POTENTIAL OF *ALOE VERA* L. FOR ENHANCING THE VALUE ADDED OF AGRICULTURE SECTOR IN THE NEW RECLAIMED LANDS

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ABSTRACT

Aloe vera is well known as good potential source for maintaining health conditions for both human and animal life as well. Nevertheless, the adoption of *Aloe vera* by Egyptian farmers is considered very low. This is attributed to the lack of information farmers possess about the cultivation, agricultural practices and economic benefits of *Aloe vera* at both individual and national levels as well. The major contribution of *Aloe vera* is derived from its industrial utilization. One of the **important pharmaceutical properties** that have recently been discovered for both the *Aloe vera* gel and whole leaf extract is the ability to improve the bioavailability of co-administrated vitamins in human subjects. Furthermore, the dried powder obtained from *Aloe vera* gel was successfully used to manufacture directly compressible matrix type tablets. The major theme of this paper is to raise the awareness of *Aloe vera* plant to both growers and policy makers in Egypt about the importance of *Aloe vera* and its huge uses in different cosmetic and pharmaceutical products. In addition to raise Egypt's national income and provide employment opportunities through an increase the value added of the agriculture sector. Finally using the new reclaimed lands as the GOE, is moving towards reclamation of 1.5 million feddans which requires innovation of new paradigm in development the agricultural sector. Adoption of *Aloe vera* in the new lands can be good example for development of agriculture in a new fashion and enhancing added value of the sector and hence the national income will be increased. This paper is conducted to demonstrate associations or relationships among different variables that affect the farmer's adoption of *Aloe vera* in the new reclaimed lands and the consumers attitudes towards demand for such products that contain *Aloe vera* and in particular cosmetics and pharmaceutical products. At the farm level, cross data is collected in a one time interview with the available *Aloe vera* farmer in El-Fayoum Governerate in 2014. Another survey was conducted to collect data about consumer's habits and preferences regarding demand for *Aloe vera* products between three consumer classes at different hours and different types of retail stores. The questionnaire was designed and protested. Data for 1146 consumers were collected, coded and analyzed. Results

recorded that there is 50.9% within the three classes know about the Egyptian *Aloe vera* various products and 49.1% within the three classes don't know about the Egyptian *Aloe vera* various products. The third low income class is the highest class represents 73.5% knows about *Aloe vera* various products due to the vital role of the spice dealers which are trust source for these class in promoting the *Aloe vera* products. While the first high income class represents 56.5% knows about the Egyptian *Aloe vera* various products because they usually do shopping and spend a lot of time looking for new products. And the second medium income class is the lowest one represents 23.1% know about the Egyptian *Aloe vera* various products. In addition data showed that the average annual revenue for *Aloe vera* leaves per feddan was LE 110 thousands, while the total variable costs estimated at LE 20,250 per feddan and the total fixed costs estimated at LE 900 per feddan. The break-even yield necessary to cover all total costs at a given output price is 10.5 ton/feddan, while the break-even price needed to just cover all total costs at a given output level price is LE 384.5. The results suggests that, a governmental effort should be done to encourage farmers and / or teenagers to buy the unfertile lands with reasonable prices and credit facilities for cultivating this miracle *Aloe vera* crop. In addition that there is a good opportunity to do more effort to increase the awareness of the high income and medium income consumers about the Egyptian *Aloe vera* various products especially they highly demand for natural products with high quality.

***Key words*:** cultivation of *Aloe vera*, world trade, enterprise budget, cost of production, Egypt.

INTRODUCTION

The agriculture sector is one of the most important national economic sectors. Although the contribution of the agriculture sector to total GDP has continued to decline over the years, it still remains one of the most important sectors in the economy of Egypt. It contributed about 11.18% of the total GDP in 2015. The sector also provides approximately 29.2% workers of the total labor force in 2013, and many industries and services are dependent on it. (Source: Central Intelligence Agency)

The agriculture sector as a material supplier to the agro-processing sector continues to play a key role in contributing significantly towards increasing food security, value addition of farm outputs, income generation, employment (labor) creation, industrial development, and poverty alleviation. Value-addition by agro-industry is currently low as compared to other types of industries because the degree of transformation of raw materials is limited. Yet this function is very important for the poor and other agriculture output resources that never fail to deteriorate as times elapse after harvest.

Medicinal plants is the most important non-traditional agriculture commodities, which offers the hope in the development of Egyptian agriculture exports in light of new global economic order dominated by economic groups and international conventions. The medicinal plants from non-traditional multiple uses as it contain organic compounds and inorganic which used in various pharmaceutical industries and other cosmetics. The medicinal plants are of great economic value as demand increases for locally and globally due its many uses and importance.

Aloe vera is one of the medicinal plants and due to its extensive medicinal, pharmaceutical and other uses it enjoys a great demand in the market across the globe. The major markets for *Aloe vera* and its extracts are Australia, US and the entire Europe. Given the exponentially growing demand for it in the international market, *Aloe vera* presents the finest commercial opportunity among the various medicinal plants. Egypt is among the few countries gifted with the unique geographical features essential for cultivation of *Aloe vera* and other high potential medicinal plants.

Aloe vera, is the common name for the species *Aloe vera* (L.) Burm. f., is grown primarily in sub-tropical climates, prefers solid sun, and as a succulent from the Lily family (Liliaceae), can withstand being watered infrequently. Like nearly all aloe plants, they are not capable of withstanding frost and related temperatures. This species tends to be larger with shorter stems, and can be identified further by its thick, fleshy, leaves shaped somewhat like tentacles, being heavy or thicker at the base and tapering to a point, and its bright green color. Younger plants tend to have off-white "spots" on them, and only the larger plants tend to produce yellow flowers. *Aloe vera* will grow, slowly, with the leaves forming a circular pattern of usually the same height (rosette), in a clumping fashion.

Improvements in income derived from *Aloe vera* are likely to occur through complementary and integrated changes in field production methods, processing techniques and marketing activities. The crop has a significant potential as a diversification crop. It has many applications in the food, pharmaceutical, and cosmetic industry besides being used in health products. It is a low maintenance crop with a crop cycle of 5 to 7 years and may even be grown in marginal lands and difficult areas.

As it is evident from the rise in the pharmaceutical and cosmetic industry that there is a huge demand of aloe products in the market, a sizeable production is required. The contribution of this paper is to increase the awareness for the economic benefits of *Aloe vera* plant to both growers and policy makers in Egypt. In addition to raise Egypt's national income and provide employment opportunities through an increase the value added of the agriculture sector. Finally using the new reclaimed lands as the GOE, is moving towards reclamation of 1.5 million feddans which requires innovation

of new paradigm in development the agricultural sector. Adoption of *Aloe vera* in the new lands can be good example for development of agriculture in a new fashion and enhancing added value of the sector.

