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THE ECONOMICS STUDY OF QUINOA PRODUCTION TO REDUCE FOOD POVERTY GAP IN NEW VALLEY GOVERNORATE-EGYPT

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Abstract:-

This research was undertaken to determine the economic importance of Quinoa, through identifying production constraints and economic features of the investment as well as the possibility of expansion in its production in ElKharga city, New Valley Governorate, Egypt. Quinoa seeds are very nutritious. Seed, in comparison with other cereals, is higher in protein content (approx. 14.6%).Quinoa is considered an important crop supplement for wheat and it is able to reduce the food gap in Egypt, which it is cultivated in desert areas. Economics of its cultivation in the study area was also assessed. The results refer to high economic efficiency of cultivating Quinoa in the study area. investment in cultivation Quinoa is economical as the gained profit was higher than opportunity cost, since the return of the pound investor reached about 1.19.In addition to the positive contribution to the national income due to the increase in the added net value compared to the wages based on the social surplus. This research has highlighted several economic advantages about encouraging farmers, young graduates and investors to cultivate Quinoaas an untraditional crop in the New valley. Then they should be provided by seedlings from reliable sources, knowledge about its cultivation and finally production marketing. Increasing the production and establishment food from Quinoa would result in increasing the income and establishing some industries depending on by-products like fodders and fertilizers from leaves and crop west of quinoa.

Keywords: *Quinoa, Total Costs, Total Return, the Safety Limit, Economic Analysis, Social Surplus, the New Valley.*

INTRODUCTION

Egypt face serious challenges in the process of achieving national food security at the level of strategic crops, at a time when environmental degradation and depletion of natural resources. This forms a danger on the sustainability of food production. This is leading to high poverty rates in Egypt, Central Agency for Public Mobilization and Statistics issueda report on indicators of poverty. The poverty rate was about 85% of the rural population is poor and 42% in urban areas below the poverty line, The poverty rate in the Upper Egypt governorates was about 58%, while this percentage was about 13.1% in lower Egypt. In other words, 48% of Upper Egypt's population is poor, while the number of poor is about 36% in Lower Egypt (capmas, 2017).Quinoa -called super food. When a lot of cultivation is possible to achieve food security, It is used as food for humans and animals. Also it is included in many industries as food.The importance of the cultivation of quinoa is its outstanding qualities in terms of Agricultural Sciences where it does not need water, since it can be planted in drought, salinity.so it can reduce the food poverty gaps.

Problem of the Study: The continued population growth in Egypt led to a decrease in the ability of wheat crop to meet the consumption needs of the community members, And thus try to find some alternatives to work to reduce imports, and raise the proportion of self-sufficiency, and reduce size of the food gap ,Which enabled it to cultivate other strategic crops that are better able to withstand salt conditions and water shortage. Western Desert, particularly the New Valley governorate, is one of the most promising areas for the expansion of quinoa cultivation, However, despite the availability of land resources of agricultural soil and ground water suitable for agriculture, and suitable for the crop quinoa that fit in those areas experiencing high levels of salinity in the soil and water, but the investor and farmers turn to other crops .

The Aim of the Study:

The research aims to identify the economic importance of quinoa, And the study of production economics by identifying the determinants of production and economic of the efficiency of investment and the possibility of expansion in the production of quinoa New Valley Governorate, As well as the assessment of the financial and economic evaluation criteria for the cultivation of Quinoa in the new valley and the extent of risk tolerance by measuring its sensitivity to higher production costs and lower revenues.

Data Sources:

The study depends on two types of data, secondary data obtained from official sources like the Ministry of Agriculture and CAPMAS. The second type of data depends on field study of some of farms in the "New Valley governorate – ElKhargacity" during 2017/2018. The field data were collected through a questionnaire that included all the variables necessary to achieve the objectives of the study for the sample of the Quinoa farms in Al-Kharga area in the New Valley governorate during 2017/2018, and was used as a test skeletal 5% of the total area cultivated Quinoa crop in Al-Kharga, about 22.5 Feddan The sample consists of 3 farms with an area of about 1.125Feddan, it distributed according to the relative importance of the area of each farm in the study area.

