1-
THE UTILIZATION OF HORIZONTAL METERING DEVICE TO PLANT TUBER WITH PREVIOUSLY PREBARING

The aim of this paper is to utilize the horizontal metering disc device to perform planting of sprouting tubers operation with minimum sprout damage, minimum tubers void, minimum tubers double and in proper time. The Horizontal metering mechanism was investigated as a new system to fulfill planting potato tuber with previously grown buds (Sprouts). The construction features of the developed potato planter (Horizontal Metering Mechanism) prototype are mainly: tuber hopper; chamber room; circle tray with feeding cups; the vibration mechanism and power transmission system from the land wheel to the rod of metering device. The theoretical investigation of the developed mechanisms was investigated. The relation between horizontal disc and tuber diameters was theoretically found. The diagram among engineering of feeding disc device parameters and tuber diameters were illustrated. The result of tuber void ratio versus land wheel speed (rpm) was 0% for time equal to four cycle time of land wheel. The tuber out percentage was evaluated at two categories of tuber samples 30-50, 50-80g. The general trend of this relationship is the percentage of tuber out decreased with the increase of land wheel speed and decrease of feeding cups diameter. The maximum value of the sprout damage percentage (Ts,%) is 26.1% at land wheel speed of 14rpm. and feeding cups diameter of 8cm recorded for category 50-80g, and the minimum value of (Ts,%) was 11.5% at Land wheel speed of 10 rpm. and feeding cups diameter of 6cm recorded for category 30-50g. From above results, May be recommend that the disc metering mechanism need more improve. Keywords: planter, potato device, tuber pieces planter and sprouts systems analysis of potato feeding.

2-
EVALUATION THE PERFORMANCE OF A NEW WIDE BED PROFILE MACHINE

Because of the fuel costs could reach 30 to 35% of the total operation costs for the seed bed preparation. Therefore, it was very important to calculate the power requirement of the proposed design unit used for reforming wide-bed suitable to vegetable crops. The pulling force and energy measurements of forming unit are measured for three setting angles of two opposite moldboard units, three operational depths and four forward speeds in light sandy soil. Setting angle was adjusted at, 20, 30 and 40 degree. Operational depth was also adjusted at 10, 15, and 20 cm. Four level of forward speed were tested, 3.92, 4.5, 5, and 6.91 km/h. Data of fuel consumption, specific energy, pulling force and specific draft were measured. Measurements were analyzed and found that increasing setting angle from 200 to 400 increased the fuel consumption by about 8%. The specific energy was decreased by about 12%, the pulling force increased by about 48%. Finally, the specific draft decreased by about 26%.

3-
DEVELOPING A NEW BED PROFILES SYSTEM FOR FERTILIZER APPLICATOR.

This trial is to use an investigated tool for made accumulated constructing of soil layer by
turning operation which acting by two opposite moldboard. Bed profile dimensions, cross section area and fertilizing depth are identify for three setting angles of moldboard share, three operational depths and four forward speeds in light sandy soil. Setting angle included, 20, 30 and 40 degree, operational depth was 10, 15, and 20 cm and 3.92, 4.5, 5, and 6.91 km/h for forward speed.

Data interface measured bed height, bed upper width, bed slop angle, bed cross section area and fertilizing depth. Measurements were compared and found that increasing setting angle from 200 to 400 the bed height increased by about 18%, while the upper width decreased from 42.25 to 19.87 cm and so the bed angle decreased by about 63%. The cross section area increased by about 36% and fertilizing depth increased by about 16% at increasing the setting angle from 200 to 400.

4-

DEVELOPING THE DRUM OF THE TURKISH THRESHING MACHINE.

A double cone shape drum device was developed, and inserted in the construction of the Turkish threshing machine in order to increase the machine threshing efficiency and capacity, and to improve the threshed grain quality. The wheat threshing by the investigated machine before and after development was tested, compared, and evaluated versus different drum speeds and grain moisture content levels.

The comparison, and evaluation based on the threshing efficiency related to the percent of un-threshed grain; the grain quality related to the percent of damaged grain; and the machine threshing capacity related to the drum speeds.

The results showed that the wheat threshing efficiency was ranged from 96.8 to 99.3%, % for the developed thresher, while it was nearly from 92.6 to 97.25% for the Turkish thresher before development. The results also indicated a marked improvement in the final grain quality for the thresher equipped with the developed drum (95.88%) compared to the thresher before development (93.13%).

In general replacing the developed drum device instead of the traditional one in the construction of the Turkish threshing machine led to increase the machine capacity by about 12.6 %, and was very competitive.

5-

THE TRIANGLE BELT PROVIDED WITH SPOONS TO PLANT POTATO TUBER WITH SPROUTS

The triangle belt vertical metering device of potato planter was constructed and tested to plant potato tubers with previously grown sprouts. The theoretical investigation was carried out to determine the factors affecting the free falling high of tuber during exiting from metering device. Reviewing the different configurations of potato planters, especially automatic machinery, found in the literature as well as the inspection of physical and mechanical properties of tubers with growing buds indicated that possible methods might be most suitable for planting sprouting potato tubers. The constructions of the developed potato planter prototype are mainly: tuber hopper; triangle belt conveyor; the feeding spoons and vibration mechanism. The general trend of tuber void relationship was the percentage of tuber void (vt%) increased with the increase of planting speed and vibration system ratios. The maximum value of (vt%) was 6.5% at land wheel speed of 14 rpm and vibration system ratio of 5.2 recorded for category in-between 50-80g, and the minimum value of (vt%) was 0.9% at land wheel speed of 8 rpm. and vibration
system ratio of 10.4 recorded for category 30-50g.

