Second-generation bioenergy

Geographic and Mass Distribution of Agricultural Waste in Egypt

Questions to be asked about Agri biomass

- What?
- Where?
- When?
- Physical and chemical structure?
- Volume to support industry?
- Cost?
- Processing Technology (scale)?

What?

- Agricultural (or crop) residues encompasses all agricultural wastes such as straw, stem, stalk, leaves, husk, shell, peel, pulp, stubble, etc. which come from cereals (rice, wheat, maize or corn, sorghum, barley, millet), cotton, groundnut, legumes (tomato, bean, soy) coffee, and fruits (banana, mango) l.
- Significant quantities of biomass remain in the fields in the form of cob when maize is harvested which can be converted into energy.
- Rice husks at the processing plant which can be conveniently and easily converted into energy
- Sugar cane harvesting leads to harvest residues in the fields while processing produces fibrous bagasse, both of which are good sources of energy.

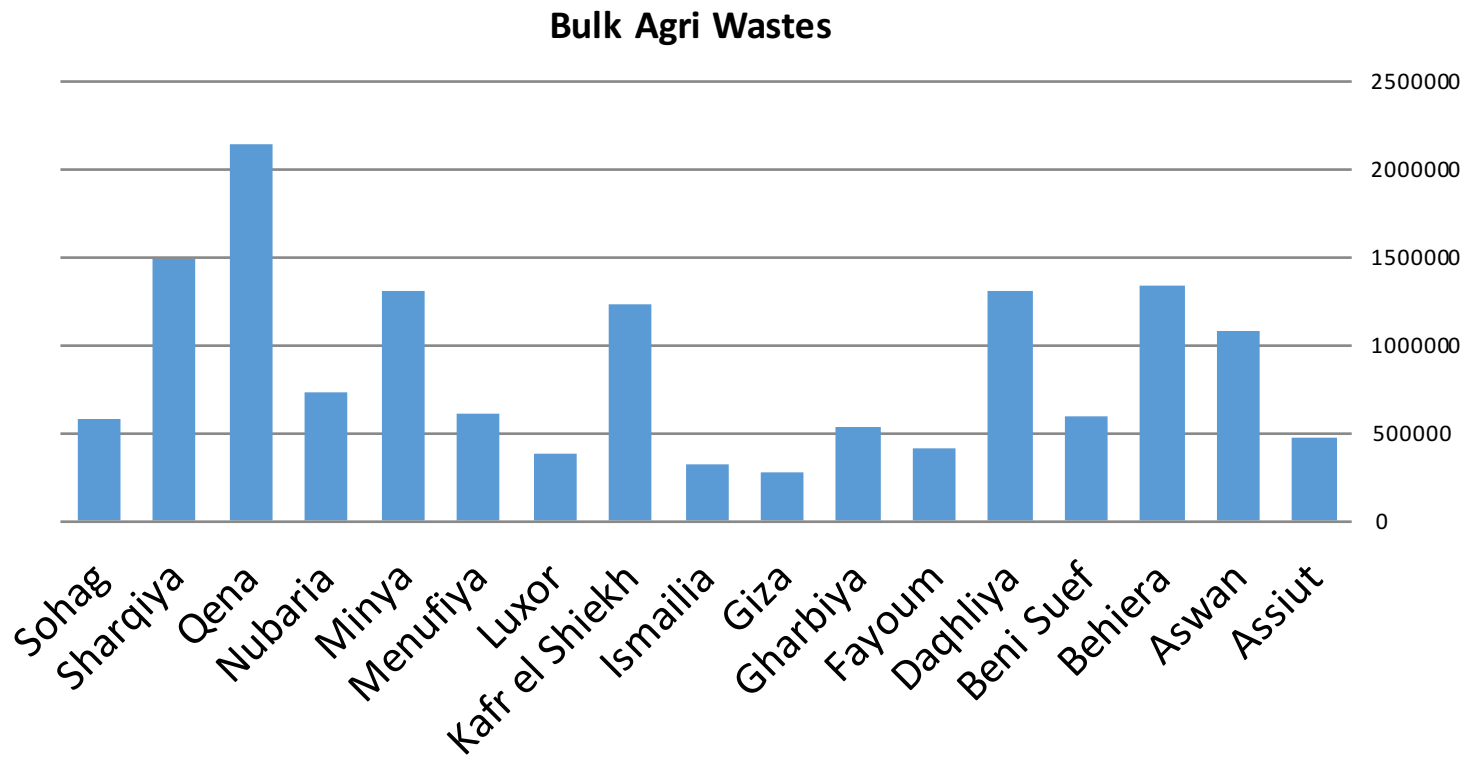
Energy Crops

- Non-food crops are grouped into grassy (herbaceous or forage) and woody (tree) energy crops.
- Grassy energy crops include switchgrass and miscanthus.
