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Application of Date Palm Trees Mulch as a Bedding Material for Dry Heifers, Part 2 –Preparing the Bedding Materials

Elashhab A.O.[1,a*], M.W. Sadik[2,b], M.K. Zahran[3,c]

[1]Agricultural Engineering Research Institute (AERI), ARC, Giza, Egypt

[2]Cairo University, Faculty of Agriculture, Department of Microbiology, Giza, Egypt

[3]Al Hofuf Stars Trading Est., P.O.220540, Riyadh, Saudi Arabia

[a]elashhabahmed@yahoo.com, [b]mwas20032004@yahoo.com, [c]mahmoud.zahran60@gmail.com

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Abstract. Date palm trees mulch can be safely and effectively used as a bedding material for cow feedlots. Feedlot managers will need to adjust bedding rates according to facilities, environment, and cow comfort. Feedlot managers interested in using date palm trees mulch as bedding will recognize that absorbency of date palm trees mulch is lower than that of sand. However, utilizing of date palm trees mulch eliminates costs of harvesting sand. A total power consumption for horizontal grinder machine, grapple to loading the grinding machine and loader for handling mulch material. Were 468 kW/h, specific energy was 46.8 kW/ton and 7.49 kW/m3. Total Power consumption to preparing the barn to use mulch bedding material for m3 were 7.84 kW/m3 every day and 78.4 kW/m3 after finish experimental time 10 days. Total cost for using date palm trees mulch as a bedding every 10 days were 3180.0 SR/m. Total cost for traditional manure management every 10 days were 3180.0 SR every 10 days for all operation

Introduction

Bedding for livestock animals must be comfortable, clean, and absorbent. There are several materials, both organic and inert, that may be used for bedding, and most may be used for all types of livestock. When organic materials are used, ammonia volatilization is reduced, improving the air in the housing facility. Bedding, as with other aspects of livestock management, can be manageable through proper care and attention [18]. The removal of accumulating manure reduces odors, a control fly larvae, and minimizes the potential for surface and groundwater contamination. Maintaining a firm, dry feedlot surface is an important factor in good animal health and a healthy environment. While this is labor intensive for feedlots, it does indicate that pen cleaning as frequently as feasible for your specific operation is good management [9]. Resting dairy cattle should have a dry bed. Stalls ordinarily should have bedding to allow for cow comfort and to minimize exposure to dampness or fecal contamination. When handled properly, many fibrous and granular bedding materials may be used, including long or chopped straw, poor-quality hay, sand, sawdust, shavings, and rice hulls. Inorganic bedding materials (sand or ground limestone) provide an environment that is less conducive to the growth of mastitis pathogens.. Bedding should be absorbent, free of toxic chemicals or residues that could injure animals or humans [13]. Compost barns have a concrete feed alley, a bedded pack area that is stirred two times a day, and a 1.2-m high wall surrounding the pack. The wall that separates the pack and feed alley has walkways to allow cow and equipment access to the stirred pack area. The stirred pack is sized to provide a minimum stirred bedded pack area of

7.4 m2/cow. Producers use dry fine wood shavings or sawdust for bedding. Fresh bedding is added when the bedded pack becomes moist enough to stick to the cows. The pack is stirred (aerated) at least two times each day to a producer recommended depth of 25 to 30 cm. Stirring aerates and mixes manure and urine on the surface into the pack to provide a fresh surface for cows to lie down on. The pack can provide manure storage for 6 to 7 months [11, 12]. Two of the most common methods of manure removal are the wheeled frontend loader and the box scraper. Both are effective at: 1) providing a smooth pen surface and 2) maintaining the integrity of the compacted protective hard pan under feedlot pens. A wheeled front-end loader requires a professional operator. A combination of a wheeled front-end loader for major manure removal and a scraper for final cleaning would be an effective compromise [9]. Evaluate different types of bedding materials included: pine sawdust (control) (SD), corn cobs (CC), and soybean straw (SS). material were collected twice a month and analyzed for dry matter. C:N ratios and pH . were measured weekly at various depths (15.2, 30.5, 45.7, and 61.0 cm) Moisture content of SD was 59.7; CC, 44.5 and SS, 60.6. ideal bedding material for compost barns should be dry, processed to parts length less than 2.5 cm, and have good water absorption and holding capacity [7] To produce high quality organic fertilizer in large scale using date palm trees mulch produced from local farms. Date palm trees mulch (DPM) was mixed with fresh farmyard manure (FYM) as nitrogen source. The mixtures were prepared by using 3 ratios (w/w) of 1:1, 2:1 and 3:1 (DPM : FCM).The results found for mixtures of 2 and 3 were better than mixture 1, therefore these mixtures are considered to be the best for composting date palm trees mulch. Regulated elements (N, P, K, Organic matter, pH, electrical conductivity, and TDS) were improved in all mixtures. The end product was free of salmonella, total coliform and faecal coliform bacteria [17]. The challenges of working with sand-laden manure are related to the physical properties of the sand. Sand has a density of 1,750–2,100 kg/m3 depending on its moisture content. Sand does not absorb moisture, This increase in weight, volume and density makes sand-laden manure extremely hard on manure-handling equipment, The simplest method of collecting sand-laden manure is to scrape with a tractor or skid steer Wear and tear on equipment is a major concern when handling sand-laden manure [8]. Manure is classified as one of the following: 1)Solid Manure is as-produced manure with a large amount of bedding, usually long stalk straw or hay. It is moved manually or by mechanical devices such as front-end loaders and skid-steers. To maintain a solid consistency during storage, 2) Semi-Solid Manure is as-produced manure with less bedding than solid. Conveying semi-solid manure with long stalk bedding from stanchion barns is the same as solid manure.3) Slurry Manure is as produced with limited bedding material, which allows the manure to flow and seek a level plane. It is handled as a liquid material, Conveying slurry manure from stanchion barns is usually by gutter cleaners or gravity flow gutters to a collection structure [15]. Organic bedding materials kind of straw, hay, saw dust, wood shavings, crop residue (corn stalks, cobs, etc.) shredded paper, paper pulp residue, composted or dried manure. They are used as bedding because their high moisture absorption. They are compatible with manure handling systems and are readily available [14]. The trailer box scraper is one of the equipment used for cleaning pens need professional operators. One of the problems is the hard of getting the corners of the pens along the feed bunk. Therefore, the front end loader, rear mounted scraper or a scraper on a tractor with a three point attachment are used to clean out the manure from the corners [14] .Solid manure is usually collected using scrapers, box scrapers, blades, front-end or skid-steer loaders or similar devices. Equipment sizes ranged from small blades suitable for tractors of 50 hp or less to large bucket loaders mounted on dedicated power units for operations generating large volumes of manure.[5]. Using semi trucks