Keywords: planter, potato device, tuber pieces planter and sprouts systems analysis of potato feeding.

6 -

THEORETICAL AND APPLIED FUNDAMENTALS DESIGN OF WIDE BED PROFILE

During the last decade, the Agric. Minster of Egypt gave a great deal of attention to reclaim new lands and grow these lands by vegetable crops whereas, these crops are considered to be high income in short rotation. Further, increase in vegetables production by increasing the yield per unit area is required to improve the wide or the shape of bed profile. In the present study, investigating and achieving new methods to conform the higher profitables vegetable crops are the main goals.

Two types of moldboard with winged shares were used to form this profile, which are mounted in opposite direction. The height and width can be adjusted. Due to the interaction between the two opposite of moldboards plows and soil, a furrow slice shifting on the surface of the moldboards undergoes a certain bending and twisting deflection which causes loosening of soil particles in the upper parts and compressing of soil in the lower parts that is, an additional crushing. The speed of movement of particular particles of soil on the moldboard varies. For simplification it is easy to assume that, the furrow slice movement on the moldboard is in continuous flow without changes in cross section. On the other side, increasing the traveling angle of forming profile unit, translate to more soil compressing in the lower parts and then increasing the height of wide bed profile (mastaba). Referring to the geometrical relations of the setting angle, the theoretical scope on wide bed profile was identified, the amount of slicing soil over the moldboard surface may be identified as the relation between setting angle and the width of cutting shares.

To verify the agronomic recommendations the dimensions of wide bed profile, from the theoretical scope, the forming unit must be adjusted at resting angle of 40º and share width of 56cm to archive profile width of 120cm suitable for Tomatoes. At resting angle of 30º and share width 40cm and at 20º and share width of 40cm the construction of bed profile width are 90 and 70 cm (Zucchini and Cucumber) respectively.

Keywords: profile, digger device, forming a wide bed profile and profile systems analysis and moldboard unit.

7 -

ELECTRICAL CONTROL OF SOIL MOISTURE CONTENT

Two-electrodes of moisture sensor is proposed in this work. This sensor overcome the problem of electrical control of soil moisture affected by salts, while this can not be accomplished by other types of sensors. The moisture content is transformed to resistance measurement, which is translated to a computer as volt value by transmission circuit. Obtaining the sensor input/output characteristics does the investigation of the soil moisture sensor. A comparison between the two-electrode sensor and ELE in salty soil was carried out. Soil moisture content is established in real time closed loop control, where the feed forward path is composed of relay element; the feedback path consists of a moisture sensor followed by a moisture transmitter. The ON-OFF moisture control and moisture control system identification is established via personal computer. The two-
electrode moisture sensor type is very simple and cheap. The field experiment indicates that the major advantage of this sensor can be used in widely salty soil.

8- **CULTIVATION PERFORMANCE AS INFLUENCED BY THE CULTIVATOR SHAPE SHARES**

Until now in Egypt, there are no common systems to mechanize the inter-row cultivations. A few attempts were carried out to test and evaluate the maize cultivation. This paper aims to evaluate the cultivation performance as influenced by three cultivator share shapes. There are L-Knives with deflected vertical edge that inclined to the direction of motion (S1), L-Knives with flat vertical edge, which inclined at an angle of 160 degree and it set up at angle of 5 degree in relation to the soil surface (S2), and the two half sweep share (S3). The sweep is longitudinal fractionated in two equal parts that fixed each one in left or right cultivator bar. The three shape shares and three traveling angles (0°, 5° and 10°) are conformed as independent variables. The percentages of weed control, the percentage of injured plants and the rate of change in the area of ridges (Pa%) were carried out as independent variables. The maximum percentages of weed control were 91.2; 94.00 and 88.7% obtained at (0°, 5° and 10°) of travelling angle respectively and share shape of L-knives with flat vertical edge that inclined at an angle of 160 degree (S2). It is recommended to keep the travelling angle in range of zero to 5 degree to increment the percentage of weed control and decrement the percentage of injured plant. The rate of change in area for the ridge profiles decreased as the travelling angles of cultivator shares increased.

9- **The utilization of a drilling planter for rice band sowing**

During the last decade, the Agric. Minster of Egypt gave a great deal of attention to plant rice by drilling machine. Further, increase in rice production by increasing the yield per unit area is required to increase the drilling intensity, which can be realized by band sowing rice. The objective of this study is to evaluate two sowing methods and itâ€™s interaction between the primary and secondary tillage treatments. Using the band sowing as a new method of rice planting has no significant effect on the yield as compared to the common mechanical sowing, although it
recorded the better percentage distribution of seeding per area. The effect of secondary tillage system (disc harrow two strips followed with rotary-dick plow) at the moldboard "S2" during band sowing "S2" recorded slightly increase, in general, compared to the common mechanical method "S1". On the other hand the good yield may be due to good soil surface roughness, good pulverization, suitable reduction conditions, good establishments and distributions of roots and also good weed control which is affected by good pulverization and plowing depth.