Methodology of the Study:

Methodology of the study is analytical method, through the analysis of the economics of data; there search was based on the use of financial and economic analysis criteria as prepared by the World Bank to be used and applied to judge the profitability of planting Quinoa crop in the study area. As well as sensitivity analysis to identify the capital recovery period and the project's ability to withstand price changes in cost and revenue components. As well as using of economic analysis criteria. The secriteria standards are used to measure and assess the overall effects of the project duration, using economic revenue, value-added, and net added value of social surplus.

RESULTS AND DISCUSSION

Economic importance of quinoa

Quinoa seeds are very nutritious. Seed, in comparison with other cereals, is higher in protein content (approx. 14.6%). Its protein fraction is well balanced and comes close to the ideal protein, qualitatively corresponding to casein. It has more favourable amino acid composition also -higher content of lysine, methionine and trend in and high content of arginine and histidine, which are important in infant nutrition. The starch content is approximately 60% represented by small granules usable in food industry as an ingredient in cream substitute. Amount of lipids in quinoa is about 8% of dry mass. The oil is very stable tanks to relatively high natural antioxidant content. Total oil contains 54 % of linoleic acid and 20% of oleic acid. Quinoa is a good source of thiamine, folic acid and vitamin C but has lower content of niacin (B3) in comparison with other cereals. Seeds contain more Ca, P, Mg, Fe, Zn, Na and Cu than cereals. It is very important to realise distribution of every single mineral in fractions of the seed. Seeds contain some anti-nutritious compounds such as saponins, phytates, tannins, and protease inhibitors (Dubey,etal 2015).quinoa grains do not contain gluten and thus, they cannot be used alone for bread-making. However, they can be mixed with wheat flour in the preparation of bread with high nutritional value (Morita et al., 2001). Accordingly, Quinoa has been selected by the food and agriculture organization (FAO) as one of the crops destined to offer food security in the 21st century (Jacobsen, 2003). Several studies showed that even halophytes are particularly salt sensitive during the stages of seed germination and seedling establishment (To be et al., 2000; Malcolm et al., 2003). However, they have an advantage over plant species that lack strategies to deal with salt in the soil (To be et al., 2000; Rosa et al., 2004). Salinity tolerance is a heritable trait with a polygenic character linked to a complex genetic basis that can be used as an efficient criterion for selection of salt

resistant populations (Flowers & Colmer, 2008). This requires the cultivation of wide areas in the desert areas, which in turn require many investments in new valley.

The current situation of the size of food gap and the self-sufficiency of wheat crop

Achieving self-sufficiency is one of the economic development policies under which any country that is trying to dispense the imports from other countries by relying on local products, instead of foreign products, to satisfy consumer needs of various goods and services. The importance of this policy can be shown in time of war, where you cannot import goods from abroad because of the difficulties and risks involved with shipping operations across the seas, and in the case of a potential off that we can benefit from its use in the production of similar goods for imported goods.

The index of self-sufficiency is one of the important indicators for many of the developing countries in particular, that demonstrates the ability of countries to provide adequate food to their countries of domestic production, and the ability of these countries to achieve high levels of self-sufficiency, particularly for commodities key strategic and foremost grain. (IFAD, 2005)

In this context, research in first shows the economic indicators of wheat crop during the period 2001 to 2017 as the most important strategic crops in Egypt. Quinoa is considered an important crop supplement for wheat and it is able to reduce the food gap in Egypt, which it can be cultivated in desert areas,