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or tractors and manure tanks is the most common way today to transfer manure from one location to another. Tanks are readily available, may already part of a farms equipment package, and would not require any additional infrastructure [2,3] .

Our objectives for this study were:

1) Calculating the consumed power for all mechanical operation. (2) Estimating the machine costs for grinding date palm trees and mechanical operation to preparing the barn to distributing mulch bedding. (3) verifying the efficiency of using date palm trees mulch as bedding materials and its effect on livestock animals comfort ability and safety. At the time produce a suitable mix for further compost production. (4) Evaluate the physical, chemical and microbiological characteristics of the produced composite bedding material after 10 days.

Materials and methods

A. Animals and housing

The investigation on the ability of date palm trees mulch as a bedding material, to absorb dry heifers cow manure and urine was done at a large scale animal farm, Al Hasa City, K.S.A. Study consists of 120 dry heifers. Heifers sections were classified into 3 sections. Section A is an animal concrete feeding area (40 x3m). Section B is an animal comfort sandy area (40 x 5 m). Section C is an animal sandy floor movement area (40 x 19m). Total barn area of section A and SectionB (320 m^2) was bedded with date palm trees mulch. Integrated pest management program was selected as an optimum strategy of manure recycling to prevent the reproduction of house fly and change the medium of larva. First step, manure was removed from feeding area by tractor attached scraper 6 ft, to transfer the manure outside the area. Second step, feeding area was cleaned by using a high pressure water pumping machine in order to remove the remaining steak manure on the concret floor within trial areas, to ensure complete cleanliness of the barn. Third step, Water was sucked from concrete basin resulting assembly by using trailer Vacuum operating by tractor before date palm mulch was applied as a bedding material. Study area was sprayed using Larvacide. Finally, the mulch was distributed by using hand-fork. Fly density was measured within the bedding 10 days period. Movement of animals and bedding layer thickness were observed daily.

B. The bedding product is produced by grinding date palm trees using horizontal grinders machine from Al Hufof Stars Station, Al- AHSA K.S.A . The finished product is very dry compared to industry standard. It is lab tested at(IDAC LABE) to have a dry matter 95% and moisture content12-14%., Mulch denacity 160kg /m3 .The bedding has a fine texture consistency that is very absorbent with less dust, and it tends to hold up longer in high moisture without turning verss the traditional sawdust or shaving products

Calculate the Quantity of mulch required to covere the expremental areas Aand B according

to [17] to produce high quality organic fertilizer in large scale using date palm trees mulch. Date palm trees mulch (DPM) and fresh farmyard manure (FYM), The mixing ratio (w/w) is 2:1 (DPM : FYM).The first stages of collecting information before starting the experiment found that wet manure samples were taken from the experiment site to determine the amount of daily production of fresh and dry manure from 120 heifers per day. Then calculate the quantity of mulch to caver expremental area.

C. Machine and equipments

1. Machine of preparing date palm trees mulch, as a bedding material from date palm trees waste.

The machine were 1- horizontal grinders machine Vermeer hg model 4000 which has an engine 384 kW, the capacity of grinding mulch is 10 ton per hour according to screen size 6 inch

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2- grapple to loading date palm trees waste to grinding machine, Hitachi model ZAXIS 200 .has an engine 122 kw, and loader New Holaned handling mulch material model W170 has an engine 140 kw, bucket capacity 2.5 cubic meter.

2. Machine of preparing the parn area to putting the mulch. Integrated pest management program was selected as an optimum strategy of manure recycling using 3 steps

The first step is removing cow manure from feeding area (section A) by tractor 58.8 kw attach rear Box scraper 6ft to transferring manure outside the feeding area 2- Clean up the feeding area using a high pressure water pump machine to clean and remove sticky manure from concrete and corners .at the same time Use manual brushes to remove the remnants of the existing structures of manure to ensure complete cleanliness of the site. 3- tractor 58.8 kw A tractor is running Vacuum Trailer to suckeing liquide manure from concrete basin 4- ULV sprayer to spray the Larvacide.. The second step is removing and transfer soil with manure from rasting area B using Loader has an engine 140 kw,bucket capacity 2.5 cubic meter and trailer capacity 25 cubic meter. This step should apply before adding the mulch layer under the caw

The third step is Covering the area by mulch using dump truck has an engine power 255 kw, box capacityis 25m3, 30 ton. To distributing the mulch in areasA and B using hand-fork.

