PERFORMANCE OF FARM TRANSPORT EQUIPMENT IN UPPER EGYPT

Hasan A. Abdel Mawla* Bahaa El-Din Hemeda**
Hassan M. Hassan***

ABSTRACT

Farm transport means that work in the agricultural sector in Upper Egypt were evaluated. The field survey of transport means proved that farmers intensively depend on animal transport because of the irregular and narrow roads existed among fields. The lack of small tractors suitable for easy movement on the narrow roads may largely contribute the reason of delay the mechanization of in-farm transport. The evaluated transport means included camels, carts pulled by donkey, small trailers pulled by small tractors and large trailers pulled by the prevailing tractors of 60- 70hp. Loaded camels of 0.5 ton load can travel on the narrow roads with speed up to 1.6 km/h and cart of 1.0 ton load may travel with speed up to 1.5 km/h. Small trailer achieved transport rate higher than that of the large trailers specially, if the transport distance less than 1.0 km. Carte cycle time is larger than that of camel at the similar transport distances. The cost of using animal transport was 10-11 LE/ton.km for 1.0 km transport distance. And may be decreased to two thirds of this value at transport distances 2.0 km. The cost of large trailer may be as high as 14 LE/ ton km for distances less than 1.0 km and that of small trailers was 10 LE/ton.km for similar distance.

INTRODUCTION

Agricultural transport is an important item that has to be mechanized because it requires intensive power. Farm transport is required to transport seed, fertilizer and other materials required in the stage of crop growing. Farm transport may be intensively required in the stage of harvesting to transport the crop from fields to the barn areas for storage or threshing. Transporting crop residual from the fields should also be don as soon as possible to retrieve the soil for preparation for next cultivation.

***Head, Ag. Eng. Dept. Al-Azhar Unive, Assiut. **Senior Researcher, AEnRI, ***Gradute student, Ag Eng, Dept, Al Azhar Unive.Assiut**

Vegetable crops should also been directly transported from fields directly to the market. Other industrial crops such as sugarcane and sugar beet should be transported directly from the field to the factory. **Rozeff (1999)** mentioned that low base cutting resulting in excess soil; excessive break-in rows; excessive speed while cutting green cane; ignoring need to cut in one direction in some badly lodged fields; excess trash in gross cane and its subsequent effects on milling efficiencies, poll. levels and crystal color, poorly maintained equipment; lack of harvester operator training and supervision; primitive mill yard storage methods and untimely rotation of mill yard cane. **Klatzel. (2000)** Farm transportation plays a key role in the agricultural and economic development of many nations as it provides access for extension agents to transfer new and improved agricultural technologies to the rural and farming communities, timely delivery of inputs to the farm and evacuation of harvests to the urban areas where they are mostly demanded. These ensure improvement in agricultural production, food availability in urban areas and improvements in the economy of the rural communities. **Abdel Mawla(2000)** Analyzing Cane Delay of Traditional delivery systems; stated that field to store transport represent the first transport stage in which camels, carets and trailers are employed. Conditions of the first transport stage are:

1- Camels and carets are used to transport cane from the field to the temporary stores. Are established at locations suitable for the main transport vehicles. Camels or the carets travel inside fields and dirt roads to reach the store. Such transport manner often start at the early morning and last for average 6 hours. The main transport vehicles should be ready for pull at certain time afternoon according to the schedule of pull. Carets in use are of one axe with rubber tires (600 kg average load) pulled by one or two donkeys. Asset of three camels (average camel load is 300 kg) is often rented for cane transporting.

2- Trailers pulled by tractors are often used to transport cane specially when field to store distances more than one kilometer. Tractor-trailers may have to be used to transport cane to a temporary store where lorries are used. A ropes passed belie the load in case of trailers not equipped

with hydraulic cylinder for easy unloading. Average load of the trailer used to transport cane from field to stores is 3 tons.

Wilson(2003) The population of working bullocks, buffaloes, yaks and camels is unknown but may be considerably higher than this. There is little recent information regarding the contribution of draught animal power to the economies of developing countries, although it has been suggested that more than half of the world's population depends on animal power as its main energy source.