Alternative uses of Aloe vera

In terms of opportunities, *Aloe vera* is the most commercialized aloe species and processing of the leaf pulp has become a large worldwide industry. In the **food industry**, it has been used as a source of functional foods and as an ingredient in other food products such as yogurt, for the production of gel-containing health drinks and beverages. As **food quality preservation**, the first time *Aloe vera* gel is used as an edible coating fruit and as alternative of the use of post harvest chemical treatments (Martínez-Romero *et al.* 2006).

In the **cosmetic and toiletry industry**, uses of *Aloe vera* in personal skin care like, skin creams, lotions, and special treatment preparations for resolving a large number of skin problems, in skin care to wounds, abrasions and burns, in sunscreen and sunburn protective ingredient in sun care products, in treatment for hair loss, its powerful as an anti-oxidants and cellular anti-ageing agents , its analgestic properties for nail inflammation (Onychitis) and finally its anti-mycotic, anti-inflammatory, and restructuring properties for tinea (Basmatker 2011).

In the **pharmaceutical industry**, it has been used for the manufacture of topical products such as ointments and gel preparations, as well as in the production of tablets and capsules.

As anti-oxidant, it is proved that both the *in vitro* and *in vivo* antioxidant potentials of *Aloe vera* polysaccharide could be further utilized in relevant industrial applications (Kang *et al.* 2014). As **gastrointestinal,** some commonly used medicinal plants such as *Aloe vera or Aloe arborescens* in the treatment of gastrointestinal ailments (Arora *et al.* 2013). As **hepatoprotective,** *Aloe vera* had induced acute liver damage (Kanat *et al.* 2006). As **anti-diabetic,** *Aloe vera* leaf extract could be used as an adjuvant agent for the prevention and/or management of diabetes and aggravated antioxidant status. (Haritha *et al.* 2014). As **anti-microbial,** *Aloe vera* has an antimicrobial effect (Habeeb *et al.* 2007). *Aloe vera* has a role as an agent to combat various fungal infections (Halder *et al.* 2012). As **dermatology,** it is proven the efficacy of aloreed ointment (propolis 50% and *Aloe vera* 3%) in treatment of different types of psoriasis (El-Gammal 2007). **Effect on burns and wound healing,** *Aloe vera* polysaccharides has positive effects on the regulation of extracellular matrix factor synthesis, which open up new perspectives for the wound repair activity of *Aloe vera* polysaccharide at molecular level (Tabandeh *et al.* 2014). As **Immunomodulation,** the extract of *Aloe vera* influences both cell-mediated and humoral immunity in animals and these effects could be responsible for its role as an agent to combat inflammatory conditions like atopic dermatitis and irritable bowel disease

(Halder *et al.* 2012). As **Anti-tumor and Anti-cancer**, emodin can act as an anticancer agent against many human cancer cell lines through its effects across multiple signaling pathways (Hsu and Chung 2012).

In the **veterinary treatments,** *Aloe vera* may be potential and valuable candidate to stimulate the immune responses in chickens and can be used successfully as an immunotherapeutic agent against coccidiosis. Further, it can also be used as a low cost alternative to allopathic drugs to control coccidiosis in chickens. (Akhtar *et al.* 2012)

Methodology and data sources

This paper is conducted to demonstrate associations or relationships among different variables that affect the farmer's adoption of *Aloe vera* in the new reclaimed lands and the consumers attitudes towards demand for such products that contain *Aloe vera* and in particular cosmetics and pharmaceutical products. At the farm level, cross data is collected in a one time interview with the available *Aloe vera* farmers in El-Fayoum Governorate in 2014, due to limitation in number of farms which cultivated *Aloe* only one farm was covered . Another interviews was conducted to collect data about consumer's habits and preferences regarding demand for *Aloe vera* products. The questionnaire was designed and protested. Data for 1146 consumers were collected, coded and analyzed. In addition, secondary data from international sources such as Ministry of Agriculture and Land Reclamation, Central Intelligence Agency, National Agricultural Statistics Service (NASS) of the US Department of Agriculture (USDA), US Census Bureau, International Trade Center, and International Aloe Science Council were collected. Descriptive statistics together with simple graphical analysis form the basis of virtually every quantitative analysis of the data.

SWOT analysis for Aloe vera plant

Before making a decision, whether to invest in setting up *Aloe vera* processing unit or not, one should carefully analyze the associated risk factors. A SWOT analysis can help in analyzing these factors, which can play important role in making the decision. **Strengths** are internal attributes that are helpful to the organization to achieving its objective. Egypt is among the few countries gifted with the unique geographical features essential for cultivation of *Aloe vera* since it has suitable soil and climate. The agricultural practices and labor costs for cultivating *Aloe vera* crop are low and its raw material is Cheap. In addition that *Aloe vera* crop has a significant potential as a diversification crop, since it has many applications in the pharmaceutical, cosmetic and toiletry, and food industry, veterinary medicines, landscape, agriculture uses like making organic manure for natural plant nutrition, natural pest control, natural preventions from atmospheric effects, and natural prevention and preservation for fruits and citrus besides being used in health products.**Weaknesses** are internal attributes that are harmful to the

organization to achieving its objective. There are few market channels and weak linkages between *Aloe vera* value chain members. In addition to the processing cost is high and it is difficult to access to finance. **Opportunities** are external factors that help the organization achieve its objective. The competition in the domestic market is limited. There is a potential trend in the developed countries for both back to nature and maintain proper health, so as *Aloe vera* is a potential source of therapeutics aids has attained a significant role in health system all the world for both human and animal not only in the disease condition but also as potential material for maintaining proper health. Growing market of pharmaceutical, cosmetic, and food industry has created the high consumption opportunities of *Aloe vera*. There is high demand in the foreign markets to *Aloe vera* products like US, Australia, and entire Europe. **Threats** are external factors that are harmful to the organization to achieving its objective. In order to penetrate in and capture the market heavy promotional charges are expected to be incurred. The cultivation may be exposed to natural disaster.