D. Controlling flies there are 3 steps to control flies 1- Spray area (A, B) using Larvicides Alsystin 050 UL to prevent larvae breeding 2- Controlling Adult flies using ULV machine 3- Install adhesive strips to measure the density of flies within the Contaminated site.

E. Estimating the horse power consumption for the different operation.

1. Machine of preparing the bedding material, to get out of machine as mulch by using Vermeer horizontal grinders machine model hg 4000 which has an engine 515 hp (384 kW), the capacity range from 6 to 10 ton per hour according to the size of screen, the fuel consumpation was measured immediately after each treatment for screen 4 insh and 6insh by using fuel scale measurement. The following formula was used to estimate ending used power (EP) to grinding machine, grapple, and loader according to [6].

$$EP = \frac{f.c \times PE \times L.C.V \times 427 \times \eta thb \times \eta m}{3600 \times 75 \times 1.36} \quad \text{(Eq. 1)}$$

Where :

EP = power consmipation (kW)

$f.c$ = The fuel consumption, (L/h)

PE = The density of fuel, (kg/L) (0.823 kg/L)

L.C.V = The lower calorific value of fuel, (11000 k.cal/kg)

427 = Thermo-mechanical equivalent, (Kg.m/k.cal)

ηthb = Thermal efficiency of the engine, (35 % for Diesel)

ηm = Mechanical efficiency of the engine, (80 % for Diesel)

Fuel consumption: The rate of fuel consumption as quantity per time unit with load and without load, as shown in the following formula, according to [1]

$$FC = \frac{f}{t} 3.6 \quad \text{(Eq. 2)}$$

where: Fc = Fuel consumption, l/h;

f = volume of fuel consumption, cm3 and, t = time, s. =Calorific value of fuel (10000 kcal / kg),

2. The last formula in (Eq. 1) was used to estimate ending used power (EP for machine of preparing feeding area secation A to putting the mulch for tractor attach rear scraper, high pressure water pumping machine and trailer vacuum .and loder to remove cow manure from expremental area and estimate ending used power (EP for machine of remove bedding material after complet the expremental from secation Aand B

F. Cost analysis and economical evaluation:-

The cost analysis was calculated according to [16] It was performed to calculate the machine operating cost . Cost analysis inputs consist of both fixed and operating costs. Fixed machine costs included machine payments, insurance, taxes, and depreciation with interest rate. Operational costs for the machine included labor, fuel and lubrication, and maintenance and repair excluding the downtime costs.Also, a comparison between the traditional bedding manure handling cost and mechanical preparing date palm trees mulch, as a bedding material cost. These total costs (TC) include depreciation (D), annual capital interest taxes (I), housing and insurance cost (THI), repair and maintenance cost (R), fuel cost (F), lubrication cost, and labor cost (L) Machine age (n) .

$$T_C = \frac{\{(D)+(L)+(THI\}+\{(R)+(F)(L_S)+(I)\}}{n} \quad \text{(Eq. 3)}$$

$$Tc = \frac{\left\{\left[\left(\frac{Pc - Sv}{Y}\right) + \left(\frac{Pc + Sv}{2} * \frac{i}{100}\right) + 0.02\,Pc\right] + \left[\left(\frac{Pc * r_c}{Y}\right) + (0.25\,Pt * fc) + (Oc * c * n) + (N * L * n)\right]\right\}}{n}$$

where;

Tc = Total cost SR /h;

Pc = Machine price, LE;

Sv = Salvage value= Pc×Sp where, Sp=Salvage percentage = 56xo.885^n for mulching machine(%), and =68x o.92^n for tractor.

n = Machine age = 5 years,10 years for tractor and 15years for grinding machine

i = Interest rate =13%;

rc =Coeficient of repair and maintenance = 1 for tractor, 0.6 for the machine;

Pt = Tractor and differant machine power (hp) ;

fc = Actual fuel consumption = measured (L l/h) ;

fp = Fuel price =3.o SR = for diesel fuel;

Lc = Lubrication cost =20% of fuel cost;

N1 = Number of labors

L = Labor cost = 15 SR /h

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(2) Machine flied capacity (Fc): Actual field capacity was calculated as follows:

$$Fc = \frac{A}{t} \quad \text{(Eq. 4)}$$

where; fc = machine capacity, m^2. / h; A = area m2. ; t = Machine operating time, h.

3.The specific energy was calculated by using the following equation:

$$\text{Specific energy} = \frac{\text{Power requirement (kW)}}{\frac{\text{Effective field capacity (feddan)}}{h}} \text{ kW.h/feddan} \quad \text{(Eq. 5)}$$

G. Characterization of composite manure bedding material Raw materials, composite date palm trees mulch and manure bedding material were analyzed for pH, electrical conductivity, temperature, total nitrogen, total phosphorus, total potassium and ,moisture to determine the ability of bedding material to absorb moisture using standard procedure [4] Also initial raw materials were analyzed chemically and microbiologically (Tables 9, 10 and11). Microbial activity and temperature measurements of compost piles Composite date palm trees mulch and manure bedding material were biologically analyzed. Microbial analysis included total viable bacterial counts (cfu/g), total coliform (MPN/100g), bacterial pathogens detection using API kit identification. A nalysis was done according to [19]

Results and discussion

The choice of bedding material used on farms is dependent on many factors, including economics, animal health and manure management .Our study are required to elucidate the precise mechanisms by which the beneficial results of using date palm trees mulch as a bedding dry cows.