Starkey(2010) Countries such as Mali, Mauritania, Senegal and Burkina Faso are seeing increasing adoption of horse- and donkey-drawn carts as draught animals enter society to improve the marketing of goods. Animals may be used to take farm produce from rural areas for sale locally, or to a road head for transfer onto the motorbikes and trucks which supply urban centers. They act as the spokes of a transport wheel, enabling the rural poor to gain access to otherwise inaccessible market hubs. At the other extreme, rapid introduction of cheap three-wheeled taxis from the Far East into countries such as Ethiopia (which has 5.5 million working donkeys) is displacing the small businesses which use traction animals in favor of externally-sourced motor vehicles. Dependency on fossil fuels for local transport contributes to pollution and climate change and makes local economies more susceptible to global market forces. Many people predict an increased demand for working animals as weather patterns are increasingly affected by climate change

MATERIALS AND METHODS

The present study was devoted to study the item related to farm transport means. The prevailing farm transport activities in upper Egypt is sugar cane transport The field survey of the transport means showed that:

- Farm transport activities still intensively activities depend on animal loading and animal pull.
- Most of in field roads do not support the motion of a common size loaded trailer.
- Farm transport may be still considered as a slow operation.
- The prevailing tractor sizes ranged between 60-80 hp.

• The prevailing trailer size is the common agricultural size 2x4 m loading surface with large tires and surface height 1.2 m from soil surface.

• Small size trailers 1x2 m loading surface and four small tires may be fabricated by the village workshops to be pulled by animals (donkeys) case

Therefore the study included evaluation of all transport means found in the field. The studied transport means may be described as follow:

Transport animals:

The animals employed for farm transport in the upper Egypt are mainly camels for load carrying and donkeys for pull. Camels of heights up to 3 m and weights up to 700 kg are prevailing for carrying agricultural products in the farm. Donkeys of heights up to 1.5 m and weights up to 250 kg are available for steel or wooden carte pull.

Steel carts pulled by animals:

Carts fabricated for animal pull with or without sides are available of common size 1x2 m and surface height 0.75 m and provided with pneumatic tires of size (16x14) .

Figure (1) show the farm transport steel carts fabricated for animal pull.

Trailer pulled by small tractors:

Other two axle small trailers of box size 1x2 m fabricated with tractor hitch point and hinge on the front axle fabricated to be suitable for narrow in field roads. There are limited numbers in the rural areas of this type of trailers because of the little number of small tractors suitable to pull them. The trailers provided with rubber tires of size (13x145). Figure (2) show the farm transport trailer pulled by small tractor.

Common size agricultural trailer

The prevailing trailer size is the common agricultural size 2x4 m loading surface with large tires and surface height 1.2 m from soil surface. Figure (3) prevailing size of agricultural trailer.

The study included the following items :

1 - Survey mechanical power available for farm transport.

2 - Determine the suitable farm road, load and speed of the transport means.

3 - Evaluation of the field performance of farm transport that include:
4 - Transport rate
5 - Transport cycle time.
6 - Transport cost.

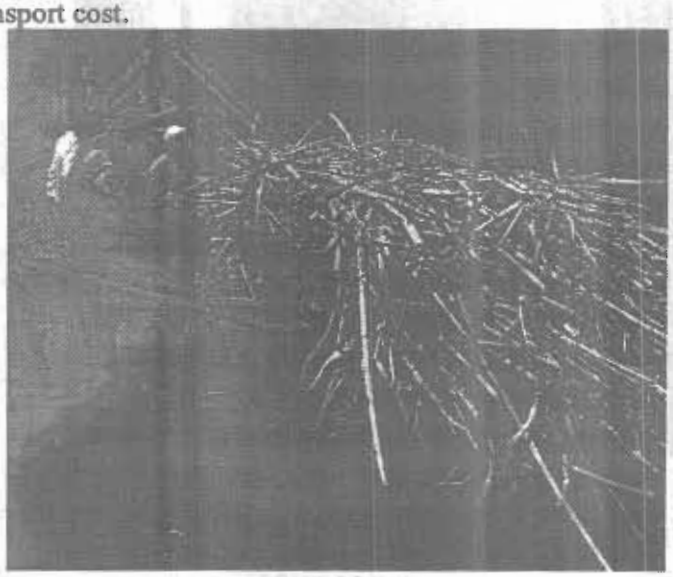


Fig (1) show the farm transport steel carts fabricated for animal pull.

