International Journal of ChemTech Research
CODEN (USA): IJCRGG, ISSN: 0974-4290, ISSN(Online):2455-9555
Vol.9, No.10 pp 01-09, 2016

An Economic Study for the Alternatives of Traditional Fodder

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Abstract: The availability of animal feed at suitable prices is considered one of the most important reasons of the increase in animal production Recently, the non availability of feed and the increase in its prices exhaust both senior and junior bringers. Therefore, searching for alternatives of traditional feed becomes essential due to the impossibility of increasing the area that is cultivated by these forage crops. The problem of this study is represented in the feed production deficit to cover the necessary nutritional requirements for different types of animal production. This study aims at identifying the current position of the green feed in an attempt to reduce the feed gap through using hydroponic barley the increase in the number of the heads' of cattle, buffalos, sheep, goats and camels reached about 34.9%, 16.9%, 23.1% and 22.1% in comparison to its counterpart in 2000, respectively. This increase in the livestock's number does not match with the tremendous increase in the population number during the same period of time. Among the most important crops of the green forage are; clover, Darawa, sweet sorghum and barley. It becomes obviously clear from this study that the non-traditional solutions for the production of green fodder can be the optimum economic solution to overcome the problem of deficit in the animal feed, including the production of green barley feed without agricultural soil and inside the isolated rooms; the so-called (Hydroponic). The hydroponic barley is the grains of barley that are cultured under specific conditions of temperature and humidity so that the length of the green part reached about 15-20 cm.
The total cost of accessories, excluding buildings, because it is a room at home or at farm equal 10165 pounds. It produces about 150 kilo of hydroponic barley, daily, which is enough for feeding six fattening calves or 6 milking cows or 50 sheep. The feeding cost for each cattle from the dry fodder per session is about 3780 pounds. The cost of hydroponic, fresh green barley is about 1800 pounds. The farmer can cover the cost of establishing the room a single session and also achieves a surplus that reaches around 1717 pounds. Thus, feeding on hydroponic barley saves about 450 pounds in comparison with its counterpart of clover per session. As a result, this study recommends expanding the production of hydroponic barley on a large scale, spreading awareness between farmers concerning the importance of feeding on hydroponic barley, and encouraging farmers to produce it. Based on this, the area planted by clover can be reduced and exploited in the cultivation of some strategically crops such as wheat
Key Words: Traditional Fodder - Barley - Hydroponic Barley - Fodder Crops.

Introduction

The livestock industry of animal production is considered a multifaceted industry in which more than one influential factor is intervened, in addition to prevention, care and veterinary treatment. The management of animal production farms represents an important element that needs to be elaborated through following the modern technological and technical means; especially in the process of producing various feeds, treating it

technologically and making use of everything that is available to convert it into animal feed with high nutritive value as an attempt to reduce nutritional costs that represents about 70% of animal production cost [1]

The availability of animal feed at suitable prices is considered one of the most important reasons of the increase in animal production. Recently, the non-availability of feed and the increase in its prices exhaust both senior and junior bringers. Therefore, searching for alternatives of traditional feed becomes essential due to the impossibility of increasing the area that is cultivated by these forage crops. Despite the low rates of the per capita consumption of the animal protein that reached about 9.2 kilogram in 2012 this average is much less than the global consumption averages. The local production cannot accompany the domestic consumption up till now. Consequently, this causes a gap that reached about 264 thousand tons during the same year. Finally, experts concludes to produce feeds from hydroponic barley, that does not need soil, fertilizers or intensive working hands and, at the same time, it is characterized by its high productivity and the increase in its nutritive value.

Problem of the Study:

The problem of this study is represented in the feed production deficit to cover the necessary nutritional requirements for different types of animal production. This is called the "Fodder Gap" that necessarily leads to the impossibility of providing animals with their food needs necessary to demonstrate their productive efficiency.

Objective of the Study:

This study aims at identifying the current position of the green fodder in an attempt to reduce the fodder gap through using hydroponic barley that may help to reduce that gap and increase the availability of animal livestock wealth.

Research Method and Data Sources:

This study uses the descriptive, statistical and analytical approach in describing the data. Besides, it depends on the data published from The Central Agency for Public Mobilization and Statistics, The Ministry of Agriculture and Land Reclamation, Bulletin of Agricultural Statistics, Bulletin of Livestock Statistics, different editions (2000-2014).

Results:

Current Situation of the Livestock:

Table No. (1) Numbers of Animal by Cattle Heads per thousand during the period (2000-2014).