10-

**THE ENGINEERING PARAMETERS AFFECTING THE AUGER-TYPE METERING DEVICES FOR**

This investigation carried out to study the engineering parameters of auger volume, cross sectional area of the orifice gate, fertilizers density and feeding shaft speed that effect on the discharge rate $\text{g/min}$ and the volumetric efficiency $\%$ of the fertilizer applicator. The results indicated that the highest value of discharge rate is 2660 $\text{g/min}$ that obtained at the orifice gate is adjusted at a cross section of area of 48 cm$^2$, on auger volume of 50.66 cm$^3$ and the rotational speed of feeding shaft was 11.6 m/s for a bulk density of 0.685 g/cm$^3$. While the lowest value was 190 $\text{g/min}$ at the sequence condition of 2.7 m/s, auger volume of 24.27 cm$^3$ and gate area of 16 cm$^2$ for super Phosphate. Increasing the gate area from 16 to 48 cm$^2$ increases the volumetric efficiency from 64.8 $\%$ to 78.9 $\%$ at bulk density of 0.685 g/cm$^3$ and from 39.4 $\%$ to 51.1 $\%$ for bulk density of 0.995 g/cm$^3$.

11-

**DEVELOPING THE METERING UNIT OF THE PNEUMATIC PLANTER**

This study is part of out comes from a projects financed by researching unit of Mansoura University. Spacing uniformity, seed volumetric rate and irregular depth of seeds in soil for wheat and sorghum are the most common characteristics used to evaluate the injection planter performance. The injection mechanisms speed, level of air pressure, the shape and the size of orifice head and the seed bulk density may all influence seed singulation and placement the seeds. The theoretical studies were carried out on the seed speeds during came out from the injection device nozzle until moment of the seed calmed
in the soil. The amount of volumetric flow rate ¿seed/s¿ is direct proportional to the injection pressure and also to the seeds density (the flow rate of sorghum largest than the wheat seeds) and inversely proportion to the orifice diameters. Also the seed spacing in row increased with the increase of planting speed and pressure. The statically analysis confirm that the seeding speeds (m/s) have a major effect on the seed miss and double index.

Key words: planter, seed device, pneumatic, single seed disc and systems analysis of seed feeding

12-

DEVELOPING A VERTICAL WHEEL DEVICES FOR SMALL SEEDS

The effect of four forward speeds (V) of 0.75, 1.03, 1.3 and 1.5 m/s and five metering speeds (R) of 0.09, 0.16, 0.20, 0.25 and 0.30 m/s with two disc cells (W) of 9 and 24 and their interaction were studied to evaluate metering process throughout planting sugar beet. Engineering parameters such as longitudinal and transversal dispersion, % were determined. Seed damage, % with distance between seeds were also evaluated. Actual distances ranged from 17.7 cm to 11.85 cm, the theoretical distances ranged from 69.4 to 10.4 cm. Under forward speed of 0.75, the best results were obtained by using metering speed of 0.16 m/s. The theoretical distance was 19.5 cm and the actual distance was 16.9 cm. Lowest lateral dispersion of 40.2 % was obtained under the same previous conditions with disc cells of 24. for sugar beet. Lowest seed damage of 2.88 % was under the mentioned conditions.

13-

DEVELOPING THE METERING UNITE OF THE PNEUMATIC PLANTER

This work represents one of the out comes from a projects financed by El-Mansoura University researches unit (title of: Developing the metering unites of the pneumatic planter). The use of vacuum seed-hold for small seeds is identified under two different pitch circle radii of holding holes on seed metering units and also under two different holes numbers. The span between the two consequently holes on the circumference of seeding disc device (?S) is considered a major independent variable used to reduce the imbrications between the seed holds number and seed holding radius. The (?S) is considered as the control factors during designing the seeding disc device in pneumatic planters. The theoretical relationship to determine the total amount of vacuum pressure required to hold the seed was identified. The radius of seeding disc is inversely proportion to the holding force meanwhile; the seed mass, radius of devices seeding disc and the crosses section area of the single hole of the seeding device are directly proportional. The inclination of practical and theoretical seed holding pressure may be ranged from 5 to 10 times of theoretical holding pressure. The 20 rpm and (?s) of 0.314 is be better than the other operation factors. But to realize the (?s) = 0.0314, it may be found at the pitch circle radius of holding holes on feeding disc device â€Râ€ = 15 cm and number of holes distributed on the circumference of seeding disc device (No) = 30 holes or at â€Râ€ =12.5 cm and (No) = 25 holes or at â€Râ€ = 10 cm and (No) = 20 holes.

Keywords: planter, seed device, pneumatic, single seed disc and systems analysis of seed feeding

14-

THE UTILIZATION OF THE PICK UP MACHINE TO OVER COME THE
FIELD RESIDUES

The aim of the present study has been concerned with a particular problem, associated with the pickup drum of the balers. That aim was seem to be achieved through developing a new design for the pickup drum, which its idea depend on using the picker chains and claw elevator chains instead of using the usual tines in the currently balers in the minister of the agriculture. This investigation carried out to study the effect of the engineering parameters of the four rotation speeds for the double job units (pickup plus elevating straw) for the proposed design, three of chassis tilt angles, three of straw feed rates and three levels of straw holder heights on the straw elevated efficiency and loss percentage for the proposed design. Also evaluate the machine performance by determining the machine field capacity and productivity.