- Switchgrass requires relatively low water and nutrients, and adaptability to low-quality land.
- In Egypt?
  - New reclaimed land?
  - Upper Egypt?

Different types of generated waste in Egypt

Type of Waste	Generation (ton/year)	Percentage of total Waste Generated (%)
Municipal Solid Waste	21.0	23.5%
Construction & Demolition Waste	4.0	4.5%
Agricultural Waste	30.0	33.6%
Industrial Waste	6.0	6.7%
Medical Waste	0.28	0.3%
Sewage Sludge	3	3.4%
Waterways Cleansing Waste	25	28.0%
Total	89.28	100.0%

Where?


Bulk Agri Wastes
2500000
2000000
1500000
1000000
500000
0
Sohag
Sharqiya
Qena
Nubaria
Minya
Menufiya
Luxor
Kafr el Shiekh
Ismailia
Giza
Gharbiya
Fayoum
Daqhliya
Beni Suef
Behiera
Aswan
Assiut

Bulletin of Agricultural Statistics

2016

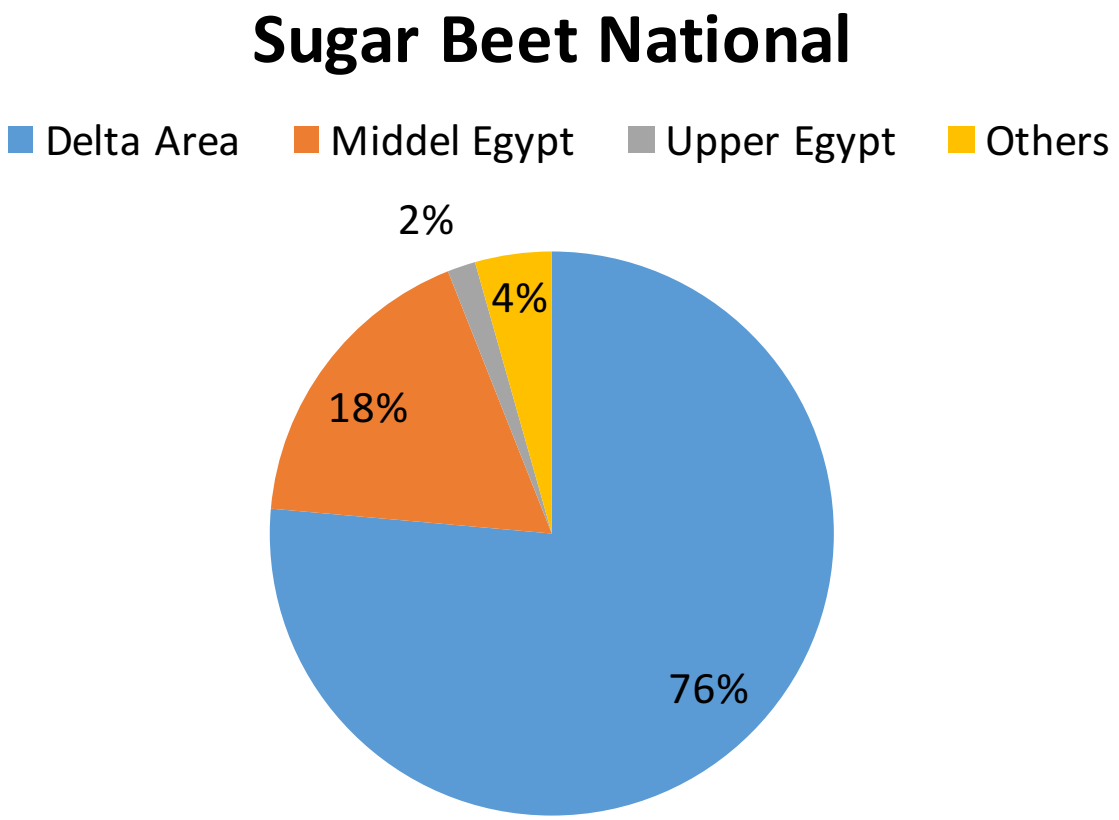
		Sugar beet	Sugar Cane	Cotton	Corn	Rice	Pepper	Eggplant
		1	2					
م	تاظفاحملا	ركسلا رجنب	ركسلا بصق					
1	ةيردنكسلإا	5528	6					
2	ةريحبلا	32038	187					
3	ةيبرغلا	10387	1439					
4	خيشلا رفك	124545	85					
5	ةيلهقدلا	72152	570					
6	طايمد	5728	30					
7	ةيقرشلا	45829	28					
8	ةيليعامسلإا	6585						
9	ديعسروب	19736						
10	سيوسلا		14					
11	ةيفونملا	800	22					
12	ةيبويلقلا	450	758					

