

Original Research Article

<https://doi.org/10.20546/ijcmas.2021.1012.056>

## Analytical study of the value chains of Garlic crop and the role of agricultural manufacturing in Beni Suf Governorate, Egypt

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### ABSTRACT

The study mainly aims to analyze the value chains for the production, processing and marketing of the garlic crop in Beni Suf Governorate, Egypt and the most important problems and obstacles it faces in the production, manufacturing and marketing stages, and to propose solutions to them. The results show that the best pictures for marketing garlic can be arranged as follows. Exporting fasting comes in the form of mature, plasticized garlic, followed by exporting it in the form of dried garlic slices or powder, then in the form of immature garlic, and finally in the form of mature garlic, where the added value of each of them is about 28,648 pounds, 28,350 pounds, 24000 pounds, zero pounds, respectively. In the case of arranging according to the net return indicators, the total return on costs and the return on the invested pound, the export of plasticized ripe garlic comes in the first order, followed by immature garlic, then dried and then mature garlic that is marketed in the local market, where the value of the net return amounted to about 25468, 19885, 16615 and 10688 pounds, respectively. While the return on the invested pound amounted to about 2.09, 0.99, 0.53, and 0.49 for each of them, respectively. Beni Suf Governorate is considered the first in terms of area and production of garlic for the republic, where it is planted about 36.4%, and produces about 40.4% of the production of the republic and the average costs of production per fed amount to about 21.712 pounds, the percentage of fixed costs in it about 30.2%, while variable costs represent about 69.8%. Rent comes in the first order of fixed costs, representing about 29.5% of the total costs, while labor costs in all stages of production come at the forefront of the arrangement of variable costs and represent about 19.7%, followed by the costs of chemical fertilizers, which represent about 13.9% of the total costs.

#### Keywords

Garlic crop,  
agricultural  
manufacturing,  
chemical fertilizers

#### Article Info

**Received:**

11 November 2021

**Accepted:**

05 December 2021

**Available Online:**

10 December 2021

## **Introduction**

Garlic is one of the important food commodities, almost in an Egyptian house, where it is used in preparing most Egyptian foods since the time of the Pharaohs. Minerals necessary for the body, China is the largest producer of it, followed by India, South Korea and Egypt in fourth place (FAO). Beni Suef is considered one of the main governorates in garlic production in Egypt., Where the average annual cultivated area reached about 10327 acres, representing about 36.4% of the area of the Republic, producing about 106807 tons, representing about 40.4% of the average total production of the Republic during the period from 2004 to 2017. It should also be noted that Egyptian garlic has two comparative advantages compared to global garlic, which is that it is presented in the global market before garlic that is produced from competing countries such as Spain, Morocco, China and India, as it ripens before the garlic grown in these countries.

High global marketing, especially the distinctive taste and flavor, which makes it a distinctive product that is required globally. Despite the increase in the quantity produced from the garlic crop in Egypt in general and Beni Suef in particular, a very limited proportion of it is directed to manufacturing for the purpose of drying, and another quantity is directed to export according to the conditions of global demand for garlic, and the rest is directed to local consumption. The value chain is considered one of the activities analysis tools that work on segmenting and analyzing the main and interrelated activities within the farm or establishment in order to focus on the activities that increase the value of the product in the form of revenues or profits. The value chain of the garlic crop includes a group of activities that are interrelated with each other, starting from the garlic production cycle in the farm, passing

through the marketing and manufacturing cycles until it reaches the final consumer.

## **The study Problem**

Beni Suef governorate is one of the distinguished governorates among the governorates of the Republic in the production, manufacture and marketing of the garlic crop - it grows about 36.4% of the garlic area at the level of the Republic, and there are a number of factories that dry garlic and export it in the form of slices or powder, while it is also available A number of export companies are exporting garlic in various forms. However, there is no correlation between garlic farmers, factory owners and export companies, which results in severe fluctuations in garlic production and prices from year to year. Therefore, the study was interested in identifying the problems, obstacles, and determinants of garlic growth and development, and attention to manufacturing processes and competition with it externally, especially with the countries of the European Union. The study mainly aims to analyze the value chains for the production, processing and marketing of the garlic crop in Beni Suef Governorate, and the most important problems and obstacles it faces in the production, manufacturing and marketing stages, and to propose solutions to them.