Year	Cows	Buffalo	Sheep	Goats	Camels
2000	3530	3379	4469	3425	141
2001	3801	3532	4671	3497	134
2002	4000	3550	4805	3582	127
2003	4227	3777	4939	3811	136
2004	4369	3845	5043	3889	129
2005	4500	3920	5097	3915	142
2006	4610	3937	5385	3877	148
2007	4933	4105	5467	4211	84
2008	5023	4053	5498	4237	107
2009	4525	4000	5592	4139	127
2010	4729	4078	5530	4175	128
2011	4729	4158	5530	4176	141
2012	4737	4036	5547	4164	147
2013	4725	3915	5564	4153	153
2014	4762	3949	5503	4186	158

Source:

The Ministry of Agriculture and Land Reclamation, Economic Affairs Sector, Bulletin of Livestock Statistic, 2014 [2].

The Importance of Fodder:

It becomes clear from Table number (1) that the increase in the number of the heads' of cattle, buffalos, sheep, goats and camels reached about 34.9%, 16.9%, 23.1% and 22.1% in comparison to its counterpart in 2000, respectively. This increase in the livestock's number does not match with the tremendous increase in the population number during the same period of time that reached about 22.84 million people, [6] this highlights the extent of the problem.

The Current Position of the Egyptian Fodder:

We can define "Feed" or "Diet" as any substance that is used in animals' nutrition and any other animals; such as poultry and fish. The source of most of this fodder was from plants. The word "feed" is used to signify the food provided to animals. As for the word "pasture", it is used to define plants that are used in grazing animals.

The most important fodder substances that are given to the farm animals in Egypt can be classified into:

• Green fodder substances that include wintry clover, sorghum ,drawd and corn sweet.

• Dry fodder that includes fillers; such as, hays and concentrated feed. Also, it includes the remnants of mills, paddles and squeezing hangover.

• Concentrated fodder and there are food additives that include mineral salts, vitamins, growth promoters. Besides, the number of fodder factors in Egypt in 2014 reached about 198 factories, including 145 working factories, 53 non-working factories. The actual capacity of the operating factories reached about 16.5 % of the total energy and nearly about 83.5 % of the off energy.

Table no. (2) Shows that, the highest amount of feed production has been achieved in 2003 since it reached about 98.59 million tons. Besides, it has achieved the highest production of green fodder by about 73.6 % of the total fodder in 2004. Also, it has achieved the highest production ratio of dry fodder in 2006 by about 22 0.5 %. Additionally, it achieved the highest production of concentrated fodder by about 10% in 2002.

Table no. (2) The Relative Importance of Producing Kinds of Fodder per Thousand Tons in Egypt during the period (2000-2014)

years	Total Production of Fodder	Concentrated Fodder		Dry Fodder		Green Fodder	
		%	Production	%	Production	%	Production
2000	88799	9.4	8305	19.7	17480	71.0	63014
2001	89956	9.8	8816	19.9	17944	70.3	63196
2002	93908	10.0	9349	19.1	17978	70.9	66581
2003	98590	9.0	8849	18.6	18350	72.4	71391
2004	97466	7.5	7339	18.8	18364	73.6	71763
2005	94876	6.4	6087	19.8	18757	73.8	70032
2006	89948	9.2	8293	22.5	20202	68.3	61453
2007	88771	8.5	7525	22.3	19802	69.2	61444
2008	94457	8.6	8097	20.6	19448	70.8	66912
2009	86415	7.2	6200	22.4	19324	70.5	60891
2010	87418	7.8	6685	22.3	19530	70.01	61203
2011	89750	7.8	6997	22.1	19859	70.1	62894
2012	88844	7.7	6827	22.2	19751	70.1	62266
2013	89297	7.8	6912	22.2	19805	70.1	125126
2014	89071	7.8	6870	22.2	19778	70.1	93696

Source:

The Ministry of Agriculture and Land Reclamation, Economic Affairs Sector, Bulletin of Livestock Statistic, 2014 [2]

First: Green Fodder:

Proper nutrition for the animal is a technical process which must completely cover its food needs in the form of balanced diets of available fodder materials, which is also an economic process in which we try to use the available raw material that has high nutritive value and low processing costs. The aim behind this is to get the most amount of the animal's production through the least amount of cost to increase the breeder's profit and encourage him to continue in increasing animal production. Thus, it increases the national income of the country's livestock. There are two nutritional types in animal feed. The first type depends on its feeding on green fodder resulting from the land of the farm, with manufactured, concentrated fodder and a little coarse fodder purchased from outside the farm. The second depends on feeding on manufactured, concentrated fodder and both are coarse and purchased from outside the farm.