		Sugar beet	Sugar Cane	Cotton	Corn	Rice
		1	2	3	4	5
	%90	ةيعارز ليصاحم				
ةظفاحم	زكرم	ركسلا رجنب	ركسلا بصق	نطق	ىماشةرذ	زرأ
Ismailia	Ismailia (ةيليعامسلأا)	41	8	372	23914	16
	El Tal El Keber (ريبكلا لتلا)	221	11	77	39870	12019
	Kantara West (برغ ةرطنقلا)	2835	162	1367	38253	550
	Fayed (دياف)	0	0	25	7221	0
	Kantara East (قرش ةرطنقلا)	[illegible]	0	[illegible]	[illegible]	[illegible]
	Sarabium (مويبارس)	0	0	0	0	0
	ىلامجإ	27608	181	2073	137806	12656
Fayoum	Fayoum (مويفلا)	15892	143	4142	70839	327
	Obshoay (ىاوشبأ)	1971	[illegible]	1836	20320	127
	Atsa (اسطأ)	29662	127	6662	93103	176
	Sinnuras (سرونس)	[illegible]	389	5507	39055	[illegible]
	Tamiya (ةيماط)	19139	594	6837	52153	671
	Youssef El Sediq (قيدصلا فسوي)	4163	32	2127	31734	77
	ىلامجإ	80136	1442	27111	307203	1578
Damietta	Damietta (طايمد)	45	19	37	267	[illegible]
	Vascor (روكساف)	4196	208	3078	6929	85896
	Kafr Saad (دعس رفك)	7094	219	17109	15184	57380
	Zarqa (اقرزلا)	[illegible]	30	300	2830	23358
	ىلامجإ	12105	475	20525	25210	187074
Gharbiya	Tanta (اطنط)	722	1247	2548	55798	55626
	Santa (هطنسلا)	106	297	70	47490	25718
	El Mahalla El Kobra (ىربكلا ةلحملا)	[illegible]	165	14846	34178	[illegible]