World wide situation for Aloe vera plant

World cultivation for Aloe vera plant

Despite the high demand for *Aloe vera* as a medicinal product, few data on its production is available. The total world wide cultivation of *Aloe vera* in 2004 is about 23,589 hectare, divided between the American Continent which is the highest one represents about 19,119 hectare, followed by the Asian and Australian Continents represents together 4,170 hectare, then the lowest one is the African Continent which represents 300 hectare. The American, Asian, and Australian continents contribution, divided between 13 countries. North America represented by Mexico and Dominican Republic are almost 60 % from the world cultivation, (Source: IASC 2004)

The National Agricultural Statistics Service (NASS) of the US Department of Agriculture (USDA) has not yet maintained annual productivity data of *Aloe vera*. The US Census Bureau groups *Aloe vera* under all other miscellaneous crop farming. The Texas Department of Agriculture Organic Certification Program presently has six certified growers of *Aloe vera* leaf listed; Benson's Aloe Farms, Good Earth Organic Farm, LODC Inc., M2 Organic Farm, Millberg Farms, and Thoeni Aloe Vera. Aloecorp, which states that it is the world's largest *Aloe vera* grower and processor, operates aloe plantations in both southern Texas and in the State of Tamaulipas, Mexico. According to the Texas Cooperative Extension, little data is available on annual production or sales value of Texas-grown aloe. It is estimated, however, that 2000 acres of *Aloe vera* have been harvested in the Rio Grande Valley, which accounts for 95% of all aloe grown in the US. An acre yields about 2,268 to 3,175 kg monthly, and growers earn about US $ 500-700 for each acre harvested.

Aloe vera widely cultivated in North America (Mexico: States of

Tamaulipas and San Luis Potosi, Southern United States of America: States of Florida, Texas, Louisiana and Arizona, Dominican Republic, Costa Rica, Guatemala, and Netherland Antilles), South America (coastal Venezuela, Brazil and Argentina), and Asia (China, Thailand, India, Malaysia). (Source: ITC 2011)

World demand for Aloe vera plant

Demand for cosmetics and toiletries was valued at US **182** billion in 2002, with an increase by **3.5** % compared to 2001. Western Europe represented almost **29** % of the global cosmetics and toiletries market, North America closely following with **27** % of total sales. Asia Pacific **24**% ranked third and Latin America **9.5**% took fourth place. The remaining **11**% of total sales is accounted for Africa and the Middle East, Eastern Europe and Australia.

The value for *Aloe vera* products is about US **110** billion while the value for raw material is about US **125** million. The crop has gained popularity with the USA being the major producer and followed by Venezuela and Mexico. Growth in demand for active ingredients, such as enzymes, amino acids and peptides, will be propelled by continued gains in cosmeceutical skin care products and high value additives such as nanoscale ingredients.

The major market for natural ingredients for pharmaceuticals is Europe, accounting for 38 % of the world market. Germany accounts for over 42 % of the European market, followed by France accounts for 25 %, Italy accounts for 9 %, and the UK accounts for 8 %. The global demand for herbal medicines has increased dramatically during the last ten years. Trade in herbal medicines for example is estimated at US $ 10 billion annually and is growing in excess of 10 % per year (CBI Market Surveys 2005). According to Nutrition Business Journal, global sales for herbs/botanicals accounted for 18.5 billion euros of sales in 2000 and *Aloe vera* leaf latex is ranked number one selling ingredient. Furthermore, *Aloe vera* is one of the 2002 top selling herbal dietary supplements in US conventional food, drug, and mass market retail stores with $524,855 retail sales. (ITC 2003)

Sales of herbal dietary supplements in the United States slightly increased in 2008, reaching a total estimated of $ 4.8 billion. While increased in 2009, reaching a total estimated of just over $ 5 billion. In 2010 increased by reaching a total estimated of more than $ 5.2 billion. *Aloe vera* is one of the five top selling herbal dietary supplements in US natural and health foods market from 2008 to 2010. (ABC quarterly journal HerbalGram)

As for the American Continent in 2004, North America which is represented by Mexico, Dominican Republic, and United States share nearly 87 % from all the American Continent selling *Aloe vera* gel. While for the Australian and Asian Continents in 2004, Thailand is almost the world selling country for *Aloe vera* gel share nearly 86 %. (Source: IASC 2004).

World trade for Aloe vera plant

Nevertheless the small volumes and values of *Aloe vera* global trade, it is obvious that there is a significant trade both between countries within the region and for wider market which is currently unrecorded in CITES trade statistics.

Monthly values of Aloe vera exports during 2014-2016

It is clear from fig. 1 that there is seasonality in *Aloe vera* exports among months, starting from January 2014 by about US $ 218,203 ending with August 2016 by about US $ 200,887. However on June 2015 *Aloe vera* exports reach the highest peak by about US $ 482,830, but rapidly in the next month on July 2015 *Aloe vera* exports reach the lowest value by about US $ 75,033. It observed that among months, on June in 2014 and 2015 *Aloe vera* exports reach the highest values, but on July 2015 and 2016 *Aloe vera* exports reach the lowest values.

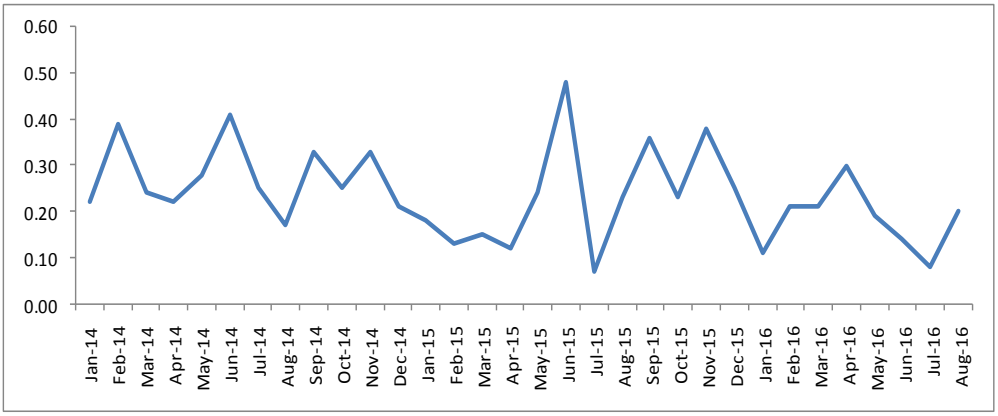

Fig. (1) Monthly values (million US $) of *Aloe vera* exports during 2014-2016
***Source*: https://www.zauba.com/**

Values of Aloe vera exports by countries

It is observed from fig. 2 that the African Continent represented by Nigeria is the largest exporter of *Aloe vera* accounting for exports US $ 2,386,404. As for the Asian Continent represented by Turkey and United Arab Emirates accounting for *Aloe vera* exports US $ 750,607 and US $ 545,538 respectively. However Egypt accounting for *Aloe vera* exports US $ 25,745, but there is a good opportunity to become like Nigeria the largest exporter of *Aloe vera* because both of them located in the African Continent and has nearly the same conditions.