A study by Siyam2019 showed that the modest economic performance of the vegetable sector in Egypt is the final outcome of a number of problems and restrictions facing the value chains of vegetable crops in their various stages, foremost among which are the weakness of the varieties, the randomness of the varietal composition, and the predominance of the use of traditional agricultural methods in production. Marketing, the severity of price fluctuations, and the unfair distribution of benefits in value chains. In the study El-Gendy et al. 2019 on an

economic study to analyze the value chain and marketing windows for the export of potatoes to the Russian Federation, the study concluded the need to expand the production of the potato crop to ensure an increase in the exported quantity, as well as the need to provide production requirements to farmers at the appropriate time and price and work to raise the marketing efficiency of potatoes, The necessity of raising the globally required marketing qualities for potatoes, and providing the necessary database for workers in the chain of production, marketing, manufacturing and exporting potatoes.

In the study Yasin et al. (2019), indicated an analytical study of losses in some stages of the value chain of the tomato crop. The most important causes of losses at the level of wholesale markets were the failure to sort out the defective fruits from the farm, and the use of leaflet cages for packing.

In the study by Mahjoub 2016, on the analysis of benefits and costs for field crops in Sharkia Governorate, the study indicated the need to reduce the high production costs of important strategic crops, including garlic, by supporting production requirements (seeds, fertilizers, pesticides) and providing them in a timely manner through cooperative societies, with Expansion of the automated service to achieve a return that encourages farmers to expand the cultivation of these crops, and the study recommended the necessity of conducting specialized studies in calculating the flows according to variable discount rates as in commercial banks.

In the study by Wafaa 2011 the results showed a decrease in the rate of penetration into the markets of the most important importing countries of Egyptian garlic during the two study periods, which indicates the weak possibility of penetration of Egyptian garlic to those countries, which means that Egypt does

not have a competitive advantage in these markets, while we find a relative increase of this indicator in the markets of all countries. From the Republic of South Africa, then Mauritius, or Lebanon.

Elias 2002, study on the marketing of garlic in Egypt and the impact of post-harvest transactions, and the results of the study concluded that the Egyptian production of garlic exceeds the need for local consumption as food and other uses, and then there is a surplus in the current production of more than 30% that can be directed to export by following Appropriate export policies, especially since export prices are much more rewarding than marketing garlic in the local market, and the study recommended taking into account early planting dates and not delaying them until mid-September, especially for those to be exported so that they can benefit from the early production until February and March when foreign markets are free of garlic Which begins in early April.

## **Materials and Methods**

To achieve the objectives of the study, both descriptive and quantitative statistical analysis methods were used. The study relied on published and unpublished secondary data for the variables under study issued by the concerned official authorities. Two questionnaire forms were designed, one for the production of garlic, and the other for factories and garlic export companies, and some research was used. and previous studies related to the subject of the study, The data was collected through three sources: the first source is the data of the Ministry of Agriculture and Land Reclamation, the Economic Affairs Sector, the Directorate of Agriculture in Beni Suf Governorate, the Investment Authority of the General Court of Beni Suf Governorate, and studies and research closely related to the subject of the

study in order to obtain the published and unpublished secondary data for Time series, factories and export companies working in the field of study. The second source is the garlic production community themselves, and due to the difficulty of conducting this study on all the vocabulary of the study community, the sample method was relied on to study the original community with good investigation so that this sample was a true representation of it, as the farmer was considered the first sample unit for research next to the factories Which works in the field of drying as well as export companies in Beni Suef Governorate. Three administrative centers representing the governorate were selected, which are Al-Wasta Center, Nasser Center, and Ihnasia

Center (Table 1) as the largest centers that cultivate garlic in the governorate. The third source is the community of factory owners and export companies located in Beni Suef Governorate in both the industrial zone of Bayyad Al Arab (Healthy Foods Factory, Al Shorouk Factory, Upper Egypt Food Industry Company, Hydrofoods Factory, Beni Suef Factory) and the light industries area in the new city of Beni Suef (Factory Al-Shennawy, Taiba Factory), Kom Abu Radi Industrial Area (Agricultural Development Company in Upper Egypt), and in the village of Tansa Al-Malaq, Nasser Center (Export Stars Company, Al-Israa Company for Import and Export of Agricultural Crops).