1. Animals and housing Study consists of 120 dry heifers. Heifers barn was devided into 3 sections. 1-Section A is animal Feeding area (concrete floor) (40 x3m). 2-Section B is an animal comfortable area (Sandy floor) (Shadow area) (40 x 5 m). 3-Section C is an animal movement area (Sandy floor)(sunny area) (40 x 19m). Total barn area of section A and Section B is 320 m^2

2. Calculate the Quantity of mulch required to covere area Aand B accouring to [17] to produce high quality organic fertilizer in large scale using date palm trees mulch, (DPM) and fresh farmyard manure (FYM), The mixing ratio (w/w) is 2:1 (DPM : FYM). The first stages of collecting information before starting the experiment found that, wet manure samples were taken from the experiment site to determine the amount of daily production of fresh manure from 120 heifers is 1067 kg/day wet manure and 490 kg/day dry manure . Calculate the quantity of mulch to caver expremental area [Section A 120 m^2, (concrete floor) and Section B 200 m2 (sandy floor)] total area is 320 m^2 and to fit the amount of manure for 10 days is 4840 kg .The equivalent quantity of mulch is 9680kg almost 10 ton of mulch enough to hold the experiment tim.

3. Estimate power consumption for the different operation acording to [6] .

3.1. power consumption kW, specific energy kW/ton and specific energy kW/m^3 for preparing the bedding material, to get out of machine as mulch . Data were tabulated in [table1] A total power consumption for horizontal grinder machine, grapple to loading the grinding machine and loader for handling maluch materal. Were 468 kW, and specific energy 46.8 kW/ton and 7.49 kW/m^3

Table 1: Power consumpation kW, specific energy kW/ton and specific energy kW/m3 for mechanical preparing the date palm trees mulch as bedding material .

	machine	Engine [kW]	Power consumpation [kW]	specific energy [kW/ton]	specific energy [kW/m^3]
1	Horizontal grinders machine	404 kW	283	28.3	4.5
2	Grapple	121 kw,	85	8.5	1.3
3	Loader	143 kw	100	10	1.6
	Total		468	46.8	7.4

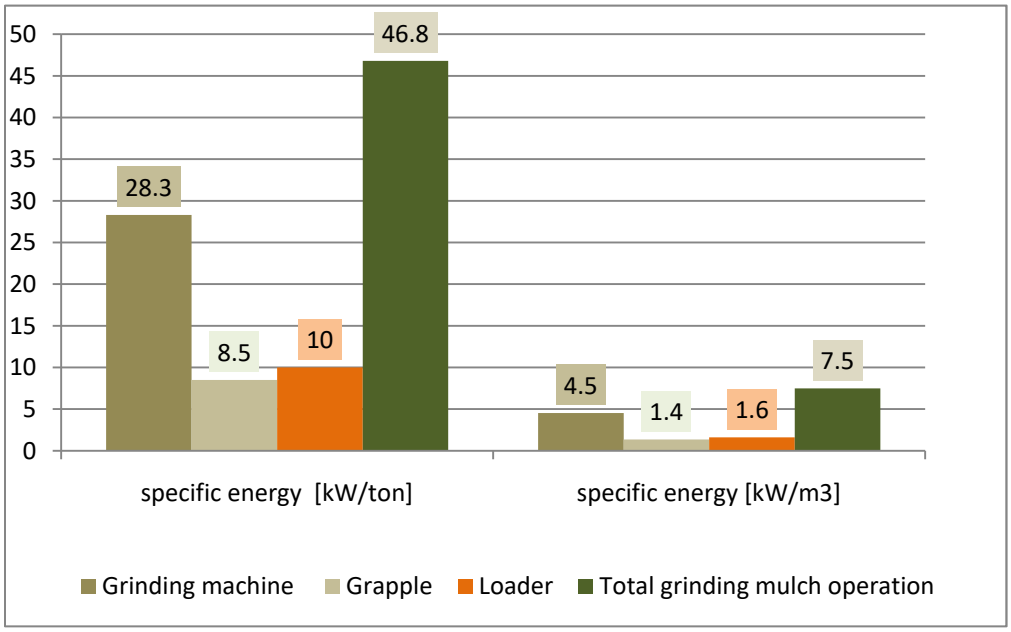


Fig. 1 Power consumpation kW, specific energy kW/ton and specific energy kW/m^3 for mechanical preparing the date palm trees mulch as bedding material .

3.2. Power consumpation for Mechanical operation of preparing the barn to putting the mulch as shone in Table [2] this operation was comleted by 3 steps. 1-first step is removing manure from feeding area (section A). The machine which used in this operation were 1- removing manure from feeding area by tractor and attach rear scraper 6 ft . 2-complete cleaning feeding area by using a high pressure water pumping and remove sticky manure from concrete feeding

area.3- sucking water from concrete basin of feeding area by tractor mounted vacuum trailer tank.

2-second step is removing soil with manure from rasting area (section B) to storage area

3-third step is covering the areas A and B by mulch.