The results indicated that the best value of straw elevated quantity was 7.075 kg/min, which obtained at 102 rpm rotation speed of the combined units and straw feed rate 4 kg/min. For increasing the straw holder's heights from 0 to 2 cm increases the field capacity from 0.058 fed/h to 0.086 fed/h at decreasing the chassis tilt angles from 36 to 28 degree. Also increasing the straw holder's heights from 2 to 4 cm increases the field capacity from 0.06 to 0.096 fed/h at increasing tilt angles from 28 and 36 degree.

THE UTILIZATION OF A METERING PLATE DEVICE FOR COWPEA PLANTING

This study is carried out to evaluate the actual relationship between the three hole areas (9.62, 15.90 and 23.76 mm²) and the feeding device parameters (seeding speed, peripheral speed of metering wheel device. The hole of feeding device was controlled by seed lever control which lies in seed tank bottom. All parameters were measured at constant level of seed brush parameters. Quality of feed, miss, multiple indexes and preciseness of seed index are the most common characteristics used to evaluate the metering wheel device performance. Varies physical properties of seeds including seeds density, projected area, sphericity and one thousand seeds mass are the most important factors in determining the optimum levers dimensions for metering device. The highest seed feed index was achieved on the seed plate with oblong holes (Aob2) for all cowpea moisture content (M1 of 64.45%; M2 of 56.13% and M3 of 49.74%), and the plates with circular holes followed this. The lowest seeding feeding ratio was obtained from the experiments using the plates with oblong hole (Aob1). The highest seed feed index was with moisture content (M1=86.08%) at 1.0 km/h, whereas the lowest the seed feed index was with M3 (46.21%) at 4.0 km/h. When the seed feed index was 86.73%, 79.77% and 74.56% for M1, M2 and M3 cowpea moisture content at 1.0 km/h planting speed, the seed feed index reached 71.04%, 61.07% and 46.21%, respectively, in a planting speed of 4.0 km/h. The changing planting speed had a greater effect on the feed index of M3 cowpea seed on the other 2 seed moisture content.

OPTIMIZING MECHANICAL SYSTEM FOR PLANTING AND HARVESTING SUGAR BEET:

Some properties of sugar beet seed species were determined. The main dimensions (length, width and thickness), sphericity, geometric mean diameter, arithmetic mean diameter, surface area, bulk density and true density were identified as physical
parameters. Meanwhile, the terminal velocity, and hardness were measured as engineering properties. The static coefficient of friction for sugar beet seed multi-germ under different coefficient surfaces (stainless steel, iron sheet galvanized, plastic and rubber) were 0.48 ± 0.42; 0.51 ± 0.56, 0.57 ± 0.34 and 0.72 ± 0.53 respectively., while, the data for the sugar beet mono-germ were 0.26 ± 0.57; 0.28 ± 0.38; 0.30 ± 0.34 and 0.36 ± 0.74 respectively.

The vertical brush metering device was evaluate by assessing the actual relationship between the three density of hair per holes in vertical brush (50, 75 and 100 hair/hole) and the feeding device parameters (seeding traveling speed, peripheral speed of metering device). The brush device was controlled by seed lever control which lies in seed tank bottom. All parameters were measured at different levels of four brush device peripheral speeds (0.16; 0.24; 0.32; and 0.4m/s). Quality of feed, miss, multiple indexes and preciseness of seed index are the most common characteristics used to evaluate the metering wheel device performance. Various physical properties of sugar beet seeds including seeds density, projected area, sphericity and one thousand seeds mass are the most important factors in determining the optimum levers dimensions for metering device. The highest seed feed index was achieved on the brush device with hair density (Hd3) for two different of sugar beet varieties (Multi-germ of 64.45% and mono-germ of 56.13%). The lowest seeding feeding ratio was obtained from the experiments using the hair density of 50 hair/hole (Hd1) with peripheral brush speed of 0.4m/s. The lower values of preciseness index indicate better performance of the brush device, therefore the lowest values of it was found at seeding speed of 2.0m/s, 0.3m/s peripheral speed of feeding device and 100 hair/hole densities.

17-

THE UTILIZATION OF A ROLLERS PRESS DEVICE FOR SUGAR BEET TRANSPLANTING

The performance of developed seedling device for transplanting sugar-beet was tested and evaluated according to the following criteria: Seedlings longitudinal dispersion; seedlings lateral dispersion; and the quality of seedling index. The aim of the present study has been concerned with a particular problem, associated with the sugar beet seedling transplanting. That aim was seen to be achieved through developing a transplanting machine with feeding system of the elastics disc which its idea depend on using rolling press device with to guide to determine the open and close levels. Under forward speed of 0.6 m/s, the best results were obtained using rolling press diameter of 15mm. The theoretical distance was 19.5 cm and the actual distance was 22.45 cm. This was acceptable result as it was in the right limit (the interference is 10%). while by changing the seedling location on the horizontal belt from 7.0 to 10 cm to the highest value of seedling dispersion 7.3% was obtained under forward speed of 1.16 m/s with rolling press diameter of 21mm. The maximum field efficiency of 94.5 % was obtained at forward speeding of 1.5 km/h and the minimum field efficiency of 83.2 % was obtained at forward speed of 4.2 km/h.