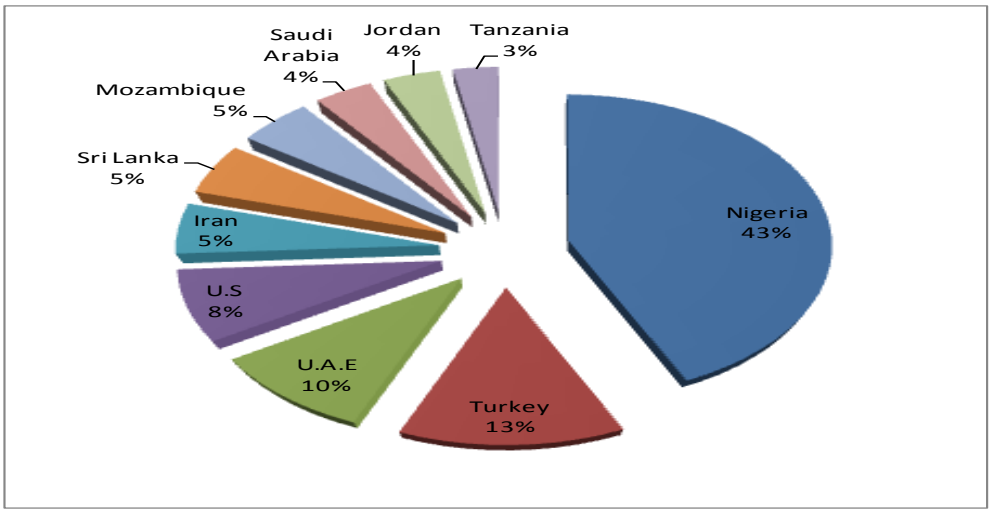

Fig. (2) Values of *Aloe vera* exports by countries
***Source*: https://www.zauba.com/**

Monthly values of Aloe vera imports during 2014-2016

It is appear from fig. 3 that there is seasonality in *Aloe vera* imports among months, starting from January 2014 to US $ 171,809 ending with August 2016 to US $ 673,815. While on October 2014 it highly increased to US $ 1,022,735. But on February 2014, April, July, and November 2015 it highly declined to US $ 58939, 48405, 65443, and 70794 respectively.

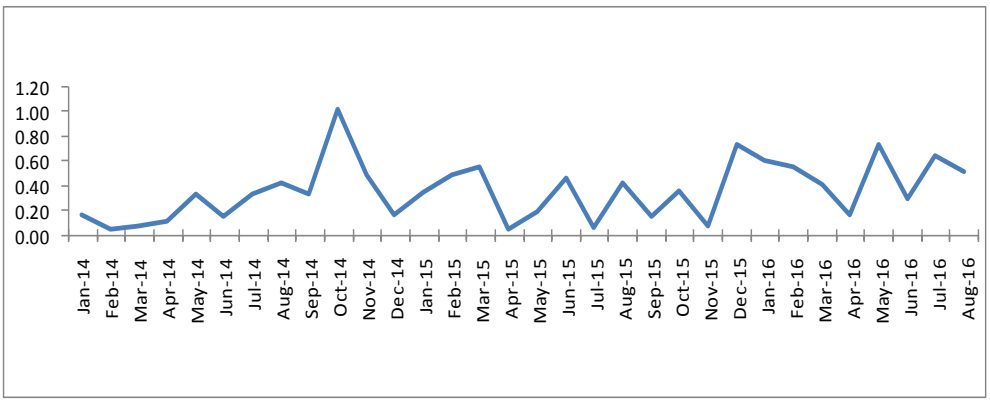

Fig. (3) Monthly values (million US $) of *Aloe vera* imports during 2014-2016
***Source*: https://www.zauba.com/**

Values of Aloe vera imports by countries

It is obvious from fig. 4 that North America represented by the United States is almost the largest importer of *Aloe vera* accounting for imports US $ 8,749,142 followed by Mexico accounting for imports US $ 889,848. Europe represented by six countries as follows Italy, Spain, Poland, France, U.K, and

Germany accounting for imports US $ 599596, 342139, 179137, 161353, 144335, and 32330 respectively. Finally Asia represented by China and South Korea accounting for imports US $ 264685 and 60169 respectively.

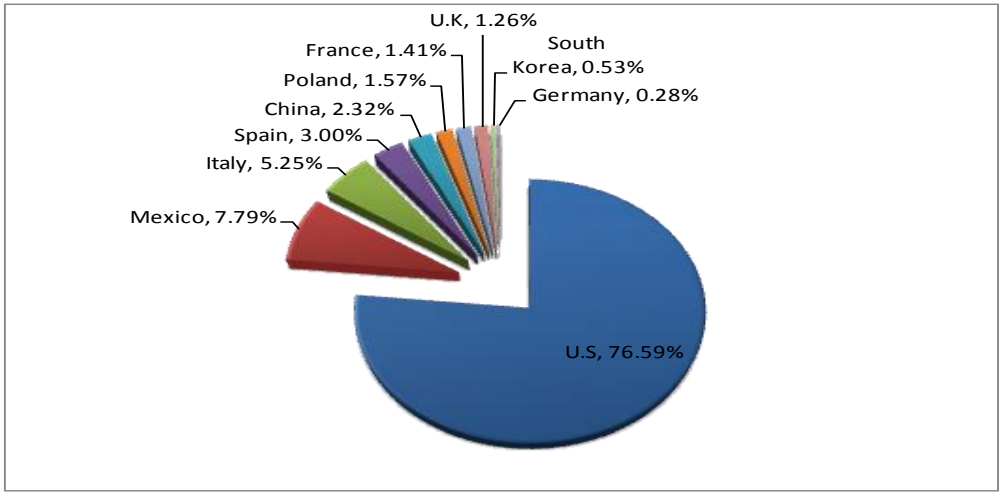

Fig. (4) Values of *Aloe vera* imports by countries
Source: https://www.zauba.com/

Domestic situation for Aloe vera plant
Domestic cultivation for Aloe vera plant

Statistical data about *Aloe vera* in Egypt concern area, productivity, yield and even production is very rare. Only few data about cactus in general is available. In 1992 one feddan in Cairo was cultivated. From 1993 to 1995 there are 5 feddans in each year in North Sinai. In 1997 there are 3 feddans in Fayoum. From 1998 till 2003 there is no data available. In 2004 the area cultivated in Fayoum increased 4 times to be 12 feddans, while in 2005 the area cultivated increased about 3 times to be 39 feddans. In 2007 there are 20 feddans in Bani-Suef. (Source: Ministry of Agriculture and Land Reclamation)

In 1993 and 1994 in North Sinai there are 2.8 ton per feddan in each year was yielded, while in 1995 the yield decreased severely to 0.4 ton per feddan. In 1997 in El-Fayoum there is 30 ton per feddan was yielded. From 1998 till 2003 there is no data available. However in 2004 and 2005, the area cultivated in Fayoum highly increased, the yield decreased severely to be 5 ton per feddan in each year. In 2007 in Bani-Suef there is just 6 ton per feddan was yielded. From 2008 till 2014 there is no available data. (Source: Ministry of Agriculture and Land Reclamation)

Domestic demand for Aloe vera plant
Consumer interviews

A random survey design was conducted in order to collect data for consumers of *Aloe vera* products in three regions which are the first high class in Nasr City, the second medium class in El-Zeitoun, and the third low class in El-Marg. Data were collected during January-March 2014 at different hours

and different types of retail stores. The questionnaire consists of four major sections. The first section derives information on the degree of awareness for consumers about the *Aloe vera* various products in the Egyptian market. The second section gains information about source of awareness from which the consumers know about the *Aloe vera* various products in the Egyptian market. The third section reports information on the consumer preferences for the *Aloe vera* products which they usually use. The last section examines consumer demand for both the quality and price.