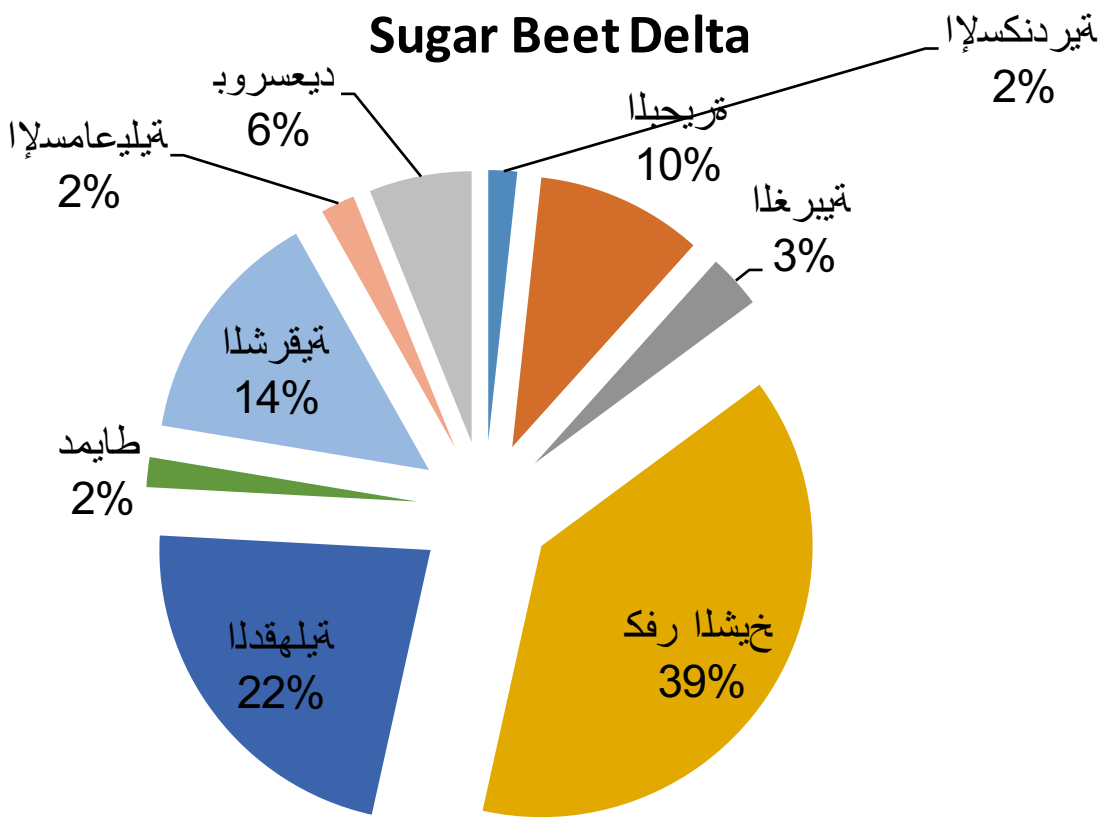
Waste -tream "Variation of timing "

Crops	Total Waste	Jan Waste	%	Feb waste	%	Mar waste
Sugar beet	1079930					323979
Sugar Cane	1131770	226354	%20	339531	%30	339531
Cotton	925117					
Corn	6341429					
Rice	3228616					
Pepper	194632	9731.6	%5	9732	%5	9731.61
Eggplant	210913	10546	%5	10546	%5	10545.7
Okra	43227	2161	%5	2161	%5	2161.35
Orange	1005674	201135	%20	201135	%20	150851

