts of production, which is investigating maximize production.

The production costs are identified as paid and estimated values that were spent by the facility in exchange for all the factors of production and raw materials that have been used. They are divided into fixed and variable costs. The distinction between them is based mainly on how much costs will change as a result of the change in the volume of production, where the land rent is one of the fixed costs (Heady, 1968).

Thus, this research aims to study the effect of different amounts of ammonium nitrate and potassium sulphate fertilizers on the output of the fresh weight and dry weight of chervil herb. It also aims to study the production costs to determine the economic efficiency of the unit productivity.

Materials and Methods

This study had been done at a farm experiments in the National Research Center (NRC) in Dokki in Giza, Egypt. It used the descriptive analysis methods in addition to using some of the methods of economic analysis in the expression of the economic variables under study.

The impact of production costs for the effect of ammonium nitrate and potassium sulphate fertilizers on productivity of chervil herb had been studied. The cost of production requirements; land preparation, seeding and planting, irrigation, using super-phosphate fertilizer, weeding, pest control, harvesting, transportation, seed cost, irrigation lines, inorganic fertilizers and other expenses were determined. Then get the total revenue and net return per

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unit productivity. This was to detect the treatment that generating the highest net return, and get the best economic efficiency and productivity of the unit which represents a concept that reflects the net return to the costs.

Economic efficiency is considered an important tool of economic analysis that can judge the efficiency of the unit productivity in the use of available resources. So it was necessary to make some metrics that were used to measure productivity, which are:

1. Average productivity of fedden which is considered one of the most efficient metrics of the land component.
2. Average production costs per fedden.
3. Total revenue and net return per fedden.
4. Total revenue attributed to the average production costs per fedden, and the added average value.
5. The net return on the cost scale which reflects the economic efficiency for unit of productivity.

Results

Production cost analysis

The total costs of the agriculture operations of Chervil plant (*Anthriscus cerefolium*) were about 5965 pound per fedden (Table 1) and the highest costs were represented by fertilization. They amounted to be about 750 pounds by 12.6% of the total costs. Fertilization costs were distributed on the two items of the fertilization process; super phosphate represented 5% of the total cost, and about 40% of the total costs of fertilization, and the cost of the inorganic fertilization at a rate of about 7.5% of the total costs and about 60% of the total cost of fertilization. Then, costs of harvest came, reaching about 1,200 pounds per fedden by 20% of the total costs. And the cost of irrigation lines reaching 1000 pounds by 16.7% of the overall total costs, then irrigation costs by 10% of the overall total cost, agriculture by 9.6%, then seeding 8.4% of overall total costs. Then transportation came by 7%, weeding by 5.4%, and land preparation by 4.2%, other expenses of 3.4%, and finally pest control by 2.5% of total costs.

Table 1: Average cost of agriculture operations used in production of Chervil per fedden and relative importance under Egyptian Conditions

Agricultural Operations	Costs (L.E.)	Relative importance (%)
Land preparation	250	4.2
Seeding and planting	575	9.6
Irrigation	600	10
Super- phosphate fertilizer	300	5
Weeding	320	5.4
Pest control	150	2.5
Harvesting	1200	20
Transportation	420	7
Seed cost	500	8.4
Irrigation lines	1000	16.7
inorganic fertilizers	450	7.5
Other expenses	200	3.4
Total cost per feddan	5965	100

The efficiency of productive economic unit:

It was shown that the total production costs of the herb, without using fertilizer, were about 5965 pounds (Table 2). In this case, it had been producing about 24.83 tons fresh herb/fed., having the price around 1250 pounds per ton. Thus, the total revenue was about 31038 pounds and the net return was about 25073 pounds (Table 3). But when the herb was dried, the production was about 7.982 tons/fed. And the price of the tons of dry herb was about 2500 pounds. Thus, a total revenue was of 19955 pounds yield a net return of 13990 pounds.

But when adding 52.5 kg. potassium sulphate, total costs reached to 6340 pounds (where fertilizer costs were about 375 pounds). At this case it had been producing about 27.36 tons/fed. fresh herbs (Table 2). Therefore, the total revenue was about 34195 and the net return was 28230 pounds (Table 3). But when the herb was dried, production was about 5.668 tons/fed., and therefore the total revenue was 14170 pounds yield a net return of 8205 pounds, which was the most least.