Data collected from a total random sample of 1146 consumers, as for the first class represents 395 consumers while the second class represents 381 consumers and the third class represents 370 consumers. With rapid to degree of awareness for consumers to *Aloe vera* products, there is 50.9% within the three classes know about the Egyptian *Aloe vera* various products and 49.1% within the three classes don't know about the Egyptian *Aloe vera* various products. As shown in fig. 5, the third class is the highest class knows about the Egyptian *Aloe vera* various products represents 73.5% due to the vital role of the spice dealers which are trust source for these class in promoting the *Aloe vera* products. Followed by the first class represents 56.5% knows about the Egyptian *Aloe vera* various products because they usually do shopping and spend a lot of time looking for new products. Finally the second class is the lowest one represents 23.1% know about the Egyptian *Aloe vera* various products.

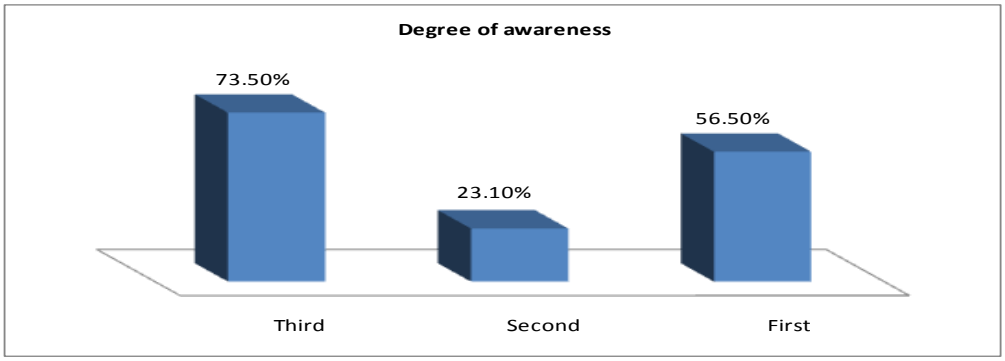

Fig. (5) Relation between classes and degree of awareness
***Source*: coded and analyzed from consumer interviews**

As shown in fig. 6 From the total of 583 consumers who knows about the Egyptian *Aloe vera* various products, with rapid to source of awareness, the highest source for the first class is shopping represents 39.9%, followed by friend's represents 35.0%, and the lowest one is colleagues represents 25.1%. For the second class, the highest source is colleague's represents 60.2%, followed by T.V represents 25.0%, and the lowest one is family represents 14.8%. For the third class, the highest source is spice dealers represents 50.0%, followed by neighbor's represents 30.1%, and the lowest one is family represents 19.9%.

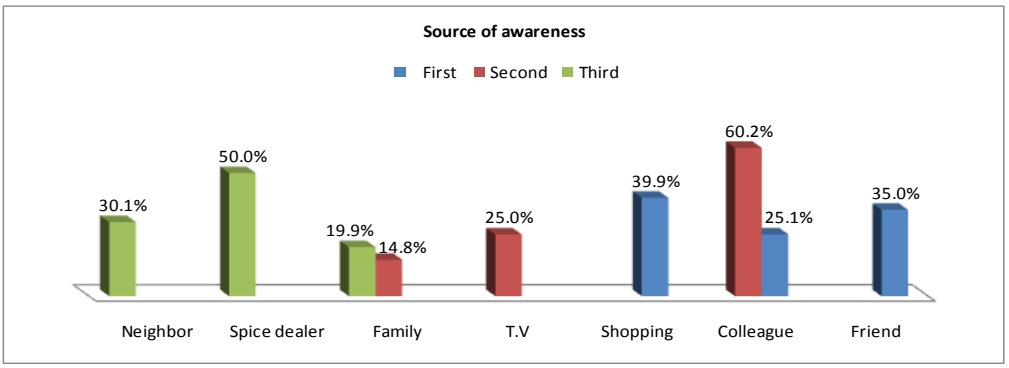

Fig. (6) Relation between classes and source of awareness
***Source*: coded and analyzed from consumer interviews**

As shown in fig. 7 from the total of 583 consumers who knows about the Egyptian *Aloe vera* various products, with rapid to various *Aloe vera* products used by consumers, the highest *Aloe vera* product used for the first class is soap represents 30.9%, followed by body lotion represents 20.6%, followed by moisturizing cream represents 18.8%, followed by wipes represents 13.0%, followed by drink represents 11.2%, and finally the lowest one is other represents 5.4%. For the second class, the highest *Aloe vera* product used is moisturizing cream represents 35.2%, followed by shampoo represents 25.0%, followed by hair cream represents 20.5%, followed by hair ampoule represents 15.9%, followed by other represents 2.3%, and finally the lowest one is psoriasis ointment represents 1.1%. For the third class, the highest *Aloe vera* product used is fresh aloe gel represents 41.9%, followed by hair ampoule represents 26.1%, followed by hair oil represents 22.1%, and finally the lowest one is hair cream represents 9.9%.

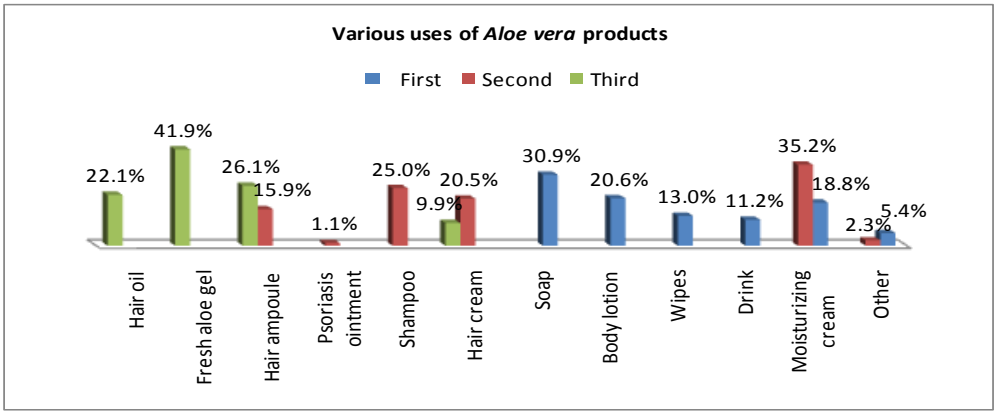

Fig. (7) Relation between classes and various uses of *Aloe vera* products
***Source*: coded and analyzed from consumer interviews**

As shown in fig. 8 from the total of 583 consumers who knows about the Egyptian *Aloe vera* various products, with rapid to consumers demand for

both quality and price of *Aloe vera* products, consumers demand for the first class needs almost excellent quality and high price represents 96.9%. For the second class, most consumers demand needs very good quality and reasonable price represents 73.9% and few consumers demand needs excellent quality and high price represents 26.1%. For the third class, almost consumers demand needs good quality and low price represents 92.3%.