Table (1).economic indicators of wheat crop in Egypt during 2001 -2017

year	Area Million Feddan	Productivity Ton/ Feddan	Production Million Ton	Costs LE/ Feddan	Net return LE/ Feddan	Quantity of consumption Million Ton	Food Gap Million Ton	Self-sufficiency ratio %	Individual consumption Kg/Year
2000/2001	2.34	2.7	6.25	1522.6	896.8	9.82	3.56	63.7	150.28
2001/2002	2.45	2.7	6.62	1558.4	972.3	11.63	5	56.99	171.02
2002/2003	2.51	2.7	6.85	1715	1016	11	4.1	62.55	160.22
2003/2004	2.61	2.8	7.18	1904	1666	11.75	4.58	61.06	169.54
2004/2005	3	2.7	8.14	1981	1956	13.35	5.21	60.97	188.95
2005/2006	3.1	2.7	8.27	2142	1863	14.26	5.98	58.03	197.99
2006/2007	2.72	2.7	7.38	2444	1769	13.77	6.4	53.57	186.99
2007/2008	3	2.7	7.98	3145	5159	14.38	6.4	55.49	191.09
2008/2009	3.15	2.7	8.52	3459	2190	14.59	6.1	58.41	189.94
2009/2010	3	2.4	7.17	3680	1977	14.98	7.81	47.86	190.25
2010/2011	3.1	2.7	8.37	4069	3884	16.88	8.51	49.6	209.9
2011/2012	2.46	2.8	8.8	4425	4358	15.66	6.86	56.17	189.67
2012/2013	3.38	2.8	9.46	4808	4274	17.21	7.75	54.96	203.36
2013/2014	3.39	2.8	9.28	5271	4047	17.03	7.75	54.51	196.11
2014/2015	3.1	2.7	9.61	5727	3942	17.56	9.76	54.7	195.32
2015/2016	3.4	2.8	9.34	7054	2573	19.56	10.22	47.75	128.84
2016/2017	3.16	2.8	8.8	8360	7264	18.22	9.44	48	185
Average of period	2.93	2.72	8.12	3721.47	2929.83	14.80	6.79	55.55	182.62

Source: Ministry of Agriculture and Land Reclamation and Agricultural Statistics Bulletin, Economic Affairs Sector, Food Balance, Central Administration of Agricultural Economics different addition

Table 1& 2showsthat the area of wheat crop has fluctuated between increase and decrease during 2001 –2017, in which it was rang ing from a minimum of about 2.34million Feddanin 2010 to a maximum was about 3.39with an annual average was about 2.93 million Feddan during that period ,the average productivitywas about 2.72 ton/ Feddan , the average production was about 8.12 million Feddan, the average of costs was about 3721.47 LE , and the average net return was about 2929.83 LE while the average food Gap was about 6.70 million ton during this period , the food gap was a statistically significant annual increase of about0.37million tons, representing about 5.5% of the average during that period that was about 6.7 million Ton.Itis also evident that the self-sufficiency rate of the wheat crop has been fluctuated between the increase and the decrease, with an annual average of about55.55%.

Table (2).Statistical parameters of economic indicators for the production of wheat crop in Egypt during 2000-2017

Items	Equation	R^2	F	Rate of change%
Area	Yt= 2.5+0.5 Xt	0.55	18.5**	1.7
Productivity	Yt= 2.68 + 0.5 Xt	0.06	0.89	0.19
Production	Yt= 6.5 + 0.18 Xt	0.76	48**	2.2
Costs	Yt= 280 + 382 Xt	0.91	160**	10.3
Net return	Yt= 516 + 268 Xt	0.59	22**	9.15
Quantity of consumption	Yt= 10.1 + 0.53 Xt	0.02	246**	3.6
Food Gap	Yt= 3.5 + 0.37 Xt	0.89	126**	5.5
Self-sufficiency ratio %	Yt= 62.5 + 0.77 Xt	0.59	21**	1.4
Individual consumption	Yt= 170 + 0.99 Xt	0.05	0.94	0.54

Source: calculated from table 1

In order to reduce the gap between production and consumption so there are some policies to achieve economic development agriculture in Egypt and attract foreign investment agriculturale specially, a policy for the production of alternative agricultural crops which include planting new varieties of plants and biodiversity to provide study economical to cultivate the plant could contribute to solving the problem of food security in Egypt and reduces the food poverty gap. This project transfers technology of growing grain quinoa from exporting countries to Egypt which shows the nutritional value, the cost of production and profits or the expected return of cultivation, whether it was returning socially or economically .