4- transfer mulch from storage to the barn by dump truck capacity 30 m3. Total specific energy to preparing the barn to putting mulch for m^3 was 11.84 kW/m3 every 10 dayes

Table 2: Power consumpation kW and specific energy kW/m^3 for Mechanical operation of preparing the parn to putting the mulch every

·	Machine operation	Power onsumpation [kW]	specific energy [kW/m^3]
1	Tractor attach rear scraper 6 ft to cleane manure outside the feeding area	31	0.57
2	High pressure water pump to clean and remove sticky manure	3	0.37
3	Tractor mounted Vacuum Trailer tank 10m^3 to suckeing liquide manure	37	1.6
	loader removing soil and manure from area B	100	3.3
5	dump truck capacity 30m^3 transfer mulch to the barn	180	6
	Total in 10 dayes		11.84

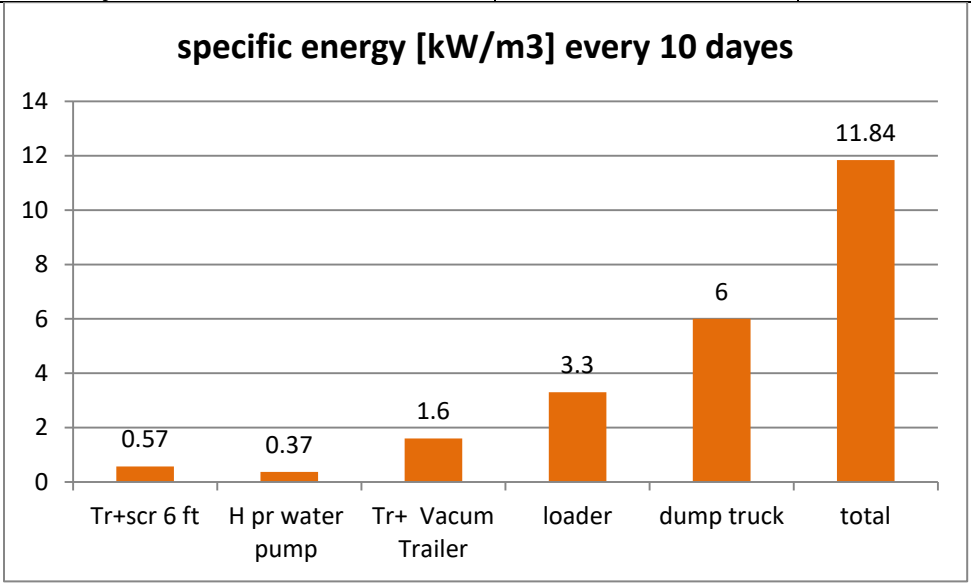


Fig. 2 Specific energy kW/m^3 for Mechanical operation of preparing the parn to putting the mulch every 10 days.

3.3. Machine removing the bedding with manur after expremintal completing using loader to removing and loading manure from areas A and B, and dump truck capacity 30 m^3 to transfer manure from expermintal area to composting yard.

Table 3: Power consumpation kW and specific energy kW/m^3 for removing manure from the barn every 10 dayes

.	Machine operation	Power consumpation kW	specific energy kW/m^3
1	loader removing and loading manure from areas A and B	100	3.3
2	dump truck capacity 30 m3 transfer manure from expermintal area to composting yard	180	3.0
	Total	280	6.3

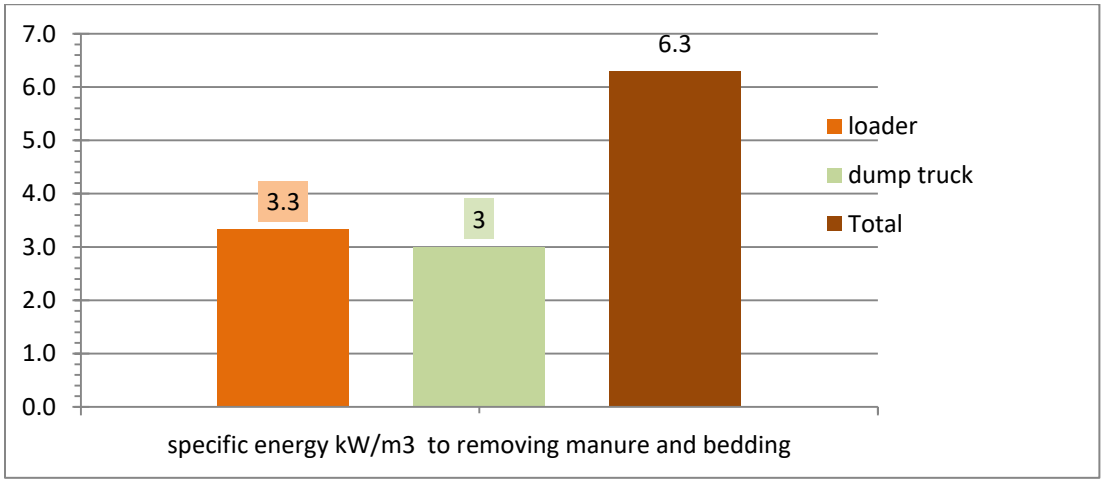


*Fig. 3 Total specific energy kW/m3 for Mechanical operation of preparing the barn of new system to putting the mulch every 10 dayes 11.84+6.3 =18.14 kW/m3 - specific energy after 4 months (120 dayes) 18.14*12= 217.7 kW/m3*