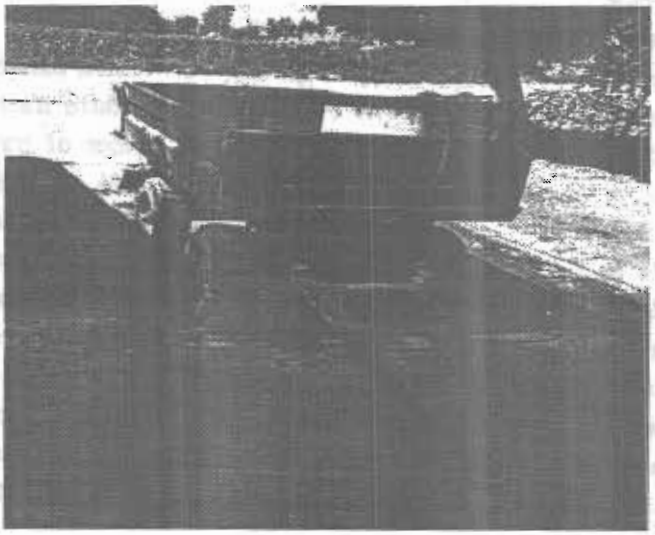


Fig (2) small trailer pulled by tractor

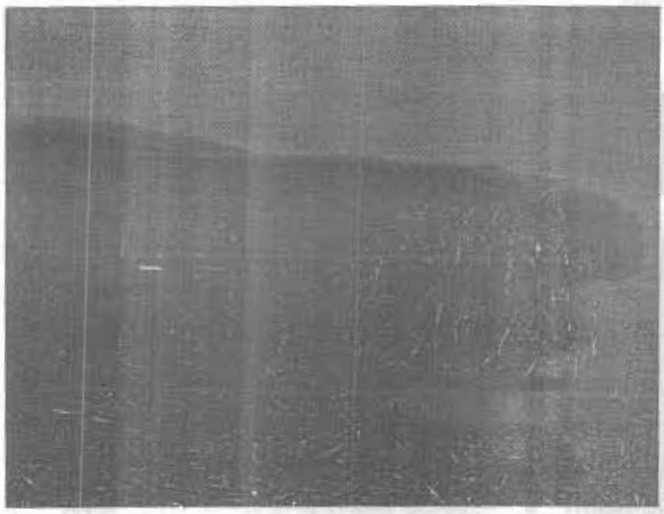


Figure (3) prevailing size of agricultural trailer.

RESULT AND DISCUSSION

Survey of mechanical power:

Effect of the availability of suitable tractor size:

Figure (4) show the percentage of tractor power distribution existing in upper Egypt according to power. The Figure slow that farm tractor of power range 50-70 hp represent 66% of the total number of tractors. Langer tractors of sizes more than 70 hp represented 28% of the total number of tractor. The rest of them are of power range 80-120 hp most of them belong to the giver mental organization. Smaller size tractors of power range 25-50 hp represented 5% of the total number of the tractors. Finally, the small tractors of power less than 25 hp represented 1% of the total number of the tractors in Upper Egypt regains .

Tractors of sizes 25 hp and less may represent the size that is suitable far safe moving along the narrow rods insides fields. These tractors can pull small trailers of loads 1.5-2 tons that can replace animal transport at wide range of farm conditions.

The lack of the tractors of sizes suitable far in field rods may represent the most important reason that delay the mechanization of farm transport.

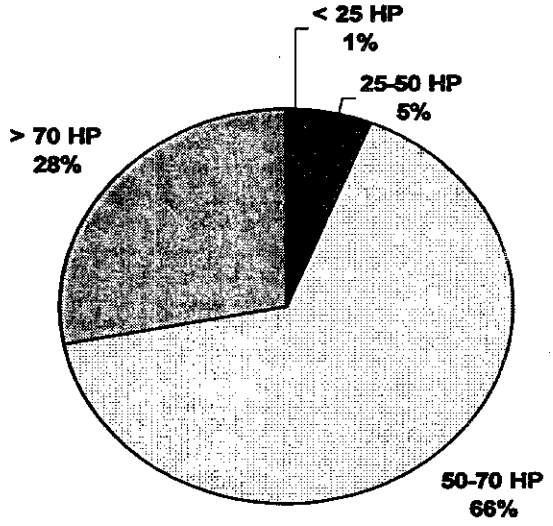


Figure (4) Percent of tractor power category within cane area

Effect of farm roads:

Reference to the prevailing conditions of Upper Egypt farm conditions, roads may be classified into narrow farm roads width <1.5 m, medium roads of road width 1.5 to 2.5 m and wide farm roads width >2.5 m. Variable sizes of carte may found in the rural areas that can be used far farm transport on the narrow farm roads.