The possibility of expanding quinoa cultivation by Principle Component Analysis

Different analysis was conducted to identify the basic characteristics affecting the changes in the study area. It was found that the height levels, soil salinity and acidity are the main factors controlling the total changes in the study capacity. Considering the availability and quality of irrigation water, the study shows that salinity would be the worst problem facing cultivation of this area either the new or the old lands. Recently digging to 4 meters in the old cultivated site revealed very highly saline drainage water at depth of 3-4 meters which under lined by shales layer which consider the base of dish will be field by saline drainage water and deteriorate the soil. Building drainage sys-tem is very necessary to continue cultivation of this area (Gamehet al, 2017).where the area expected to be cultivated in the new valley amounted to about 358.5 thousand Feddan, so Quinoa is the suitable crop to cultivate in this area without any change in its productivity.

Economic Characteristics of Investment Efficiency in Al Kharga Region in the New Valley Governorate during Season 2017/2018

Net Farm Income (NFI) is intended as a consistent measure of the profitability oftenant-type farming1 which allows farms of different business organization, tenure and indebtedness to be compared.so this research studied the returns and costs of production Quinoa crop for sample 2017/2018.

1-fixed costs: are those costs which either cannot readily be allocated to a specific enterprise or do not vary with small changes in the scale of the individual enterprise, like (machinery repairs and depreciation, rent and rates, general expenses, reclamation and infrastructure..). table 3showed that the average of fixed costs for one Feddan of Quinoa during 2017/2018, the Fixed costsofrecla mation and infrastructure, irrigation network, cultivated, rent and maintenance and repair were about 17.5 , 10.5, 3.6, 1, 0.5 thousand LE by rate 52.8% , 31.8% , 10.9%, 3% , 1.5% Respectively.

Table (3). The relative importance of the average fixed costs of cultivating Feddan of Quinoain ElKharga 2017/2018

Statement	Value (LE)	%
Cost of reclamation and infrastructure	17500	52.8
Cost of irrigation network	10526	31.8
Cost of cultivated	3600	10.9
Rent	1000	3.0
Maintenance and repair	500	1.5
Total	33126	100

Source: compiled and calculated from questionnaires

2-Thevariable costs are costs that are readily allocated to an enterprise and which will vary in approximately direct proportion to the scale of the enterprise(like fertilizers, pesticides, seed,casual labor). table 4 showed that the average of labor, administrative salaries, irrigation, fertilization and prevention, collection and mobilizati on were about 1.1,1.3 , 0.8 , 0.5 , 1 thousand LE by rate 23.4% , 27.7% , 17%, 10.6% , 21.3% Respectively

Table (4). The relative importance of average variable costs of cultivating Feddan of Quinoain ElKharga 2017/2018

Statement	Value (LE)	%
Cost of labor	1100	23.4
Cost of administrative salaries	1300	27.7
Cost of irrigation	800	17.0
Cost of Fertilization and prevention	500	10.6
Cost of Collection and mobilization	1000	21.3
Total	4700	100.0

Source: compiled and calculated from questionnaires

3-Return of Quinoa crop: table 5showed that the average net revenue of Quinoa cultivation under the conditions of the New Valley reached about 50000 LE/ Feddan. return on the pound investor reached about 1.19of pound.

Table (5).The relative importance of the average revenue of cultivating Feddan of Quinoa in ElKharga 2017/2018.

Statement	Value
Average yield of seeds	1 ton
Price of Kg	50 LE
Total revenue	50000 LE
Net farm revenue profit	12174
Return of the pound investor	1.19

Source: compiled and calculated from questionnaires

The bracken even point for the production of Quinoa crop: this analysis is very important to evaluated opportunity cost for any investment project, that was depended of the fixed costs or variable costs and the price of unit yield ,this analysis can be done by showing the intersect curve of production with costs curve. In this point wasn't gave not revenue and not loses. So when this point was decreased the project can be earn the profits and decrease the loses. Table 6 showed the result of analysis the bracken even point for Quinoa crop production, this point was about 422.21 Kg to compare that with yearly production was about 1000Kg, that production was greater than the point safety for about 42.22% average production of Quinoa in year. The estimate of the revenue eequalizeris shown to be about21110.38 LE, while compare that with the average revenue from one Feddan of Quinoa that was about 50000 LE, showed that the actual revenue was greater than revenue equalizerfor about 42.22 % . As for the safety of production, this is used to assess the sensitivity of the project against the decline in productivity that can occur due to some unexpected changes. Production safety reached about 57%. This means that project will remain profitable if production is reduced by up to 57%.
If the ratio is lower than that, the project will be subject to losses. The price of the balance was around 23.99 LE and the price safety level was 52.35 LE.