Also, it was noticed that when ammonium nitrate was added, a positive correlation between its doses and both of the fresh and dry weights of the herb was shown. This was confirmed by the notable that the highest net return of dry plant was about 44085 LE (*) and that when adding 150.44 kg ammonia only without the addition of potassium sulfate. And at the same time this case was the second highest net return of the fresh herb amounted to about 58020 Egyptian pounds (Table 3).

It has been observed also, that when 150.44 kg ammonium nitrate were added, 51.2 tons/fedden fresh herb were produced (Table 2), at a cost of fertilizer amounted to 600 Egyptian pounds, and the total costs were 6565 LE (**), while the net return reached 58020 Egyptian pounds per fresh herb.

(*) The price per ton of dry herb was about 2500 LE

(**) The total net revenue was "without adding Potassium sulphate nor ammonium nitrate" about 5965 Egyptian pounds

Table 2: The total costs of potassium sulfate and ammonium nitrate fertilizers used for producing dry and soft herb of Chervil per fedden.

Ammonium nitrate weight (Kg.)	Potassium sulphate weight (Kg.)	Dry weight of Chervil (ton/fed)	Fresh weight of Chervil (ton/fed)	Costs of fertilizers (LE)		Total cost of fertilizers (LE)	Total cost (LE)
				Potassium sulphate	Ammonium nitrate		
0	0	7.98	24.83	0	0	0	5965
0	52.5	5.67	27.36	375	0	375	6340
0	105	7.87	27.99	750	0	750	6715
75.22	0	8.40	24.62	0	300	300	6265
75.22	52.5	8.85	37.73	375	300	675	6640
75.22	105	9.41	35.40	750	300	1050	7015
150.44	0	20.02	51.19	0	600	600	6565
150.44	52.5	11.14	35.76	375	600	975	6940
150.44	105	8.10	30.50	750	600	1350	7315
225.67	0	19.22	45.65	0	900	900	6865
225.67	52.5	15.02	47.36	375	900	1275	7240
225.67	105	19.32	61.62	750	900	1650	7615

Table 3: Total revenue and net return for dry and soft Chervil herb and the productivity per fedden for each.

Fresh Ton/fed	Total revenue LE	Net return LE	Dry Ton/fed	Total revenue LE	Net return LE
24.83	31038	25073	7.982	19955	13990
27.36	34195	28230	5.668	14170	8205
27.99	34991	29026	7.868	19670	13705
24.62	30778	24813	8.402	21005	15040
37.73	47158	41193	8.846	22115	16150
35.40	44250	38285	9.408	23520	17555
51.19	63985	58020	20.02	50050	44085
35.76	44703	38738	11.136	27840	21875
30.50	38130	32165	8.096	20240	14275
45.65	57058	51093	19.22	48050	42085
47.36	59203	53238	15.02	37550	31585
61.62	77025	69410	19.318	48295	42330

At this case, the net return was the second highest for fresh herb, where the total revenue was 63985 LE. While, it has been produced 20.02 tons/fedden dry herb, when using the same amount of fertilizer, having net return 44085 Egyptian pound, representing the highest net return of dry, and total revenue was 50050 Egyptian pounds. Also it was noted that when adding 105 kg of potassium sulfate and 225.7 kg ammonium nitrate it produced 61.62 tons/ fedden fresh herb (Table 3) at a cost of fertilizer in 1650 amounted to LE, and the total costs amounted to about 7615 LE (Table 2). While the net return in this case amounted to be 71065 Egyptian pounds representing the highest net return for all previous treatments at all whether for fresh or dry herb (Table 3). This was mainly attributed to increasing fedden productivity at this case to the highest recorded level.

Thus, it was shown from results that the highest average productivity from all previous treatments had reached to about 61.62 tons fresh herb per fedden (Table 2) with an average price 1250 Egyptian pounds per ton.

And hence the Total revenue = average productivity per fedden X price of productivity unit = 61.62 X 1250 = 77025

Also it was found that total costs of fresh herb in that case had reached about 7615 LE. As Net return= total revenue - total Cost. The net return in that case = 77025 - 7615= 69410 LE which reflects the economic efficiency of the unit productivity.

The net return to all costs considered one of the most important economic efficiency scales for unit productivity. At the above mentioned cases, it reached about 9.12, which means to spend 1 pound costs lead to a return of 9.12 pounds and reflects increasing the economic return of crop unite production.

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