Small carte of 0.6 ton load may transport on narrow roads (>1.5m width) at speed up to 1 km/h as show in the table. Other larger carts of larger loads 1.0and 1.2 ton may be pulled on the wider roads at speeds up to 2.0 km/h. Camel load did not change with the road with even limited improvement of camel speed may exist when travel on the wider roads. Small trailer of load up to 0.8 ton may travel on the narrow field roads with speeds up to 1.5 km/h and other small trailers of loads 1.5 tons and 2.0 tons may travel on the medium on wide farm roads at speeds 3km/h and 6 km/h respectively. Large trailer of 4 ton load can not transport on the narrow roads and may travel on the medium roads of god condition

with maximum load 2 ton and speed 1.8 km/h. the large trailer of full loads (4ton) can travel on the wide farm roads at 4 ton/h.

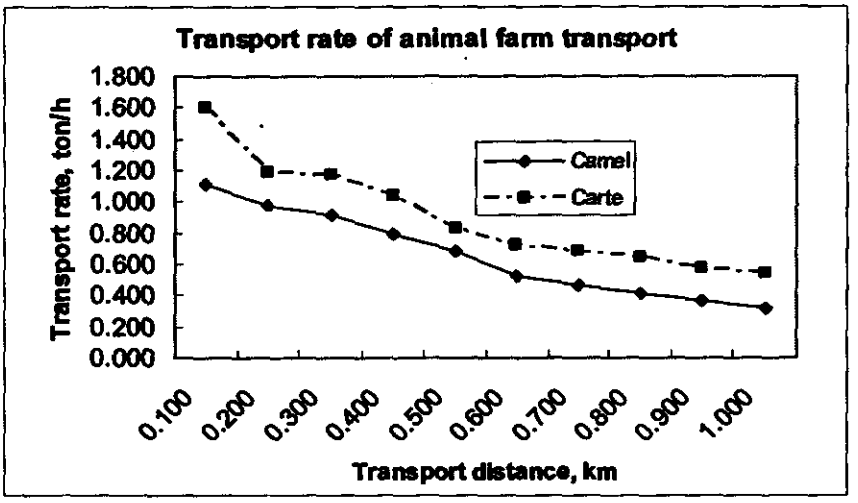
Table (1) Performance of farm transport means in relation to farm roads.

Mean	Performance	Road condition		
		>1.5m	1.5-2.5m	>2.5m
Camel	Load, ton	0.5	0.5	0.5
	Speed, km/h	1.2	1.6	1.6
Carte	Load, ton	0.6	1.0	1.2
	Speed, km/h	1.0	1.5	2.0
Small trailer	Load, ton	0.8	1.5	2.0
	Speed, km/h	1.5	3.0	6.0
Large trailer	Load, ton	---	2.0	4.0
	Speed, km/h	---	1.8	4.0

Transport rate

Figure (5) Show the Transport rate of animal Transport (Camel and carts pulled by donkeys). The rate of the farm transport means decreased as the transport distance increased. Camels may transport with rate > 1.0 ton/h of the transport distance as short as 100 – 200m. At longer distances, camels may achieve 0.4 ton/h at distances up to 1.0 km . Carts performance showed similar trend with little higher transport rate up to 1.5 ton/h at the short transport distance and up to 0.5 ton/h at 1.0km transport distance.

Tractor pulled trailers were used to transport farm materials to distances as far as 5km. Figure (6) show the transport rate of the large as well as small trailers. The figure show that the transport rate of the small trailer may be more than that of large trailer when transporting farm materials to distances , up to 1.0 km. the transport rate of small trailers may be ranged from 1.2 to 1.6 ton/h compared to 1.0 to 1.4 ton/h when transporting to distances was up to 1.0 km. At longer transport distances, the rate of transport by small trailers become less than that of the large trailers.