3.4. Power consumpation for traditional manure management system in the farm, the following equipment was used to perform manure removal from barn.1- Cleaning feeding area by Tractor engine power 44kw attach rear scraper 6 ft to remove liquide manure to concrete basin and suckeing liquide manure from concrete basin by trailer vacuum 2- remove and transfer soil and manure from rasting area B to movment area C using tractor 58.8 kw attach rear scraper 10 ft and make cycle betwen area B and C Until remove all wet manure from area B and replac it by dray soil from area C . this operation made every day . as shone in table [4] . Total Power consumpation of traditional manure handling system is 226 kW and specific energy 8.4 kW/m^3 in one time and

Table [4] Power consumption kW and specific energy kW/m^3 for mechanical operation of

Table 3: traditional manure handling system two times every day

	Machine operation	Power onsumpation [kW]	specific energy [kW/m^3]
1	Tractor attach rear scraper 6 ft to cleane manure outside the feeding area.A	62	1.2
2	Tractor mounted Vacuum Trailer tank 10m^3 to suckeing liquide manure	74	3.2
3	Tractor attach rear scraper 10 ft to remove and transfer soil and manure from rasting area B to movment area C	90	4
	Total every day	226	8.4

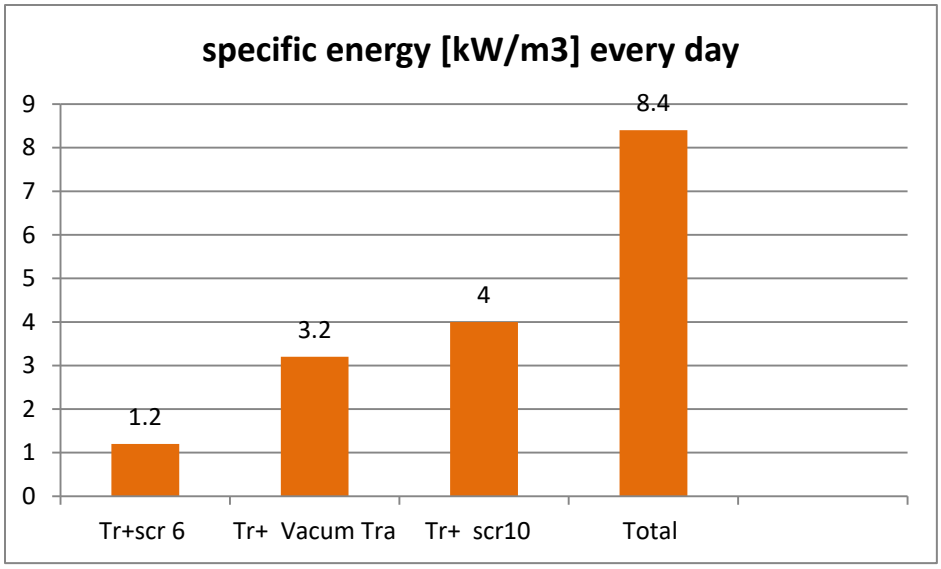
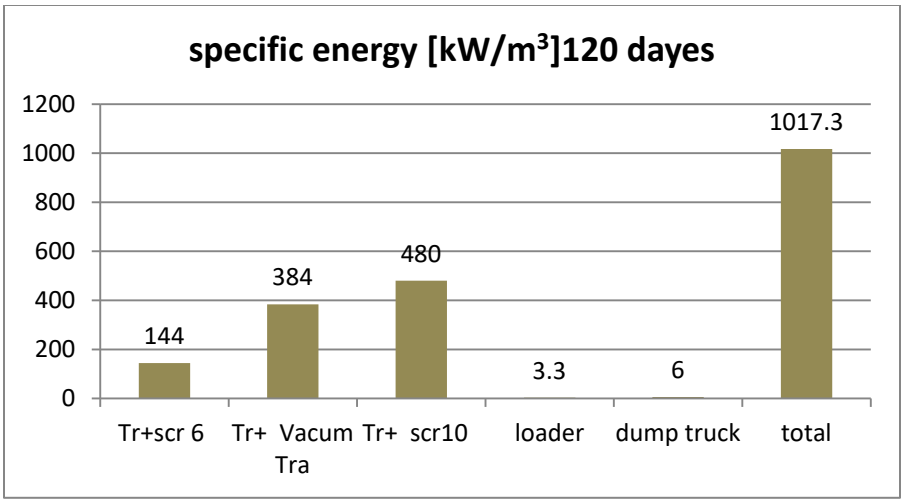


Fig. 4 After 4 months manure is completely removed using loader and dump truck capacity 30 m^3 to removing and loading manure from the barn to composting yard. as showen in table [5] total specific energy of traditional manure handling system after 120 days (4 months) is 1017. 3 kW/m^3



4. Cost analysis and economical evaluation included fixed and variable costs were calculated acording to [16]

4.1 Machine of preparing the bedding material, to get out of machine as mulch .As shown in Table 6, the total cost for mechanical preparing the date palm trees mulch as bedding material costs 1256 SR / h for the first stage.