**Table.1** Distribution of the study sample items for the garlic crop on the selected centers and villages

Number of farmers in the sample	%	The area of garlic in fed	Village	Center
20	63	933	Abusir Al-Malq	Wasta
11	37	538	Qimn the bride	
31	44	1471	2	Total Wasti Center
18	68	862	Tanga El Malak	Naser
9	32	415	Behbeshin	
27	39	1277	2	Total Nasser Center
7	60	339	S. Elgabal	Ehnasia
5	40	230	M.El-emra	
12	17	569	2	Total Ehnasia Center
70	100	3317	6	Total study sample

**Source:** Directorate of Agriculture in Beni Suef, Information Center.

**Results and Discussion**

**The current situation of the area and production of garlic at the level of the Republic and Beni Suef**

Table (2) indicate that Beni Suef governorate ranks first among the governorates of the Republic the area of garlic cultivation. Its

relative importance during period 2004/2017 ranged between a minimum of about 32.1% in 2008, and a maximum of about 51.8% in 2015, with average about 36.4% of the average garlic cultivation area at the level of the Republic. The study showed the relative importance of the production of Beni Suef Governorate compared to the production of the Republic Table (2), that it ranged between

33.1% and 56.4% in 2015, with an average 40.4% of production of garlic during the study period.

### **The development of garlic cultivation area in Beni Suef and Republic during 2004: 2017**

The results in Table (3) showed that the area of garlic in Egypt takes semi-increasing and then decreasing waves every two or three years. Farmers stop planting it when its price drops. It shows that the area planted with garlic reached maximum in 2008, reaching about 126% compared 2004 and reached minimum in 2009. The results also showed that the area planted with garlic in Beni Suef takes the same characteristics of the cultivated area of the Republic and it reached its maximum in 2016 where it reached about 130% compared to the base year 2004, It reached its lowest level in 2009, reaching 76% compared to the base year.

### **Development of garlic production at the level of Republic and Beni Suef during 2004: 2017**

Data in Table (4) showed that the garlic production of the Republic was fluctuated during the study period, and it reached maximum in 2008, when it reached 119% compared to the base year 2004, while it reached its minimum in 2009, where it reached about 69% compared to the base year. While Beni Suef Governorate, the production reached its highest in 2008, reaching about 137% compared to the base year, and reached minimum in 2009, reaching 88%.

### **Analysis of the actors in the value chain of garlic production, processing and marketing in Beni Suef Governorate**

The stage of the value chains for the

production, processing and marketing of garlic includes important stages, the pre-agricultural stage, in which the percentage of those cultivating less than an fed was about 38.6%, while the percentage of those cultivating an fed of 1 acre was about 50%, and the percentage of those cultivating more than an fed. About 11.4%, 65.8% of the farmers also made the decision to plant because garlic gives a good return, as well as because of the spread of its cultivation in the region, while 34% believe that they grow it because it is an easy-to-market crop, while the majority of farmers consider the neighboring farmers as the main source of their knowledge garlic cultivation about 82.9%, while friends represent about 10%, while the role of agricultural extension represented about 4.3%, and manufacturing and export companies represented only 2.9%. Relatively, also the experience of garlic growers in Beni Suef is due to the fact that garlic is grown in Beni Suef continuously and from long periods, where the percentage of those who grow garlic from 5 to 10 years is about 48.6%, and the percentage of those who grow it from 10 to 20 years is about 25.7%, while The percentage of those who have been cultivating garlic for more than 20 years represents about 14.3%, (Tables 5 and 6).

The stage of cultivation, where the results of the study showed that although about 87.1% of farmers adopt technical recommendations, they adopt them in varying proportions in terms of quantity and quality, and that there are important and influential recommendations in the quantity and quality of production that they adopt in a small percentage, for example, despite the great impact of the cultivar and the quality of the seeds, but only 40% of the farmers are keen on this matter.

The study showed that most farmers were not aware of modern technical recommendations in the pre-harvest stage of garlic, especially

potassium fertilization before the end of the season, as well as stopping irrigation and fasting garlic at least two weeks before harvest - factors that greatly affect the quantity of production and the quality of its marketing qualities, as their percentage reached about 44.3 % and 28.6%, respectively. Also among the prominent characteristics at this stage is that farmers get modern recommendations from neighboring farmers, friends and relatives in the first place, where the percentage of those who get acquainted with the modern recommendations of them is about 36.4 and 35.5%, respectively, while the percentage of those who get modern technical recommendations from the guidance The agricultural sector is only about 26.4%. The study also showed 40% of the farmers encountering a problem in obtaining good

seeds, as the study showed that 85.6% suffer from the high price of seeds, and about 75% suffer from the lack of good seeds, (Tables 7 and 8).