18-

OPTIMIZATION OF MACHINE PARAMETERS FOR SUNFLOWER THRESHER USING FRICTION DRUM

A pedal-operated sunflower thresher was designed and constructed at the Agric. Eng.
The machine performance was evaluated for optimal design parameters via three levels of the pressure surface press on friction drum (2.0, 4.0 and 6.0 kg/cm²), four levels of friction drum speed (2.8, 3.7, 4.9 and 6.9 m/s), different radial curves of pressure surface (330, 345, and 365 mm) and different resting times of sunflower head inside threshing chamber (5, 10, and 15 sec). The sort of sunflower plant used to evaluate the prototype was Helianthus Annuus L.

The performance of threshing machine was evaluated for its threshing efficiency, cleaning efficiency, visible seed damage, threshing capacity and specific energy consumption. Threshing efficiency recorded 98.4% in case radial curve 345 mm and friction drum speed of 6.9 m/s at time consuming 5 sec under high pressure 6 kg/cm². The minimum values of visible seed damage were 0.45, 0.65 and 0.86% corresponding to radial curves 330, 345 and 365 mm respectively occurred at low pressure and low friction drum speed at threshing time 5 sec. Cleaning efficiency increased by values 97.9, 96.8 and 96.8% while increases threshing time by 5, 10, and 15 occurred at lower pressure and large radial curve with using high friction drum speed. While, threshing capacity recorded 212 kg/h at high pressure occurred at radial curve 345 mm high friction drum speed and high pressure 6 kg/cm². But the specific energy consumption increases by 4.6, 4.8 and 5.2 kW.h/ton while pressure increases by 2, 4 and 6 kg/cm² at low radial curve of 345 mm.

19-

ECONOMIC EVALUATION AND SELECTION OF FARM MACHINERY

This research is mainly conducted to study the farm machinery economic evaluation and selection the optimum tractor and implement sizes. The connection between draft and fuel consumption relative to the operation cost and machine selections is identified as a present idea to evaluate the tractor-plough operation. Therefore, the objective of this research is to use the economical method to select the tractor and plough for the tillage operation depending on the tractor-plough properties. For this reason the tractor tire specifications and the chisel plough properties are used by the visual basic program to calculate the fuel cost/ted at different tractor power, forward speed and plough width. The results showed that the suitable tractor can be used to tillage operation of 47.81 kW for all plough width and at different forward speed.

20-

Vertical metering device for mono-germ seed planting.

Some properties of sugar beet seed species were determined. The main dimensions (length, width and thickness), spherisity, geometric mean diameter, arithmetic mean diameter, surface area, bulk density and true density were identified as physical parameters. Meanwhile, the terminal velocity, and hardness were measured as engineering properties. The static coefficient of friction for sugar beet seed multi-germ under different coefficient surfaces (stainless steel, iron sheet galvanized, plastic and rubber) were 0.48 ? 0.42; 0.51 ? 0.56, 0.57 ? 0.34 and 0.72 ? 0.53 respectively., while, the data for the sugar beet mono-germ were 0.26 ? 0.57; 0.28 ? 0.38; 0.30 ? 0.34 and 0.36 ?
The vertical brush metering device was evaluated by assessing the actual relationship between the three density of hair per holes in vertical brush (50, 75 and 100 hair/hole) and the feeding device parameters (seeding traveling speed, peripheral speed of metering device). The brush device was controlled by seed lever control which lies in seed tank bottom. All parameters were measured at different levels of four brush device peripheral speeds (0.16; 0.24; 0.32; and 0.4m/s). Quality of feed, miss, multiple indexes and preciseness of seed index are the most common characteristics used to evaluate the metering wheel device performance. Various physical properties of sugar beet seeds including seeds density, projected area, sphericity and one thousand seeds mass are the most important factors in determining the optimum levers dimensions for metering device. The highest seed feed index was achieved on the brush device with hair density (Hd3) for two different of sugar beet varieties (Multi-germ of 64.45% and mono-germ of 56.13%). The lowest seeding feeding ratio was obtained from the experiments using the hair density of 50 hair/hole (Hd1) with peripheral brush speed of 0.4m/s. The lower values of preciseness index indicate better performance of the brush device, therefore the lowest values of it was found at seeding speed of 2.0m/s, 0.3m/s peripheral speed of feeding device and 100 hair/hole densities.