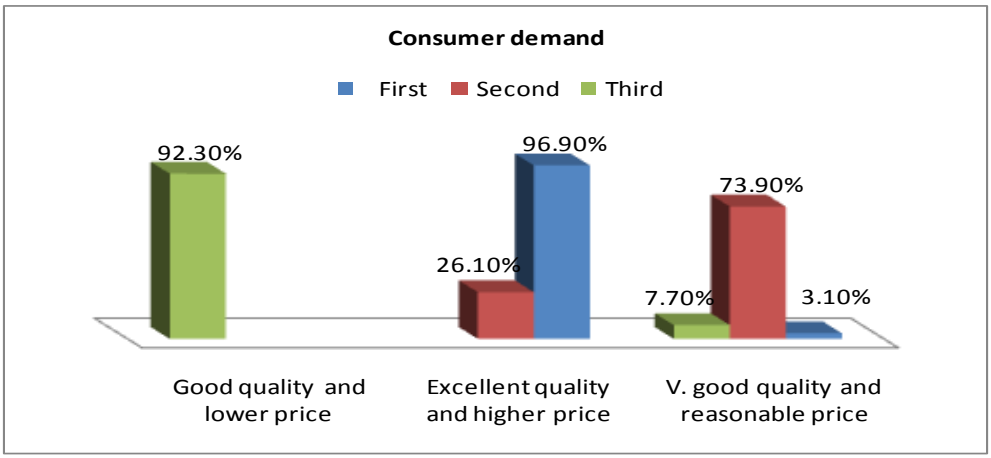

Fig. (8) Relation between classes and consumers demand
***Source*: coded and analyzed from consumer interviews**

Frequency charts

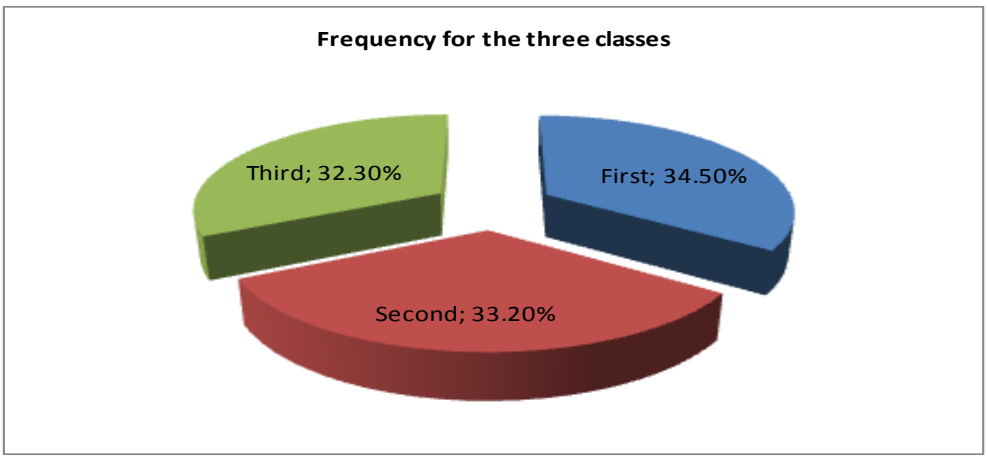

Fig. (9) Frequency for the three classes
***Source*: coded and analyzed from consumer interviews**

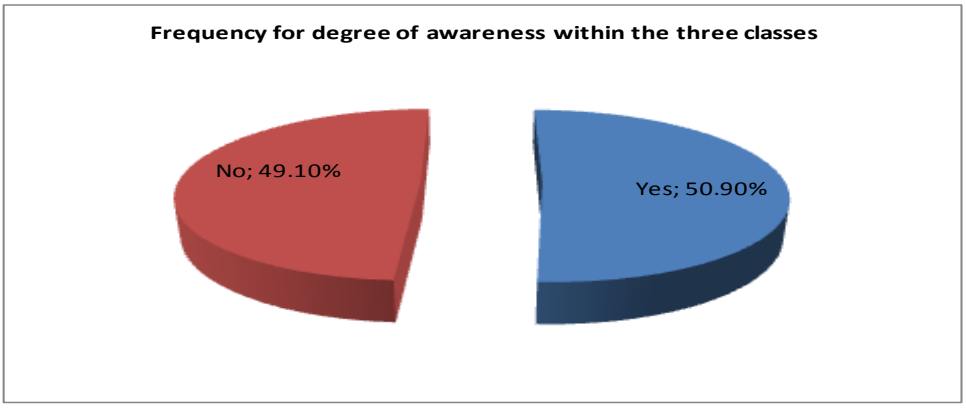

Fig. (10) Frequency for degree of awareness within the three classes
***Source*: coded and analyzed from consumer interviews**

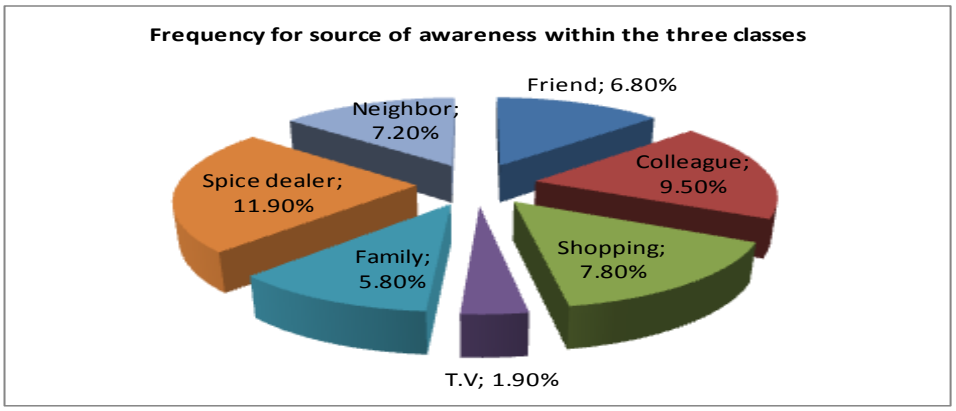

Fig. (11) Frequency for source of awareness within the three classes
***Source*: coded and analyzed from consumer interviews**