As for the first type, the number of animals that are bred in the land of the farm exceeds its ability to produce green fodder, which needs to rely heavily on the manufactured fodder. As for the second pattern, it is clearly applied on milk or fattening farms near the cities since the manufactured feeds play an essential role in the formation of the animal diets for the production of meat or milk.

The Most Important Green Fodder Crops:

First: Clover.

Clover is considered the wintry fodder crop in animal nutrition. It is planted early at the beginning of October till it's mid. The farm animals' nutrition on clover starts from the beginning of December and till the month of May. This means that nutrition on it can be done for about six months. The total area of the clover reached about 1.3 million feddan in 2013/2014, with an average of productivity that reached about 29.7 tons / feddan, while the overall production has reached about 38.8 million tons. Dakahlia Governorate has occupied the highest space that is estimated by about 165.1thausand feddan. While Nubaria achieved higher productivity by about 50.1 tons / feddan. Finally, Al-Behara has achieved the highest productivity that reached about 4.5 million tons / feddan, approximately.

Second: ***Al-Drawa***

It is the maize grown when it is planted so dense and taken from it only one share. It is planted next to the main summer crop (Maize). Besides, it bears summer heat. It is recommended not to submit it to the animal alone due to its negative impact on animal production, either in the case of meat or milk production. Also, it causes diarrhea for farm animals. Its summary planted area reached about 182.2 thousand feddan by a production of about 1.073million tons in 2013 / 2014.

Third: Corn Sweet

It is considered one of the summery green fodder since it has a higher nutritional value and does not cause any harm to the animal. Also, it helps to increase milk production and the amount of meat. Besides, we can get three stuffed out of it. The total wintry cultivated area reached about 43 feddan to produce about **387** tons, during the same year. As the summery cultivated area, it reached about 27.85thousand feddan to produce about 331.21thousand tons, during the same year. Besides, Sorghum Fodder, Amshouty , Maize fodder, are planted as summery fodder crops. Their areas are estimated by about 8.1, 7.1, 6.7 thousand feddan for each of them, respectively, and its production is estimated by about 100.14, 122.032, 97.9 thousand tons each of them, respectively, during the same year.

Table No. (3) Wintry Green Fodder Crops in 2014

Crop	Area by Feddan	Productivity by Ton/Feddan	Production by Ton
Clover	1309312	29,668	38844550
Clover Tahreesh	222274	12.434	2763861
Clover(for seed production)	101371	0.263	26637
Elephant Fodder	26	9.500	247
Sudan Grass	4	36.000	144
Fodder Beet	670	9.000	6030
Corn sweet	43	9.000	387
Green Fenugreek	30	2.367	71
Total	1633730		41641927

Source:

The Ministry of Agriculture and Land Reclamation, Economic Affairs Sector, Bulletin of Agricultural Statistics, 2014 [2].

The provision of green fodder is an imperative to animal's nutrition. It is the proper diet for ruminants and a source of the essential nutritional elements that are needed by the animal since it has the ability to supply the cows and sheep by about 75 % of its protein if this is fodder are from legume, but if it is presented in silage it has the ability to supply animals by about 40-50 % out of their required energy.

Moreover, it improves ruminations and rumen chewing process. Also, it helps in the improvement of the palatability of the mixture as it maintains the balance of the digestive tract of the animal. Besides, it increases the absorption of nutrients that are digested and reduces the speed of the production of volatile fatty acids. This leads to reduce the incidence of some diseases; such as acidity, in addition to the fact that if it is cultivated, the economic cost of the project of cattle and sheep is reduced. Besides, it helps to increase the soil fertility.

It becomes clear from Table No. (3) that the clover has occupied the first position in terms of the cultivated area that reached about 1.4 million tons, followed by each of the Clover Tahreesh and Clover (for seed production). On the other hand, Sudan Grass has occupied the first rank in terms of productivity that reached about 36 tons, followed by each of clover and Clover Tahreesh by a productivity that is approximately estimated by about 29,7and 12,4tons, respectively.