The results of the study showed that about 56.4% of farmers prefer to sell their crops themselves in garlic sales rings, compared to 40.6% who sell their crop standing in the field (totally) to traders, 2% to exporters, and 1% to garlic drying factories. The results of the study showed that the percentage of companies buying from the farm gate represents only about 2% of the total sale of farmers, the results of the study also showed that the percentage of factory owners buying garlic directly from the farmers is very weak, as it represents about 1% of the total sale of garlic farmers (Table 10).

**Table.2** Economic indicators of garlic crop in Egypt and Beni Suef Governorate during 2004 to 2017

Production (ton)			Area in (Fed.)			Year
Relative importance	Beni Suef	Egypt	Relative importance	Beni Suef	Egypt	
33.1	94375	285294	32.8	9869	30115	2004
36.1	87555	242485	34.5	8975	26028	2005
34.8	75494	217197	32.3	7555	23411	2006
39.5	121951	308806	35.3	11624	32944	2007
37.9	128845	339621	32.1	12164	37845	2008
42.4	83061	195741	37.1	7522	20256	2009
43.6	106614	244620	38.2	10005	26218	2010
42.5	125650	295833	35.9	11408	31787	2011
39.1	120889	309190	35.0	11074	31621	2012
39.5	92389	234163	33.7	8246	24469	2013
39.2	103150	263161	36.6	10300	28157	2014
56.4	111947	198598	51.8	11330	21875	2015
43.2	117688	272229	41.0	12855	31354	2016
43.4	125682	289766	36.9	11657	13570	2017
40.4	106806	264050	36.4	10370	28404	Mean

**Source:** Ministry of Agriculture and Land Reclamation - Economic Affairs Sector - Agricultural Economics Bulletin.

**Table.3** Development of the cultivated area of the garlic crop in Beni Suf Governorate and the Republic during 2004: 2017

Beni Suf		Egypt		Year
Standard Number	Area in Fed.*	Standard Number	Area in Fed.*	
100	9869	100	30115	2004**
91	8975	86	26028	2005
77	7555	78	23411	2006
118	11624	109	32944	2007
123	12164	126	37845	2008
76	7522	67	20256	2009
101	10005	87	26218	2010
116	11408	106	31787	2011
112	11074	105	31621	2012
84	8246	81	24469	2013
104	10300	93	28157	2014
115	11330	73	21875	1015
130	12855	104	31354	2016
118	11657	105	31570	2017

**Source:** Ministry of Agriculture and Land Reclamation - Economic Affairs Sector - Bulletin of Agricultural Economics.

\*The area includes garlic in the old and new lands by the solid and intercropping cultivation.

\*\* Consider 2004 as the base year.

**Table.4** Development of the production of the garlic crop in Beni Suf Governorate and the Republic during 2004: 2017

Beni Suf		Egypt		Year
Standard Number %	Production in ton*	Standard Number %	Production in ton*	
100	94375	100	285294	2004**
93	87555	85	242485	2005
80	75494	76	217197	2006
129	121951	108	308806	2007
137	128845	119	339621	2008
88	83061	69	195741	2009
113	106614	86	244620	2010
133	125650	104	295833	2011
128	120889	108	309190	2012
98	92389	82	234163	2013
109	103150	92	263161	2014
119	111947	70	198598	1015
125	117688	95	272229	2016
133	125682	102	289766	2017

**Source:** Ministry of Agriculture and Land Reclamation - Economic Affairs Sector - Bulletin of Agricultural Economics.

\*The production includes garlic in the old and new lands by the solid and intercropping cultivation.

\*\* Consider 2004 as the base year.