**Vertical brush seed metering device for sweet sugar beet planter**

In crop production, the mean condition for high productivity depends on singular seed holding in metering device of sugar beet planters. A general design of vertical or horizontal feeding disc is only to plant the coated sugar beet seeds due to the irregularity of surrounding shape of seeds. The paper is focused on developed and constructed vertical brush metering device to plant the ordinary types of sugar beet seeds (multi or mono germs). The physical properties of sugar beet seed species have influences on the behavior of vertical brush metering device. To evaluate the vertical brush metering device, some properties of sugar beet species were determined and some experimental results of planting were identified in this paper. The main dimensions (length, width and thickness), sphericity, geometric and arithmetic mean diameter, surface area, bulk density and true density were identified as physical parameters. Meanwhile, the terminal velocity, and hardness were measured as engineering properties. The static coefficient of friction for multi-germ seeds under different surfaces (stainless steel, sheet galvanized, plastic and rubber) were 0.48 ? 0.42; 0.51 ? 0.56; 0.57 ? 0.34 and 0.72 ? 0.53 respectively, while they were 0.26 ? 0.57; 0.28 ? 0.38; 0.30 ? 0.34 and 0.36 ? 0.74 for the mono-germ seeds respectively under the above mentioned surfaces. The regressions analysis for the relationship between the main parameters of sugar beet seed indicated that the highest positive effective factors affecting the approximation physical sugar beet seeds properties is the width of sugar beet for multi-germ while the length is more effective for mono-germ seeds. The vertical brush metering
device is one key part of sweet sugar beet planter; it was evaluated by assessing the actual relationship between the three density of hair per hole (50, 75 and 100 hair/hole) and the feeding device parameters (seeding traveling and peripheral speeds of metering device). The seeds flow in brush device was controlled by seed lever control which lies in seed tank bottom. All parameters were measured at different levels of brush device with four peripheral speeds (0.16; 0.24; 0.32; and 0.4 m/s). Feeding quality, missing seeds, multiple indices and precision of seed index are the most common characteristics used to evaluate the metering device performance. The highest seed feed index was achieved on the brush device with hair density of 100 hair/hole for two different sugar beet varieties (Multi-germ of 83.07% and mono-germ of 80.56%). The lowest seed feed index was obtained from the experiments using the hair density of 50 hair/hole with peripheral brush speed of 0.4 m/s. The lower values of precision index indicate better performance of the brush device, therefore the lowest values were found at seeding speed of 2.0 m/s, 0.3 m/s peripheral speed of feeding device and 100 hair/hole densities.

22-

**Soil Response to Tillage Treatments**

Soil structure is an important measure of soil quantity that is significantly affected by tillage systems. The investigation was carried out on the suggested system of tillage to get the best soil structure for achieving a high production. To fulfill this aim, five tillage systems were investigated. The combination between the primary tillage, (moldboard plow, 20 cm in depth; chisel plow, 20 cm; disk plow, 10 cm; disk harrow, 10 cm and control without tillage), and two secondary tillages (disk harrow followed with rotary and control) as tillage systems are identify. Clod size distribution, main weight diameter, soil roughness, tillage degree, soil resistance, soil shearing, bulk density, and mechanical measurements such as rolling resistance, slippage, draft and fuel consumption were measured as independent variable. The results indicated that, the soil surface after using moldboard plow or disk plow were more response to pulverization. The lowest mean weight diameter (34.81 mm) was recorded at disk harrow followed with rotary. Increasing the mean weight diameter (MWD) increased the soil roughness. Moreover, decreasing the MWD values because of increasing soil pulverization consequently increases the number of impacts and then decreases the penetration values. Bulk density, rolling resistance, slippage, and draft were affected by tillage systems.

23-

**PERFORMANCE OF DEVELOPED PLANTING AND HARVESTING SUGAR BEET MACHINE**

Authors were developed a planting and harvesting sugar beet machine. The machine was constructed to plant two rows and harvested one row. The planting mechanism was used brush metric device while the pulling and topping were the function of harvesting mechanism. The main goal of the present research is to test and evaluate the developed
sugar beet machine performance. Operation costs for sugar beet planting and harvesting and to be suitable for the Egyptian farm conditions. The developing machine performance can be summarized as: Planting mechanism was used to plant two rows of sugar seeds™ and within planting operation formed three furrows using three shares of double mouldboard. The planting mechanism is brush wheel metric device. The machine capacity is one Fed./hr with total cost of 60 LE./Fed. Pulling mechanism is involved three main sugar beet harvester components namely, two appropriate shares for loosing the ridge structure around the roots, pulling out belt and a proper disk knife as a topping mechanism. Two opposite belts were constructed to push on leaves and pulling sugar roots and topping the leaves before crop was dropped on land surface. The machine harvesting capacity was 0.5 Fed/hr, and total harvesting cost was 200-300 LE/hr. The machine proper conditional performance were: Forward speed in both planting and harvesting operations were 1.5-2 km/h, and a 50-65 tractor can be used to operate the machine in both planting and harvesting operations.

**DEVELOPMENT PLANTING AND HARVESTING SUGAR BEET CROP MACHINE.**

The main goal of the present research is to develop a rationalized power, and operation cost combined machine suitable for sugar beet planting and harvesting operations, and to be suitable for the Egyptian agricultural conditions. The developing machine components can be summarized in two parts: First component is planting unit: is planted two sugar seeds™ rows with suitable depth at top of the middle center of the two row furrows, in the same time formed three cultivable rows. The formed three shares are seated after the two planting rows. Each formed row share is a consisted from a double mouldboard bottoms, at end of it whereas, the drop seeds is covered by the sliding soils path. Second Component is sugar beet pulling unit: is involved three main sugar beet harvester components namely, two appropriate shares for loosing the ridge structure around the roots, pulling out belt mechanism with its proper power transmission system, and a proper disk knife as a topping mechanism. The machine id performed 60-70 cm riders during planting two rows. Also harvester one sugar beet row through pulling out and topping mechanisms. Three proper ridges in shape of a double mouldboard were constructed one was fixed on the front machine frame and the other two ridges were fixed on the back frame. Also two proper shares form for loosing the ridge structure around the roots.