As it is shown in Table (4), Drawa occupies the first place in terms of the cultivated area by about 182.2 thousand feddan, approximately. Then, it is followed by the Corn Sweet by about 22.75and the Sorghum Fodder by about 8.072 thousand feddan. As for the productivity, Sudan Grass has ranked the first place by about 33.023 tons / feddan, followed by Sorghum by about 32.29tons / feddan and Amshoti by about 17,14tons / feddan. It becomes clear that the highest share of production was for Al-Darawa. It reached about 1.07million tons during the same year. Then, it is followed by Corn Sweet, sorghum and the Amshoti by about 331.21, 175.12, 122.03 thousand tons, respectively. As the Nile green fodder, its total area reached about 24.12thousand feddan, approximately. Besides, the Total Summery Silage has also reached about 268.11thousand feddan.

Table No. (4) The Summery Green Fodder Crops in 2014

Crop	Area by feddan	Productivity Ton/feddan	Production by Ton
Drawa	182223	11.375	1072877
Corn Sweet	22750	14.558	331205
Cowpea Fodder	1912	12.000	22944
Elephant Fodder	2083	13.020	27121
Sorghum	5423	32,292	175119
Amshoti	7119	17.142	122032
Denaiba	3354	8.756	29368
Millet	6011	13.474	80992
Sudan Grass	260	33.023	8586
Maize Fodder	6675	14.662	97872
Sorghum Fodder	8072	12.406	100139
Rods Fodder	30	1.000	30
Total Summery Silage	268110		
Total Nile green fodder	24123		

Source:

The Ministry of Agriculture and Land Reclamation, Bulletin of Agricultural Statistics, Bulletin of Livestock Statistics, (2014) [2]

The Economic Study for Barley:

It becomes clear from Table No. (5) that this crop has achieved the highest planted area and production by about 147.22 thousand feddan, 167.024 thousand tons in 2005, respectively. As for the highest productivity, it was achieved in 2013 by about 1.674 tons / feddan.

Table No. (5) Area, Total Production and Productivity of the Barley Crop during the Period (2001-2014)

Statement	Production by Ton	Productivity Ton/Feddan	Area by feddan
2001	93905	1.277	73554
2002	100797	1.283	78557
2003	٥٨٥٥٢	١,٢١٨	٤٦٣٥٣
2004	16308	1.153	14150
2005	167024	1.135	147217
2006	136211	1.285	105977
2007	137088	1.644	83390
2008	132298	1.554	85555
2009	146269	1.533	95443
2010	117113	1.329	88103
2011	107597	1.541	69838
2012	130318	1.656	78679
2013	130318	1.674	78679
2014	101021	1.672	60413

Source:

The Ministry of Agriculture and Land Reclamation, Economic Affairs Sector, Bulletin of Agricultural Statistics, 2014.[٣] .

The Production of the Green Barley Fodder without Agricultural Soil (Hydroponic):

It becomes obviously clear from this study that the non-traditional solutions for the production of green fodder can be the optimum economic solution to overcome the problem of deficit in the animal feed, including the production of green barley fodder without agricultural soil and inside the isolated rooms; the so-called (Hydroponic).

A Comparison between Ordinary and Hydroponic Barley:

Hydroponic	Ordinary
Buds soften the bean and create enzymes and amino acids that work on cell renewal.	Among its disadvantages is its difficulty to be digested since it is protected by an outer hard bark.
The length of the green part reached about 15-20 cm away from the white root system.	It contains protein by about 9%.
Protein ratio reached about 19%.	Each one kilogram contains 90 grams of protein that is difficult to be digested.
1 Kilo contains 190 grams of easily digested protein	It wastes not less than 20%
The proportion of waste is 0%	Net of the useful protein is 72 gram/kilo.
the useful protein is 190 grams / kilo	Digested protein does not exceed 30 grams.
Digestion increases by about 25%	In case of feeding through ordinary barley banes, the ratio of increase in the animal's weight was 100 grams in the form of fats that was increased according to the kind of feeds that were involved in feeding and through its help the ratio may reach about 250 gram, daily.
Increase of red blood cells, thereby increasing oxygen and helps to better performance of the animal	
The rate of increase in the body weight of the animal is 350 grams on the form of meat up to 500 grams daily according to the feed used in feeding	

Source:

Animal Production Research Institute: "Animal Nutrition ... Scientifically and practically," Agriculture Research Center, and the Egyptian Ministry of Agriculture, first Edition, 1997.[4]

It is a system that is considered one of the modern techniques. It aims at increasing the green fodder resources. Besides, it is among simple ways that have a very high efficiency in the production of green fodder in which temperature and humidity are well controlled. Moreover, the water needs of agriculture are well controlled and greatly reduced. There are some types of fodder crops, salt-tolerant, which can be irrigated by the underground water that has different degrees of salinity.