**Table.5** The categories of garlic growers and the reasons for their cultivation.

Reasons for growing garlic		The area planted of garlic	
Relative frequency	The reason	Relative frequency	Classes
38.9	High net income	37.6	Less than Fed.
34.3	Easy marketing	50	Fed.
26.9	It is widely cultivated in the region	11.4	More than Fed.
100	Total	100	Total

**Source:** Collected and calculated from the questionnaire forms of the field study sample in 2019: 2020.

**Table.6** The experience of garlic growers and the source of their knowledge of its cultivation.

Source of farmers' knowledge garlic crop		When did you start growing garlic?	
Freq.%	Reason	Freq. %	Reason
82.9	Neighborhood	11.4	Less than 5 years
4.3	Agricultural guidance	48.6	From 5: 10 years
2.9	Export companies	25.7	From 10 to 20 years old
10	Friends	14.3	More than 20 years
100	Total	100	Total

**Source:** Collected and calculated from the questionnaire forms of the field study sample in 2019: 2020.

**Table.7** Source of farmers' access to modern technical information and recommendations

Rep.%	Cause
36.4	Neighborhood farmers
26.4	Agricultural guidance
35.5	Friends and Relatives
1.7	TV
100	Total

**Source:** Collected and calculated from the questionnaire forms of the field study sample in 2019: 2020.



**Table.8** The problems of garlic farmers' access to good, disease-free seeds.

The problems encountered by farmers in obtaining good seeds		There are problems in obtaining good seeds	
Rep. %	Reason	Rep. %	Reason
85.6	Seed price	40	Yes
14.4	Lack of good seeds	60	No
100		100	Total

Source: Collected and calculated from the questionnaire forms of the field study sample in 2019: 2020.

**Table.9** Methods of the farmers sell garlic.

Rep. %	Reason
56.4	local market
40.6	Wholesaler
2	exporters
1	Factories
100	Total

Source: Collected and calculated from the questionnaire forms of the field study sample in 2019: 2020.  
 \*\*The economics of garlic crop during the different stages of production and marketing

**Table.10** The relative importance of the cost components of garlic production (pounds / feddan) according to the study sample for the agricultural season 2018: 2019.

Total costs %	Variable costs %	Costs	Factors of production
2.3	3.4	510	Plowing and planning
4.8	6.9	1041	Irrigation machine
1.5	2.1	317	Spray machine
9.4	13.5	2051	Seeds
7.0	10.0	1512	Manure fertilizer
13.9	20.0	3026	Chemical fertilizers
6.3	9.0	1364	Pesticides and fertilizers
19.7	28.2	4282	Workers
3.8	5.4	816	Transport and weight
1.1	1.6	243	Petty cash
69.8	100	15162	Total variable costs
29.5	-	6400	Fixed costs (rent)
0.7	-	150	Taxes
30.2	-	6550	Total fixed costs
100	-	21712	Total costs

Source: Collected and calculated from the questionnaire forms of the field study sample in 2019: 2020.

**Table.11** Costs of producing a ton of dried garlic in the Egyptian pound in 2018: 2019.

Total costs %	Fixed and variable costs %	Value of costs	Production component
-	-		Fixed costs
9.6	55.4	3000	Workers
1.6	9.2	500	Destruction of machinery and equipment
1.3	7.4	400	Maintenance of machines and equipment
1.4	8.3	450	Rental of machinery and equipment
0.2	0.9	50	Taxes
0.2	1.0	55	Insurances
0.8	4.6	250	Administrative expenses
0.7	3.9	210	Training courses
1.6	9.2	500	Quality improvement expenses
13.7	100	5415	Total fixed costs
-	-		Variable costs:
62.6	75.7	19650	Raw Materials (4 Tons Dry Plasticized Garlic)
12.3	14.9	3860	Natural gas
3.1	3.8	980	Electricity
2.9	3.5	920	Waters
1.0	1.2	395	Packing and warping material
0.8	1.0	255	Shipping freight
82.7	100	25970	Total variable costs
100	-	31385	Total costs
-	-	48000	Ton value

**Source:** Collected and calculated from the questionnaire forms of the field study sample in 2019: 2020.

\*Economic indicators of garlic production, processing and marketing

**Table.12** Important economic indicators for the production, processing and marketing of garlic

Dehydrated garlic slices and powder export (tons)	Plasticized ripe garlic Export (tons)	Unripe garlic export (tons)	Fresh garlic local sale** (fed.)	The product Indicator
31385	12180	20115	21712	Total costs
48000	37648	40000	32400	Total return
16615	25468	19885	10688	Net return
1.53	3.09	1.99	1.49	Total cost return
0.53	2.09	0.99	0.49	Return on the invested pound
28350	28648	24000	-	Total value added