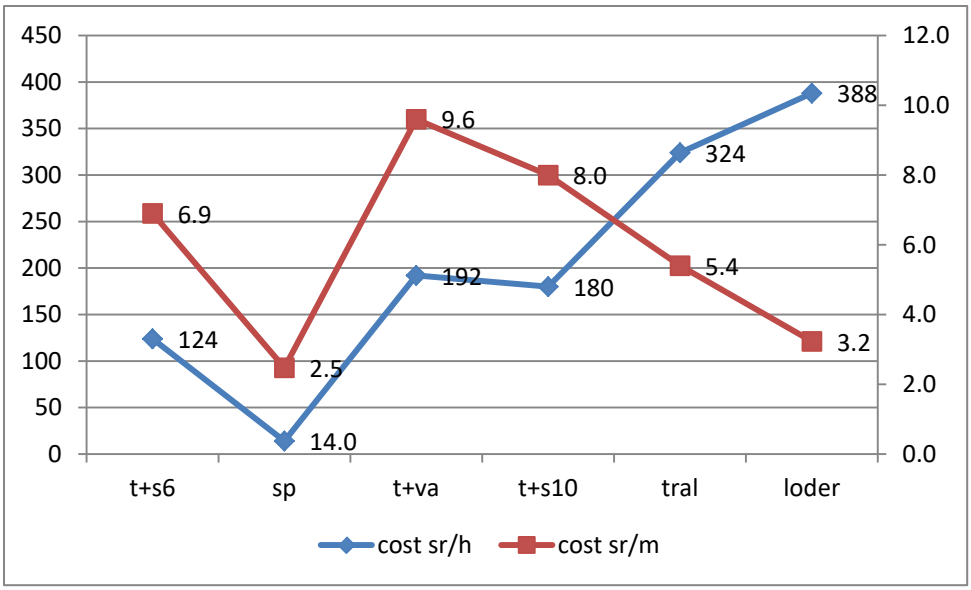
Table 6: Cost analysis for mechanical preparing the date palm trees mulch as bedding material .

	Machine operation	Engen power kW	Machine capacity M^3/h	Cost SR /m3	Cost SR /h
1	horizontal grinders	550	62	10.7	663.4
2	grapple	165	62	3.3	204.6
3	loader	195	62	6.3	388
	Total cost			20.3	1256

4.2. Cost analysis for mechanical preparing the barn area to putting mulch .the resaluts at table 7 for second step operation to remove manure at secation AandB costes 835.05 SR / hour and 26 SR / m3.

Table 7: Cost analysis for mechanical preparing the parn area to putting the mulch

.	Machine operation	Machine capacity M^3/h	Cost SR /m3	Cost SR /h
1	Tractor attach rear scraper 6 ft to cleane manure outside the feeding area	40	2.3	124
2	High pressure water pump to clean and remove sticky manure	13.5	1.1	14
3	Tractor mounted Vacuum Trailer tank to suckeing liquide manure	20	9.6	192
4	loader removing soil and manure from area B	60	6.3	388
5	dump truck capacity 30m3 transfer mulch from storage to the barn	60	5.4	324
			26	1042



4.3. Removing the bedding with manur after the end of the experiment . As shown in Table 7b, the total cost of the manure removal process from barns is 8.6 SR /m3 and 712 SR /h for Removing the bedding

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Table 7b: Cost analysis for removing the bedding with manur after expremintal

.	Machine operation	Machine capacity M^3/h	Cost SR /m3	Cost SR /h
	loader remove manure and loading the truck from expermintal area	120	3.2	388
	dump truck capacity 30 m3 transfer manure from expermintal area to composting area	60	5.4	324
	Total cost		8.6	712

4.5. Total cost for using date palm trees mulch as shown in table 8, the total cost a bedding every 10 dayes were 3180.0 SR/m3 and total cost 28620 SR/m3 After 3 months .

Table 8: Total cost analysis and economical evaluation for using date palm trees mulch as a bedding

.	operation	Cost SR/m3	Total cost/barn (60m3)
1	Machine preparing mulch bedding material	20.2	1212.0
2	preparing the parn area to putting the mulch 60 m3	26	1560.0
3	removing the bedding with manur after expremintal	6.8	408.0
	Total cost by 10 dayes	53.0	3180.00
	Total cost After 3 months		28620

4.4 Cost analysis and economical evaluation. According to the traditional manure management system in the farm, the following equipment was used to perform manure removal from barn two times every day.

1- Cleaning feeding area by Tractor engine power 44kw attach rear scraper 6 ft to remove liquide manure to concrete basin and suckeing liquide manure from concrete basin by vacuum trailer 2- remove and transfer soil and manure from rasting area B to movment area C using tractor 58.8 kw attach rear scraper 10 ft and make cycle betwen sechan B and C antal remove all wet manure from area B and replac it by dray soil . this operation made every day . Every 3 months the whole manure is removed from each barn at a depth of about 50 cm . As shown in Table 9, feedinng area and the rest area are cleaned daily and the manure is completely removed every three months. Total cost for traditional manure management after 3 months is 57004 SR.