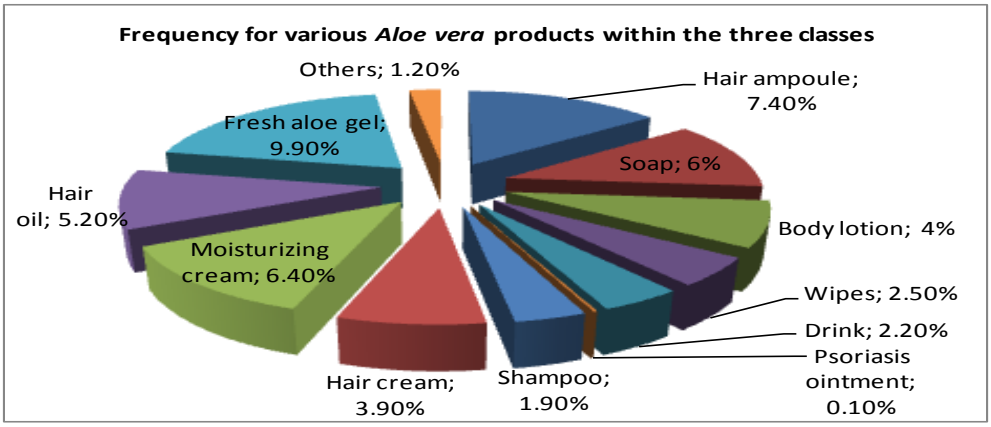

Fig. (12) Frequency for various uses of *Aloe vera* products within the three classes
***Source:* coded and analyzed from consumer interviews**

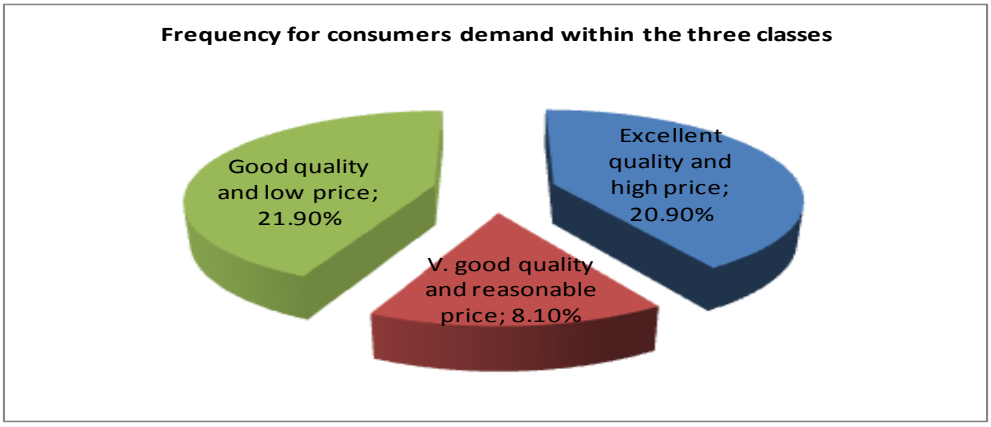

Fig. (13) Frequency for consumers demand within the three classes
Source: **coded and analyzed from consumer interviews**

Domestic trade for Aloe vera plant

Statistical data about *Aloe vera* imports or even exports in Egypt is very rare. Only few data about aloes extracts and cactus in general is available. In 2006, Egypt imports from India and Kenya about 22.44 and 6.25 ton of aloes extracts respectively, valued at LE 78,190 and 28,957 respectively. In 2009, Egypt imports from Kenya about 0.53 ton of aloes extracts, valued at LE 28,117. In 2010, Egypt imports from each of the USA and Germany about 0.1 ton of aloes extracts, each valued at LE 13,556. (Source: Ministry of Trade and Industry, General Organization for Export and Import Control).

In 2006, Egypt exports to Algeria about 2 ton of cactus and to Qatar about 20 ton of ornamental cactus. In 2008, Egypt exports to Germany and Lebanon about 18.3 and 5 ton of cactus respectively. In 2009, Egypt exports to Iraq and Syria about 0.5 and 3 ton of cactus respectively. In 2010, Egypt exports to Spain, Oman and France about 26.1, 0.001, and 0.002 ton of cactus respectively. (Source: Ministry of Agriculture and Land Reclamation, Central Administration of Plant Quarantine)

Organic enterprise budget for Aloe vera

An enterprise budget provides an estimate of the potential revenue, expenses, and profit for a single enterprise. Enterprise budget can be created for different levels of production or types of technology.

Some efficiency measurements are calculated from the data such as gross margin per feddan and per ton, farmer margin, farmer incentive, return per cubic meter of water, break-even price and break-even yield as shown in table (1).

The data showed that the average annual revenue for *Aloe vera* leaves per feddan (1) was about LE 110 thousands which indicate possibilities to improve the income derived from *Aloe vera*. The total variable costs estimated at LE 20,250 per feddan, where the cost of labor represents about 55 % from

the total variable cost which reflects the relative importance of human labor for cultivating and harvesting this crop, while both seedling and manure represent about 14 % and 18 % respectively from the value of total variable cost. The value of gross margin is estimated about LE 89,750 per feddan which indicate the ability for this crop to compete between different kinds of crops which can be grown in such kind of land. Another advantage of cultivating this crop is the lower value for fixed cost which represented as depreciation of drip irrigation system which estimated about LE 400 per year, in addition to the lower cost for unfertile land rent which not exceeds more than LE 500 per feddan yearly. The estimated profit was about LE 88849.6 per feddan, this high profit give indicators to encourage farmers in future to expand this crop in unfertile lands and become a good source for income in new lands. Value of break-even yield and break-even price Were estimated about 10.5 ton/feddan and 384.5 LE /ton respectively . which reflect the risk free for that crop.