The results of the study showed that the relative importance of the fixed and variable costs of garlic production, that the fixed costs represent about 30.2% of the costs of producing fed. of ripe garlic, amounting to 21.712 pounds / feddan, and the fixed costs are represented in the rent, which represents about 29.5% of the total costs and taxes represent 0.7%. As for the relative importance of the variable costs items, which represent about 69.8% of production costs, at the forefront comes the labor costs, which represent about 19.7% of the total costs, followed by the fertilizer costs, which represent about 13.9% of production costs, and then in the third order comes Seed costs, which represent about 9.4% of the total costs. Then came the costs of municipal fertilizers, pesticides, fertilizers, irrigation, transportation and weight, which amounted to about 7%, 6.3%, 4.8%, and 3.8%, respectively.

By reviewing the data which shows the relative importance of the average fixed and variable cost items for manufacturing dried tons in garlic manufacturing companies in the sample of the study during the 2018/2019 season, it was found that the wages of workers represent the most important items of fixed costs, with an average of about 3000 pounds, representing about 55.4% of the average The total fixed costs, which amount to about 5415 pounds, and represent about 9.6% of the average total costs, which amount to about 31.385 pounds, then the costs of depreciation and improving product quality come in second place in terms of relative importance, as the average of each of them is estimated at about 500 pounds, representing about 9.2% of the average The total fixed costs, and about 1.6% of the average total costs, followed in order by the costs of renting machines, equipment and maintenance, where each of them amounted to about 450 pounds, 400 pounds, representing about 8.3%, 7.4% of the average total fixed costs during the study period, and about 1.3%, 1.4% of the average total costs, respectively.

As for the variable costs, which include each of the raw materials (mature dry plasticized garlic), natural gas, electricity, water, packaging materials, and shipping freight, it was found from the same previous table that the costs of the main raw materials are ranked first in terms of relative importance For both variable costs and total costs alike, where the average ton in the factories of the study sample was estimated at about 19.650 pounds, representing about 75.7% of the average total variable costs, which amounted to about 25.970 pounds, and it represents about 62.6% of the average total costs, which amounted to about 31.385 pounds. Natural gas costs come in second place in terms of the relative importance of the items of variable costs and total costs alike, as the average ton amounted to about 3860 pounds, representing about 14.9% of the average total variable costs, and about 12.31% of the average total costs per ton (Table 12).

Data in Table (25) shows that the total yield per fed.of ripe garlic that is sold in the local market during the garlic harvest season amounted to about 32,400 pounds/fed., where the average year of production per fed. of ripe garlic in the study sample 2018/2019 was about 10.8 tons/fed., the average price per ton during the season was about 3000 EGP, an acre of garlic achieved a net return of about 10,688 EGP /fed. which is the difference between the total return per fed., which amounted to about 32,400 EGP, and the total costs, which amounted to about 21,712 EGP / fed. to the total costs amounted to about 1.49 pounds / fed., and this ratio is considered one of the important criteria for measuring economic efficiency to judge the production activity, and the increase of this percentage from the correct one indicates the profitability of the productive activity, and the return on the investment pound in the production of an acre of garlic was about 0.49.

In the same time, the total revenue from exporting a ton of immature garlic has reached about 40,000 pounds / ton, where the results of the study showed that a ton of unripe garlic was exported at about 2500 US dollars. And that the net return amounted to about 19885 pounds / ton. And that the total return to the total costs amounted to about 1.99 pounds / ton, and this ratio is considered one of the important criteria for measuring the economic efficiency to judge the production activity, and the increase of this percentage from the correct one indicates the profitability of the productive activity, and the return on the investment in the preparation and export of tons of immature garlic has reached About 0.99 and the added value, which was estimated at 24000 pounds / ton.

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## How to cite this article:

Mohamed Hussien Mohamed Attwa, Hussien Mohamed Ahmed Hussien, Mohamed Desouki Hassan Dewdar and Ghada Abd El Samee Rabee Mansour Ghedan. 2021. Analytical study of the value chains of Garlic crop and the role of agricultural manufacturing in Beni Suf Governorate, Egypt. *Int.J.Curr.Microbiol.App.Sci.* 10(12): 509-520.  
doi: <https://doi.org/10.20546/ijcmas.2021.1012.056>