Table 9 Cost analysis for traditional manure handling system in the barn

.	Machine operation	Engine (kW)	Machine operation (h)	Cost SR /m^3	Cost SR /h	Cost/ One barn
1	tractor attach rear scraper 6ft to scrabing the manure outside the feeding area.A	44	0.30	6.9	124	37.2
	Tractor mounted Vacuum Trailer to suckeing liquide manure	58.8	0.50	9.6	192	96
	tractor attach rear scraper 10 ft to remove manure from area B to area C	58.8	0.75	8	180	135
	Total cost every day			24.5	506	268.2
	Total machine cost by 4monuth (120 day)			2938		32184
	sand Soil	400m3		50		20000
	loader remove manure and soil by truck from expermintal area		5		388	1940
	dump truck capacity 30 m3 transfer manure from expermintal area to composting area		5		324	1620
	dump truck capacity 30m3 transfer soil from storage to the barn		5		324	1260
	Total cost After 4 months					57004

5. The choice of bedding material used on farms is dependent on many factors, including economics, animal health, manure management, and animal well- being. Data presented in table 3 showed that in section A date palm trees mulch absorb and filter manure and urine highly till day10 (Moisture of bedding material was 30.0%) which could indicate that date palm trees mulch is a good bedding material as it behave as a filter. On the other hand in section B bedded material of date palm trees and sand has higher absorption, moisture content at day 10 (52.19%). In the present study, although elevated relative to Heifers bedded with date palm trees mulch was within range considered normal. Concentration of regulated elements in composite bedded material of date palm trees mulch mixed with fresh heifers manure in section A and section B are present in table 4. Bedding in section A and section B were closer in elements content. Indeed, N, P and K concentrations were higher in section A than section B and within the normal standard concentration ranges observed in healthy cattle [20] Date palm trees mulch mixed with fresh heifers manure denacity is 620 kg /m3.

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Table 10: Chemical Composition of raw materials used for composting

Characteristics	Date palm trees mulch	Fresh cow manure
pH	6.66	7.22
Moisture (%	**4.5**	**41.8**
Organic Matter (%)	**88.70**	**38.00**
Organic Carbon (%)	**44.45**	**19**
C/N Ratio	76.63: 1	15: 1
NDF (%)	**61.38**	**67.38**
ADF (%	**41.85**	**62.05**
Ash (%)	18.01	70.75
Nitrogen (%)	**0.58**	**1.26**
Phosphorus (%)	**0.25**	**0.54**
Potassium (%)	**1.70**	**1.55**
Calcium (%)	**2.25**	**2.80**
Sodium (%)	**0.55**	**0.54**
Magnesium (%)	**0.26**	**0.27**

Table 11: Microbiological Composition of raw materials used in composting

Characteristics	Date palm trees mulch	cow manure
Total viable bacterial counts (cfu/g)	TNTC	TNTC
Total coliform (MPN/g)	Nil	TNTC
Bacterial detection	Bacillus sps	Salmonella, E.coli

Table 12: Chemical properties of the composite bedding materials

Time	Section A (Date palm trees mulch in concrete area)					Section B (Date palm trees mulch and sand)				
Days	pH	EC (us cm-1)	Moisture (%	NDF %	ADF %	pH	EC (us cm-1)	Moisture (%	NDF %	ADF %
Day1	7.21	15.57	57.23	65.14	57.53	7.34	15. 7	56.37	61.6	44.50
Day2	7.33	20.24	55.38	63.51	46.32	7.53	18.6	54.17	68.51	42.03
Day3	7.37	25.31	62.60	63.61	48.06	7.25	22.1	54.61	63.93	47.97
Day5	6.72	19.99	37.73	63.42	51.62	6.60	18.8	54.21	66.10	49.56
Day7	7.16	22.57	39.70	69.62	60.22	7.03	18.7	53.30	66.78	56.29
Day10	7.53	16.88	30.00	60.00	49.40	7.34	27.3	52.19	68.27	56.38

Table 13 Major elements properties of the composite samples.

Time	Section A (Date palm trees mulch in concrete area)						Section B (Date palm trees mulch and sand)					
Days	N%	P%	K%	Na%	Ca%	Mg %	N%	P%	K%	Na%	Ca%	Mg%
Day1	1.50	0.81	1.67	0.65	2.46	0.26	2.03	o.49	1.11	o.35	2.51	0.03
Day2	1.51	0.65	1.59	0.53	2.18	0.27	1.38	o.49	1.32	0.48	2.33	0.29
Day3	2.00	0.53	1.71	0.54	2.36	0.30	1.66	o.61	1.61	0.55	2.40	0.03
Day5	1.14	0.16	1.73	0.60	2.11	0.26	1.35	0.18	1.37	o.53	2.14	0.26
Day7	1.12	0.12	1.11	0.37	1.93	0.20	o.96	0.34	0.98	o.55	1.87	0.69
Day10	1.85	0.50	1.42	0.59	2.56	0.26	0.38	0.38	1.09	0.43	2.35	0.24

Summary

Date palm trees mulch can be safely and effectively used as a bedding material for cow feedlots. Feedlot managers will need to adjust bedding rates according to facilities, environment, and cow comfort. Feedlot managers interested in using date palm trees mulch as bedding will recognize that absorbency of date palm trees mulch is lower than that of sand. However, utilizing of date palm trees mulch eliminates costs of harvesting sand. A total power consumption for horizontal grinder machine, grapple to loading the grinding machine and loader for handling maluch materal. Were 468 kW/h, specific energy were 46.8 kW/ton and 7.49 kW/m3. Total Power consumpation to preparing the barn to use mulch bedding material for m3 was 7.84 kW/m3 every day and 78.4 kW/m3 after finish experiment time 10 days. Total cost for using date palm trees mulch as a bedding every 10 dayes were 3180.0 SR. Bedding management every 120 days were 28620 SR

Total cost for traditional manure management every 120 days were 57004 SR for all operation

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