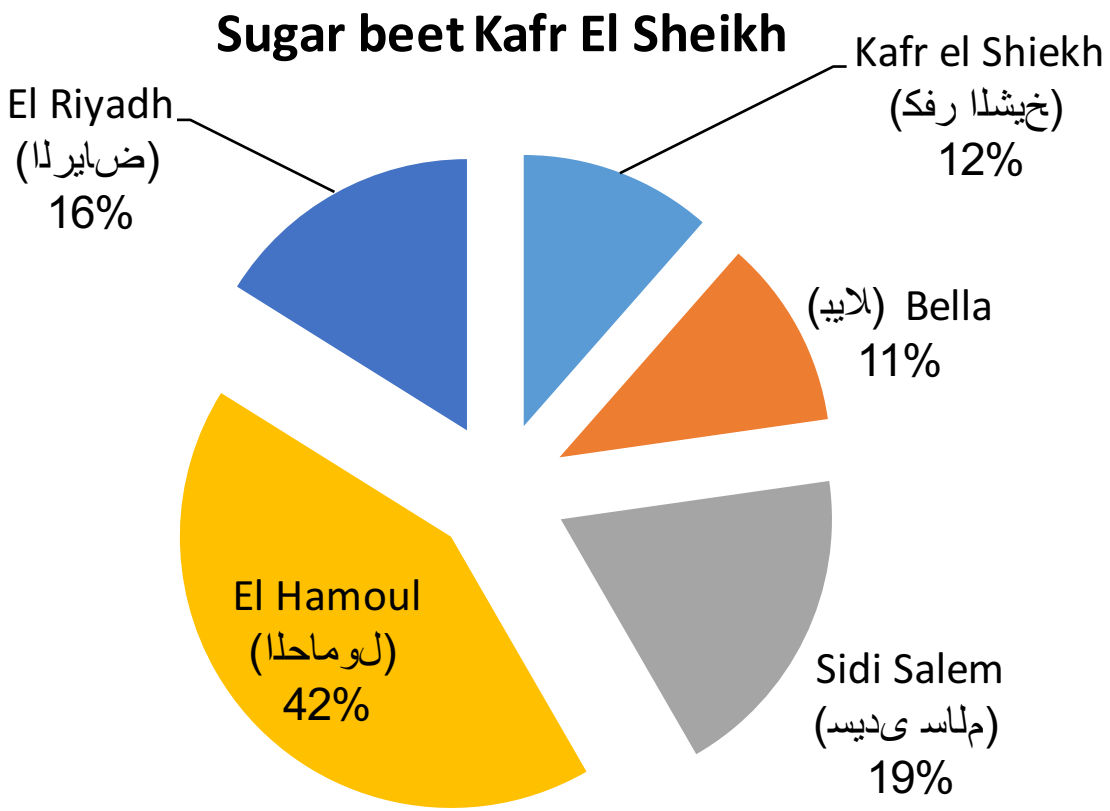
Sugar beet


Sugar Beet National
Delta Area
Middel Egypt
Upper Egypt
Others
2%
4%
18%
76%

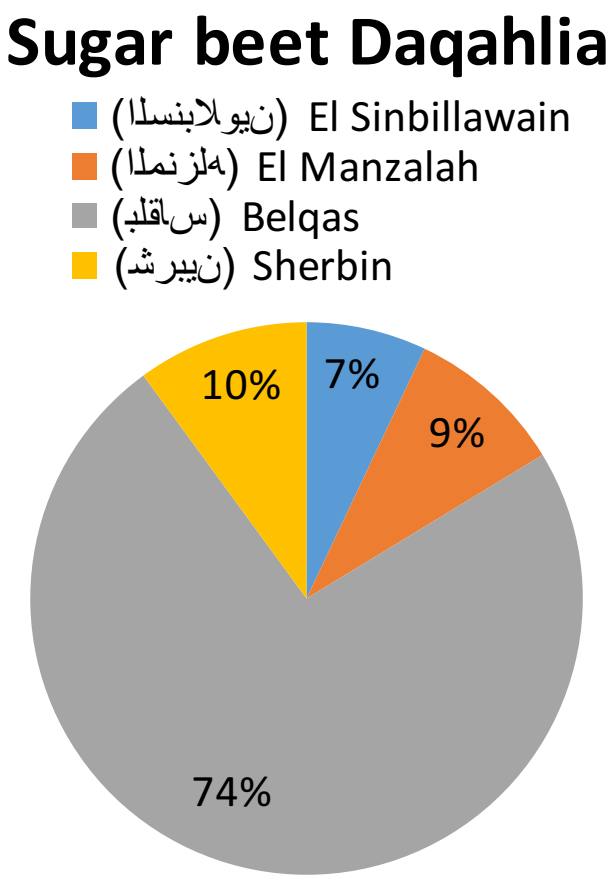
Sugar beet


Sugar Beet Delta
ةيردنكسلإا
2%
ةيحيبلا
10%
ةيبرغلا
3%
ةيقرشلا
14%
طايمد
2%
ةيلهقدلا
22%
خيشلا رفك
39%
ديعسروب
6%
ةيليعامسلإا
2%