**FARM MACHINERY ECONOMIC EVALUATION AND SELECTION THE OPTIMUM TRACTORIMPLEMENT SIZES**

The general view of this work is mainly conducted to study the farm machinery economic evaluation and selection the optimum tractor and implement sizes. The relationship between draft and fuel consumption relative to the operation cost and machine selections is identified as a present idea to evaluate the tractor-plow operation. And the specific objectives is to used the economical method by the visual basic program to select the suitable tractormachine for the agricultural operation depending on the machine properties. The study considered on rice crop as a main crop in Egypt. Rice crop is the highest
cultivated area in Dakahlia governorate (453 thousand feddan) and the rice production per unit area is the highest in the world (3.89 ton/fed.) (Ministry of Agriculture and Land Reclamation, 2008). For these reasons, rice crop was selected to evaluate the tested factor under study.

Therefore, vitrify the objectives the following steps could be considered:
1- Collect the data about the technical specification, and power requirement of the famous used tractor, rice combine and others three machines (chisel plow, leveler and seed drill).
2- Calculate the machinery costs based on the mathematical modules of tractor wheel/soil interactions information.
3- Finally, select the optimum size of tractor/machine combination by determine the machine costs and timeliness cost related to the machine and farm size.

26-

IRRIGATION WATER UTILIZATION AS A FUNCTION OF SOIL MECHANICS AND ITS PROPERTIES

An experiment was conducted for identifying the most efficient tillage method using the sub-soiling plough for enhancing some of physical properties of the heavy clayey soils. The experiment was conducted on a heavy clayey soil of an area 1800 m² located in Serewa village â€“ Belqas â€“ Daqahlia. This area divided into 4 adjacent plots, each one has a dimensions of (9m x50m) and was allocated only, for one treatment. The surface irrigation was the system applied and the amount of irrigation water added was equal for each plot (22.5m³) and was applied at the same time for all plots. Furthermore, an accounting for the rate of water flux in mm/day beneath soil profile along subsequent ten days from saturation was the last objective of this research. Only, four treatments were involved in this research as (Treat.1): sub-soiling plough at 40cm depth with a lateral spacing of 150cm, (T2): sub-soiling plough at 60cm depth with a lateral spacing of 150cm, (T3): sub-soiling plough at 40cm depth with a lateral spacing of 300cm and (T4): sub-soiling plough at 60cm with a lateral spacing of 300cm. For all plots, the sub-soiling plough was followed by chisel plough at 20cm depth and laser-controlled leveller at the dead level. All the data obtained clearly indicated that, the second treatment (T2) achieved the highest mean value of soil infiltration rate (2.2 mm/h) over all treatments and the lowest mean values for the cone penetration resistance, water content and bulk density at the surface layer of soil profile after tillage (2.41 M.Pa), (17.74 % w/w) and (1.17 g/cm³), respectively. Whereas, at saturation, it achieved the highest mean value of the water content (62.78 %w/w) and the lowest mean value of penetration resistance (.01 M.Pa). On the other hand, the mean value of the water content rested in the soil of the second treatment at the tenth day from saturation was (24.68 %w/w), producing the highest water flux (4.29 mm/day). Also, the second treatment achieved the shortest period of time needed until all amount of the deluge imposed on the soil surface after irrigation be completely infiltrated (20 h.).

27-

Agitator unit in auger metering device for fertilizer applicator

This investigation was carried out to study the engineering parameters of auger volume, cross sectional area of the orifice gate, fertilizer density and feeding shaft speed that
effect the discharge rate, g/min, and the percent volumetric efficiency of the fertilizer applicator. The results indicated that the highest value of discharge rate was 2,660 g/min obtained at the orifice gate with a cross section area of 48 cm², auger volume of 50.66 cm³ and feeding shaft rotational speed of 11.6 m/s for a bulk density of 0.685 g/cm³. The lowest value was 190 g/min at the sequence condition of 2.7 m/s, auger volume of 24.27 cm³ and gate area of 16 cm² for super phosphate. Increasing the gate area from 16 to 48 cm² increased the volumetric efficiency from 64.8 % to 78.9 % and from 39.4 % to 51.1 % for bulk density of 0.685 and 0.995 g/cm³, respectively.

28-

**Some properties of fertilizers in relation to particle motion in the hopper and on the distributor disc**

The quality of fertilizer distribution pattern for the rotary distributor depend on the physical and mechanical properties of fertilizers that used by the rotary distributor. The effect of physical and mechanical properties on the particle motion in the hopper and on the disc was discussed.

Five important properties were measured, namely particle shape, particles size distribution, coefficient of dynamic friction, angle of repose, and particle density. Methods to determine the physical and mechanical properties, and tests results were discussed.

The particle density was 1297 and 1791 kg/m³ for Urea and Ammonium Sulfate fertilizer. The largest repose angle of Urea was 380 and the smallest angle was 340, while the largest repose angle of Ammonium Sulfate fertilizer was 410, and the smallest angle was 350.