The hydroponic barley is the grains of barley that are cultured under specific conditions of temperature and humidity so that the length of the green part reached about 15-20 cm. This is different from the white root system.

Through an arithmetic process, it becomes clear that the percentage of the digested barley in one kilo of the hydroponic = the ratio of the digested barley × 4 kilo of normal barley.

The Cost of Hydroponic Barley:

The room that is consisted of 2 stands height about 3 meters and its length 3 meters with seven floors of stands, each floor holds 10 pans hydroponic barley (the tray's dimensions are 30 cm × 70 cm) each tray implants 1 kg seeds that gives after culturing 7.5 kg of hydroponic barley. Therefore, the room's energy is 20 × 7.5 = 150 kg of hydroponic barley per day, which is enough for feeding six fattening calves or 6 milking cows or 50 sheep. Thus, the size of the room should be 3 × 4 meters. Therefore, the cost of buildings and room's isolation will be small.

The Cost of the Room's Accessories [٣]

1. Split air conditioning Freon with its composition = 5000 pounds.
2. Stands = 1600 pounds including installation and chipping.
3. Bulbs = 220 pounds (9 bulbs).
4. Water's Motor =400 pounds (0.5 horsepower).
5. Water's barrels= 120 pounds (two 60 -liter barrels).
6. Suction to pull moisture =140 pounds.
7. Pans for culturing = 2100 pounds (140 for each tray).
8. Hose (3 meters) with a manual machine for irrigating barley=30 pounds.
9. Plastic buckets to soak barley = 75 pounds (3 buckets).
10. Two wall fans to guarantee the movement of air in the room = 400 pounds.
11. Thermometer and hygrometer to measure the temperature and humidity = 75 pounds.

Thus, the total cost of accessories, excluding buildings, because it is a room at home or at farm = 10165 pounds. It produces about 150 kilo of hydroponic barley, daily.

The Cost of Feeding of the ordinary barley:

Some studies states [(5)] that the daily food ratio is at a rate of 2% of the weight of the cattle + one kilo. This means that if the cattle weighing 300 kg, is the weight of the daily food will be 7 kg fodder.

7 km × 3 = 21 pounds per day.
21 pounds × 30 days = 630 pounds.
630 pounds × 6 months = 3780 pounds.

The Cost of Feeding on Hydroponic Barley:

20 kg × 50 = 10 pounds a penny a day
LE 10 × 30 days = 300 pounds
300 pounds × 6 months = 1800 pounds

The Difference in the Output:

The feeding cost for each cattle from the dry fodder per session is about 3780 pounds. The cost of hydroponic is about 1800 pounds.

3780-1800 = 1980 pounds saving for each head per session.

Cost of feeding on Clover:

25 kg × 50 penny = 12.5 pounds.
12.5 kilo × 30 days = 375 pounds.
375 kg × 6 months = 2250 pounds.

The cost of food per head of clover per session is about 2250 pounds.

2250-1800 = 450 pounds.

Thus, feeding on hydroponic barley saves about 450 pounds in comparison with its counterpart of clover per session.

From what has been mentioned above, it becomes clear that, despite its high cost of farming, nutrition on green hydroponic barley achieves savings by about 1980 pounds per rotation. This is more than that of its counterpart of ordinary barley. Also, it gains savings by about 450 pounds in comparison to its counterpart of clover. Besides, it has the advantages of using hydroponic barley that improves the genetic traits of the animal which helps to give birth to twins in addition to the previously mentioned advantages. As a result, this study recommends expanding the production of hydroponic barley on a large scale, spreading awareness between farmers concerning the importance of feeding on hydroponic barley, and encouraging farmers to

produce it. Based on this, the area planted by clover can be reduced and exploited in the cultivation of some strategically crops such as wheat.

Conclusion:

Despite the high fixed costs of hydroponic barley, the production capacity per room is enough to feed six animals either fattening calves or milking cows. If the savings achieved through feeding on hydroponic barley is 1980 pounds per animal, then savings of six animals will be about 11880 pounds per session, which exceeds the fixed cost of the hydroponic chamber that reaches about 10165 pounds. Therefore, the farmer can cover the cost of establishing the room a single session and also achieves a surplus that reaches about 1717 pounds.

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