Fig(5)the Transport rate of animal Transport

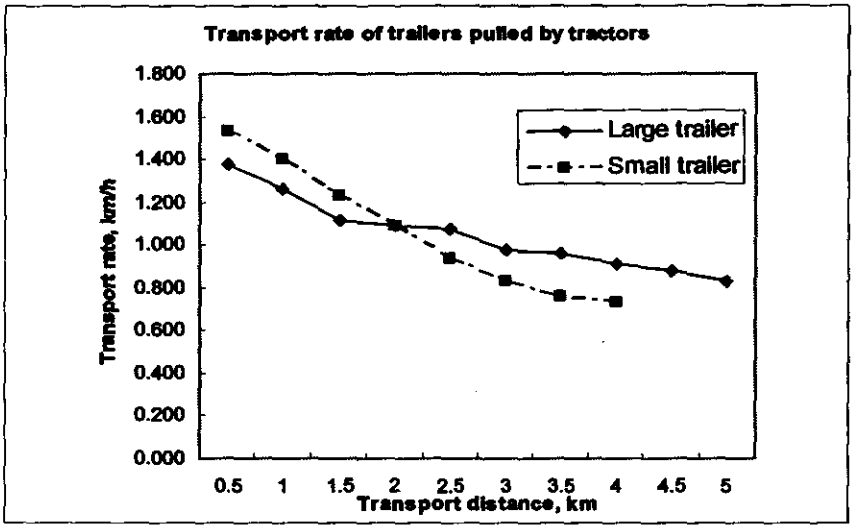


Fig (6) the transport rate of the large as well as small trailers

Transport cycle time:

Figure (7) show the transport cycle time. The cycle time of carts may be longer than that of the camel due to longer loading time of the carts , cycle time of the carte ranged from 0.4 to 1.4h Compared to 0.3 to 1.2 h of the camels. When transporting to distances up to 1.0 km.

Figure (8) show the cycle time of the large trailers ranged from 2h to up to 3.2h compared to 0.5 h to up to 1.3h of the small trailers when transporting farm products to distances rang 0.5 to 4.0km. the short cycle time of the small trailer may explain the higher transport rate of the small trailers specially at short transport distances

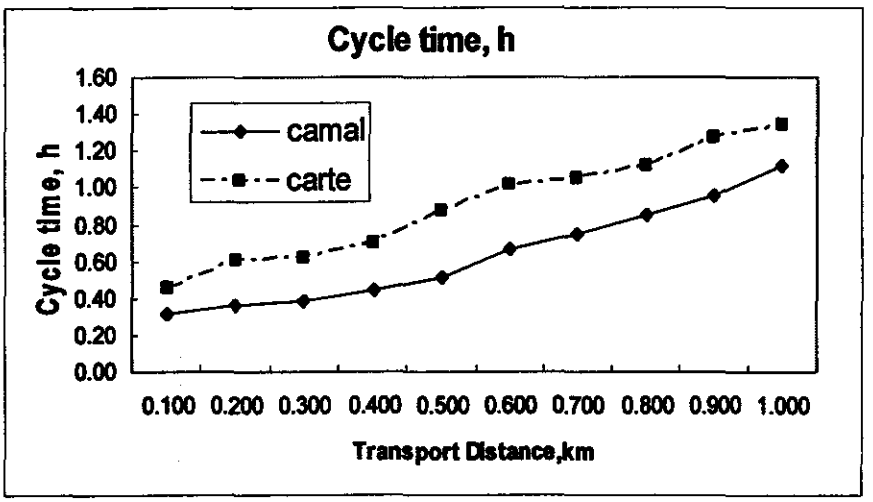


Fig (7) the transport cycle time

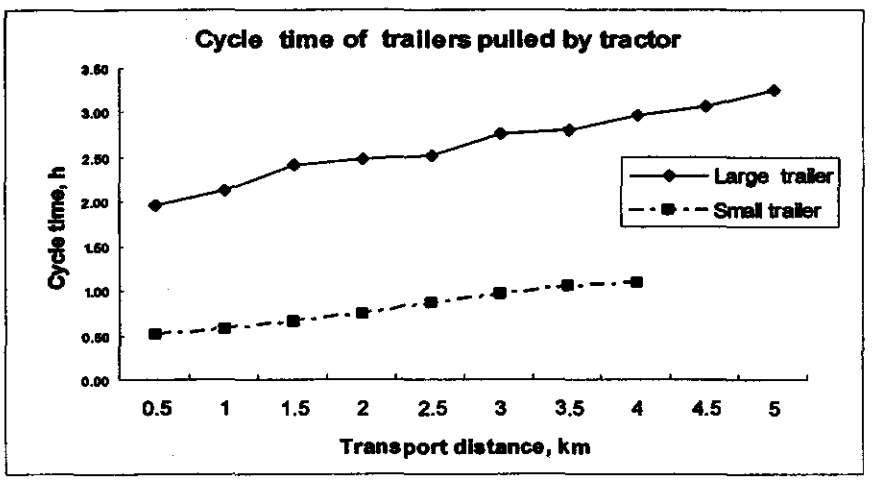


Fig (8) the cycle time of the trailers pulled by tractor

The cost of transporting agriculture materials by different means was estimating according to the prices of 2010. The most existing transport distances for sugarcane farm inside the field to the road or transporting other crop materials from field to the village was within 1 to 2 km.