29-

**Developed unit for picking rice straw from the field**

Within the framework of national strategy for management of agricultural wastes in the governorates of Egypt, trend prevails currently for dealing with these wastes to benefit from them. However, rice straw residues represent high quantities from these wastes. So, for the aims of this research has been carried out of two objectives. The first objective was to develop a machine which pick-up rice straw directly from the soil surface after harvesting, where mechanical design for this unit was already conducted and the efficiency of picking wastes increased than the traditional systems by a large percentage. Then, the second objective was to clean up the fields immediately after crop harvesting to increases the needed time to the next crops. The evaluation of the developed pick-up unit is carried out in 2011-2012 seasons in Agric. Eng. Dept., Mansoura Univ. to investigate the effect of some engineering parameters by analyzing the relative relationships between the various parameters such as the effect of forward speed, tilt angles and straw holders clearance on pick-up efficiency, losses, flow rate and productivity. The results indicated that the maximum value of straw pick-up efficiency was 98.60 % obtained at 0.784 km.h⁻¹ of forward speed, tilt angle of 0.785 rad and straw holders clearance of 20 mm. At these operating parameters the minimum losses was obtained, the developed unit flow rate and productivity were 0.938 and 0.924 Mg.h⁻¹ respectively.

30-

**The theoretically and practically motion performance of particle fertilizers on the rotary spreader**
fertilizers on the rotary spreader, theoretically and practically was carried out. By using the real fertilizer granules (regular and irregular shapes) of mathematical equations system has advantage of easing to obtain its inputs, and compare the results of this system with the laboratory experiments results of the fixed rotary distributor; to determine, if we can use these mathematical equations with the different fertilizers particles or not?. The constructions of the fixed rotary distributor are mainly: power source unit, AC drive unit, vertical electrical motor holder, the spinner, and the funnel. This study evaluate the mathematical equations system through the following measurements: The radial velocity of fertilizer particles and the Staying angle of the fertilizer particle on the disc (measured from the getting out position on the disc until its exit at the disc edge), under the following different operational conditions: two types of fertilizers (Urea 46-0-0 and Ammonium Sulfate 21-0-0), five different disc speeds (420, 480, 540, 600, and 660 rpm), three impact positions on the disc (0.06, 0.08, and 0.10 m), and six replicates. When comparing the laboratory results with the mathematical equations system, the obtained results showed that, the radial velocity values using the mathematical calculation method were greater than the radial velocity values using the laboratory calculation method, for both of Urea and Ammonium Sulphate fertilizers. The staying angle of the particles (Radians) remains constant with the increase of disc speed, using the mathematical calculation method (Cunningham, 1965) for both of two fertilizers types. The staying angle results of the two types of fertilizers using Cunningham, 1965 method were very closer to the staying angle results using the laboratory method, but for the staying angle results of the same two types of fertilizers using Ritter et al., 1980 method were far from the other results of the staying angle, using laboratory method.

Qualifying of the rice straw chopping unit

The aims of this research has been carried out to qualifying a chopping unit for rice straw as a suitable length for livestock feed. The cutting unit was qualified to cut the straw. The qualifying unit performance was tested and evaluated in 2011-2012 seasons in Agric. Eng. Dept., Mansoura Univ. at four levels of cutting drum rotation speed of 2.00, 2.84, 3.64, 4.46 m.sec-1 with three levels of cutter drums interference of 10, 20 and 30 mm and three levels of cutting discs span of 15, 25 and 50 mm. The data were determine the effect of the above variables on average chopped straw length, straw chopped factor percentage and power requirements. The results indicated that the highest value straw cutting factor percentage were 99.60 % obtained at chopped unit rotation speed of 4.46 m.sec-1 and the cutter drums interference was adjusted at 10 mm when the cutting discs span was 25 mm. At these parameter the cutting straw length was about 24.9 mm and the power requirements was about 44.03 kW.

Steering evaluation of tractor using the response surface methodology.

The research aim is to developed the traditional tractor steering system and how to choice and design the hydraulic steering of the tractor using local material and how to the steering components such as pump, steering unit, custom steering shaft, cylinder, double-shear clevis ends for the cylinder and rod are compatible with each other. On the basis of the tractor IMT (26.1kW) the hydraulic steering is conducted and the lab and field experiments are carried out. The theoretical calculated is don and the experiments are
recognized in the Tractor and Machinery Testing Station at Alexandria, Agricultural Engineering Researches Institute, Agricultural Researches Center, El-Dokki “El-Giza, Egypt. From the experiments the actual outer front wheels steering angles $\alpha_o$ increased with the inner steering angles $\alpha_i$. It varied from about (0.0 to 35.69 degrees) at values of ($\alpha_i$) varying from about 0.0 to 50 degrees respectively. The turning radius (R) increased with the increasing of inner and outer front wheel steering angles ($\alpha_o$ & $\alpha_i$). The Values of turning radius (R) varied from about [151.4 cm to 5154.5 cm] at values of ($\alpha_i$) varying from about [(0.0 to 50) degrees] and ($\alpha_o$) varied from about [(0.0 to 35.69) degrees] respectively.