Table (6).Equalization and safety analysis of cultivating Feddan of Quinoa inElKharga 2017/2018

Statement	Value
Equalizer point	422.21Kg
Revenue equalizer	21110.38 LE
Productive Safety Limit	57.8%
Equalizer price	23.8 LE
Price safety limit	52.35 LE

Source: compiled and calculated from questionnaires

Economic Analysis of Quinoa Crop
Economic analysis aims to contribute to the extent of crop quinoa to achieve the goals of economic development and strategic crops saving. The following are the economic standards of quinoa in ElKharga. Using mathematical relationships between the current values of income and costs have been estimated by evaluation criteria, the data in table 7 showed the results of the economic analysis of quinoa production in the sample of the research in Kharga, It is clear that the current value of the value added was to about45 thousand LE, while the present value of net value added was about 7 thousand LE and the social surplus was about 6 thousand. That refers to positive contribution to quinoa production in national income.

Table (7).economic analysis of quinoa production in ElKharga 2017/2018

Statement	Value
Total current value of revenue	50000
Total present value of variable and fixed costs	37826
Total current value of production inputs	4700
Total current value of the wages	1300
Current value of value added	45300
The present value of net value added	7474
Social surplus	6174

Source: compiled and calculated from questionnaires

Egypt's Competitive Advantage / Disadvantage:
The SWOT analysis below summarizes the strengths, weaknesses, opportunities and threats that exist for Quinoa.
While the health food market will sustain good niche crop production, future opportunities are certainly contained in the component strengths of the crop.
From a farmers' view, Quinoa production currently does look advantageous on the basis of return per acre in comparison to traditional crops.

Table (8).SWOT Analysis, Quinoa

Strengths Uses: • Whole seed • Flour • Flakes Known potential uses: • Small granule starches (various applications) • Saponins • Oil • a dietary supplement	Opportunities • domestic health food markets • Growing celiac and diabetic markets • Value-added markets • Various potential industrial uses
Weaknesses • Current industrial use of Quinoa is limited by small-scale production • Need to be able to produce 'competitive' yields/ production costs • Prices for the grain too high to be commercially competitive with wheat, rice, and barley	Threats • Unconfirmed ability to produce Quinoa in Egypt with yields consistently above 1ton/Feddan • Several South American countries are exporters of Quinoa with the ability to increase production and exports • Ability to produce good quality Quinoa in Egypt

Recommendations:
1. Egypt should seek to fill the food gap and achieve food security for the population through the expansion of cropping horizontally, vertical expansion through scientific research and the integration between Arab countries.
2. Expansion in the cultivation of quinoa grain in all desert regions because its cultivation doesn't need large amounts of water, but it can grow the crop on frost and rain water only.
3. Needs to be a greater role on the propaganda and the announcement of the product (quinoa) to familiarize the public with its high nutritional and its value.
4. Need to support businessmen and investors in order to expand the cultivation of quinoa and reduce the cost of importing wheat from abroad.

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Conclusion:
This paper is presented an economic study for the cultivation of the plant quinoa to solve the problem of food security in Egypt. This project transfers the technology of growing grain quinoa from exporting countries to Egypt, the nutritional value, the cost of production and profits or the expected return of cultivation (*i.e.* the return is socially oreconomically).The results refer to high economic efficiency of cultivating Quinoa in the study area. Investment in cultivation Quinoais economical as the gained profit was higher than opportunity cost, since the return of the pound investor reached about 1.19. In addition to the positive contribution to the national income due to the increase in the added net value compared to the wages based on the social surplus.

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