The cost estimated for the 1 km transport distance was 12 LE/ton.km for camel and 11 LE/ton.km for carts. In case of transport distance 2 km the cost may be reduced to two thirds of those values. For small trailers pulled by tractors, the transport cost may be 10 LE/ton.km for the small trailer and 14 LE//ton.km for the large trailers if the transport distance within 1 km. The longer transport distance, the lower, the transport cost for both trailer sizes.

CONCLUSION

Farmers intensively depend on animal transport due to narrow farm roads and the labe of small tractors as that can easy travel on the narrow roads among fields. Camels transport at relatively constant load and speed cycle time of the carte was larger than that of camel at similar transport distances. Small trailers transport at higher rate compared to that of the large trailers specially at shorten transport distances. From the paint of view of transport cost it is recommended not to use the cart or the camel for transporting agricultural materials to distances more than 2km

It was also absorved that using large trailers for transport agricultural materials to short distances is more costly than other methods.

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الملخص العربى

تقييم معدات النقل المزرعى بالوجه القبلى

حسن عبد الرازق* ، بهاء حميده** و حسن متولى***

يهدف البحث الى تقييم أداء وسائل النقل الحقلى المستخدمة فى نقل المنتجات والمحاصيل الزراعية من داخل الحقول إلى اماكن تخزينها أو تصنيعها. وأثناء جمع بيانات الدراسة تبين ان أهم المحاصيل التى تتطلب النقل من داخل الحقل وبصورة مباشرة بعد حصادها هو قصب السكر وحيث تبين أن وسائل النقل الحيوانية المتمثلة فى الجمل ووسيلة النقل المجرورة بالحيوانات المتمثلة فى عربات الكارو وتمثل العمود الفقرى للنقل من داخل المزرعة الى الطريق المعبر. كما تبين ايضا أن عشوائية الطرق بين الحقول وضيقها وعدم انتظامها او انشغالها بالمخلفات او نواتج تطهير قنوات الرى تعتبر اسباب مباشرة لتأخر ميكنة النقل الحقلى. كما أن عدم وفرة الجرارات الصغيرة التى يمكنها الحركة على تلك الطرق تعتبر سببا مهما ايضا فى تأخر ميكنة النقل الحقلى. وقد تم تقييم وسائل النقل من حيث معدل النقل (طن/الساعة) وزمن دورة النقل وتكاليف النقل. وقد تبين أن وسيلة الجمل قليلة التأثر بظروف الطريق ويعتبر معدل النقل بها ثابت الى حد ما. أما الكارو فقد تبين ان دورتها الزمنية اعلى من الدورة الزمنية للجمل. وبالنسبة للنقل بالمقطورات والجرارات الزراعية فقد تبين انه فى حالة توافر الجرار ذو الحجم المناسب لجر المقطورات الزراعية الصغيرة على الطرق الضيقة فإنه تحقق معدل نقل أعلى من استخدام المقطورة الكبيرة خاصة فى حالة مسافات النقل الأقل من ١ كم.

وقد وجد أن تكاليف نقل الطن بالجمل والكارو كانت فى حدود ١٠-١١ جنيه/ طن.كم وذلك اذا كانت مسافة النقل ١ كم (المسافة السائدة لنقل القصب من داخل الحقول) وعند ازدياد المسافة بحوالى ٢ كم تقل التكاليف لتلثى تلك القيمة. وقد وجد ايضا أن تكاليف النقل بالمقطورة الكبيرة تعتبر باهظة (١٤ جنيه/طن.كم) فى حالة مسافات النقل الأقل من ١ كم ويفضل استخدام المقطورة الصغيرة فى تلك الحالة.

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*أستاذ الهندسة الزراعيه بجامعة الأزهر فرع أسيوط

**باحث أول بمعهد بحوث الهندسة الزراعية

***طالب دراسات عليا بالهندسة الزراعية بفرع جامعة الأزهر بأسيوط