Table(1): Average organic enterprise budget for *Aloe vera* crop per feddan

	Unit	Quantity (unit/fed.)	Price (LE)	Value (LE/fed.)
Revenue				
Product (Leaves)	Ton	55	2000	110000
Total revenue				110000
Variable cost				
Seedlings	Number	6000	0.50	3000
Manure	m	23	400	3750
Labor				
Hired mechanical	Hrs	7.2	50	360
Hired human	Man/day	251.1	45	11299.5
Interest	LE/year	18409.50	0.10	1841
Total variable cost	LE/fed.			20250
Gross margin	LE/fed.			89750
Gross margin	LE/ ton			1632
Fixed cost				
Machinery				
Irrigation system	LE	1	4000	4000
Depreciations	LE			400
Rent of land	LE/year			500
Total fixed costs	LE			900
Total costs	LE/fed.			21150.5
Total costs	LE/ ton			384.6
Profit	LE/fed.			88849.6
Profit	LE/ ton			1615.4
Farmer margin	LE/ ton			1615.4
Farmer incentive	% / ton			81
Water requirement	m^3			1.8
Return per $m^3$of water				49360.86

Source: **computed and compiled from field interview, 2014**

Conclusion

The contribution of this paper is to increase the awareness for the economic benefits of *Aloe vera* plant to both growers and policy makers in Egypt. In addition to raise Egypt's national income and provide employment opportunities through an increase the value added of the agriculture sector. Finally using the new reclaimed lands as the GOE, is moving towards reclamation of 1.5 million feddans which requires innovation of new paradigm in development the agricultural sector. Adoption of *Aloe vera* in the new lands can be good example for development of agriculture in a new fashion and enhancing added value of the sector. Results indicate that the total world wide cultivation of *Aloe vera* in 2004 is about 23,589 hectare, divided between the American Continent which is the highest one represents about 19,119 hectare, followed by the Asian and Australian Continents represents together 4,170 hectare, then the lowest one is the African Continent which represents 300 hectare. The demand for *Aloe vera* products is increasing in the international market due to the vast benefits that can be driven out of the product. The value for *Aloe vera* products is about US **110** billion while the value for raw material is about US **125** million. As for the American Continent in 2004, Mexico was the biggest country sold the product *Aloe vera* gel, followed by Dominican Republic, then the United States. As for Asia and Australia Continents in 2004, Thailand was the biggest country sold the product *Aloe vera* gel. Nevertheless the small volumes and values of *Aloe vera* global trade, it is obvious that there is a significant trade both between countries within the region and for wider market which is currently unrecorded in CITES trade statistics. During 2014 - 2016 Nigeria is the largest exporter of *Aloe vera* products followed by Turkey, then the United Arab Emirates, while the United States is the largest importer of *Aloe vera* products followed by Mexico, then Italy. The current situation for *Aloe vera* in Egypt is neglected, statistical data about *Aloe vera* in Egypt concern area, productivity, yield and even production is very rare. A survey was conducted randomly to collect data about consumer's habits and preferences regarding demand for *Aloe vera* products between three consumer classes at different hours and different types of retail stores. The questionnaire was designed and protested. Data for 1146 consumers were collected, coded and analyzed. Results recorded that there is 50.9% within the three classes know about the Egyptian *Aloe vera* various products and 49.1% within the three classes don't know about the Egyptian *Aloe vera* various products. The third low income class is the highest class represents 73.5% knows about *Aloe vera* various products due to the vital role of the spice dealers which are trust source for these class in promoting the *Aloe vera* products. While the first high income class represents 56.5% knows about the Egyptian *Aloe vera* various products because they usually do shopping and spend a lot of time looking for new products. And the second

medium income class is the lowest one represents 23.1% know about the Egyptian *Aloe vera* various products. In addition to estimate the cost of production and profitability per feddan for *Aloe vera* plant, cross data is collected in a one time interview with the available *Aloe vera* farmer in El-fayoum Governorate during 2014 cropping season. The data showed that the average annual revenue for *Aloe vera* leaves per feddan was LE 110 thousands, while the total variable costs estimated at LE 20,250 per feddan and the total fixed costs estimated at LE 900 per feddan. The break-even yield necessary to cover all total costs at a given output price is 10.5 ton/feddan, while the break-even price needed to just cover all total costs at a given output level price is 384.5 LE. The results suggests that, a governmental effort should be done to encourage farmers and / or teenagers to buy the unfertile lands with reasonable prices and credit facilities for cultivating this miracle *Aloe vera* crop. In addition that there is a good opportunity to do more effort to increase the awareness of the high income and medium income consumers about the Egyptian *Aloe vera* various products especially they highly demand for natural products with high quality.

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امكانيات نبات الصبار فى زيادة القيمة المضافة لقطاع الزراعة فى الاراضى الجديدة المستصلحة

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اعد هذا البحث لدراسة بعض المتغيرات التى تؤثر على تبنى المزارعين لنبات الصبار فى الاراضى المستصلحة الجديدة اضافة الى معرفة مواقف المستهلكين نحو الطلب على هذه المنتجات التى تحتوى على الصبار وخاصه مستحضرات التجميل و المنتجات الصيدلانية. واعتمد البحث على البيانات التى تم جمعها من احدى مزارع الصبار المتاحة فى محافظة الفيوم عام ٢٠١٤، كما تم ايضا تصميم استبيان و اجراء مقابلات مع عدد ١١٤٦ مستهلك تم تصنيفهم بين ثلاث فئات للمستهلكين للتعرف على عادات المستهلكين و تفضيلاتهم فيما يتعلق بالطلب على منتجات الصبار.

وقد اظهرت النتائج ان هناك ٥٠,٩ % من الفئات الثلاثة لديهم وعى بمعرفة منتجات الصبار المختلفة كا تبين ان نحو ٧٣,٥ % من فئة المستهلكين من ذوى الدخل المنخفض لديهم وعى بدرجة اعلى بمعرفة الصبار و منتجاته المختلفة نظرا لتداوله وتعدد استخداماته لافراد هذه الفئة. فى حين تراوحت نسبة الوعى بالصبار ومنتجاته بين ٥٦,٥ %، ٢٣,١ % بين افراد كل من الفئة الاولى والثانيه على الترتيب.

كما اشارت نتائج البحث ان الايرادات السنوية للفدان من الصبار فى صورة اوراق خام بلغت نحو١١٠ الف جنية ، فى حين قدرت اجمالى التكاليف المتغيرة بنحو٢٠٢٥٠ الف جنية للفدان واجمالى التكاليف الثابتة المقدرة بنحو ٩٠٠ جنية للفدان. بما يعكس امكانيات هذا المحصول فى زيادة مصدر الدخل للزراع فى الأراضي الجديدة. كما قدر انتاج التعادل بنحو ١٠,٥ طن للفدان، فى حين بلغ سعر التعادل نحو ٣٤٨,٥ جنية للطن الامر الذى يعكس تمتع المحصول بدرجة عالية من الاستقرار وعدم تعرض الزراع لاى مخاطر .

واوصى البحث بضرورة تشجيع المزارعيين من خلال زيادة الوعى وتوفير التسهيلات الائتمانية للتوسع فى هذا المحصول خاصة فى الاراضى الجديدة ،فضلا عن انشاء والتوسع فى تصنيع الصبار ومنتجاته لزيادة القيمة المضافة وزيادة فرص العمل والتوسع فى التصدير .