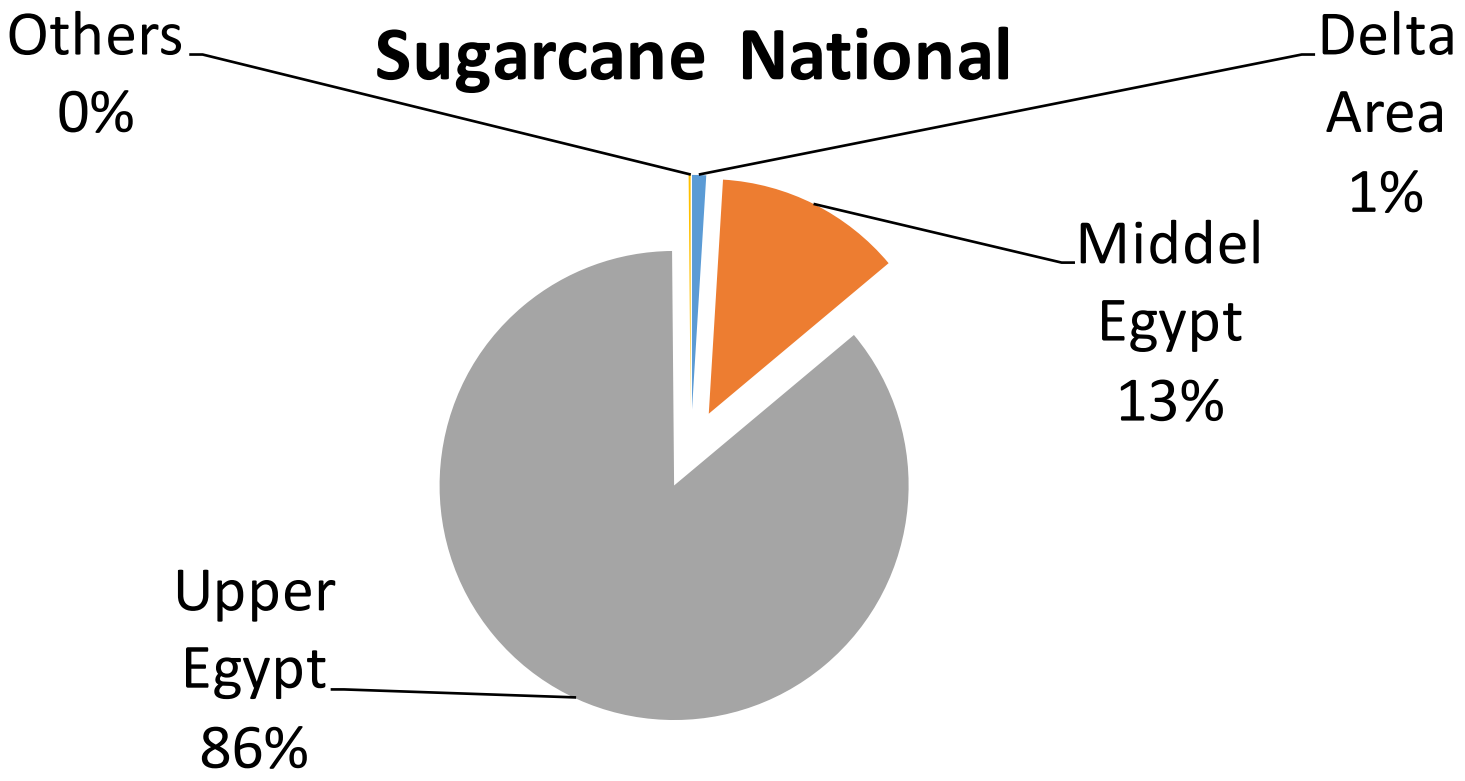
Sugar **beet**


Sugar beet Kafr El Sheikh
El Riyadh
(الرياض)
16%
Kafr el Shiekh
(كفر الشيخ)
12%
Bella (بلاية)
11%
El Hamoul
(الحامول)
42%
Sidi Salem
(سيدى سالم)
19%

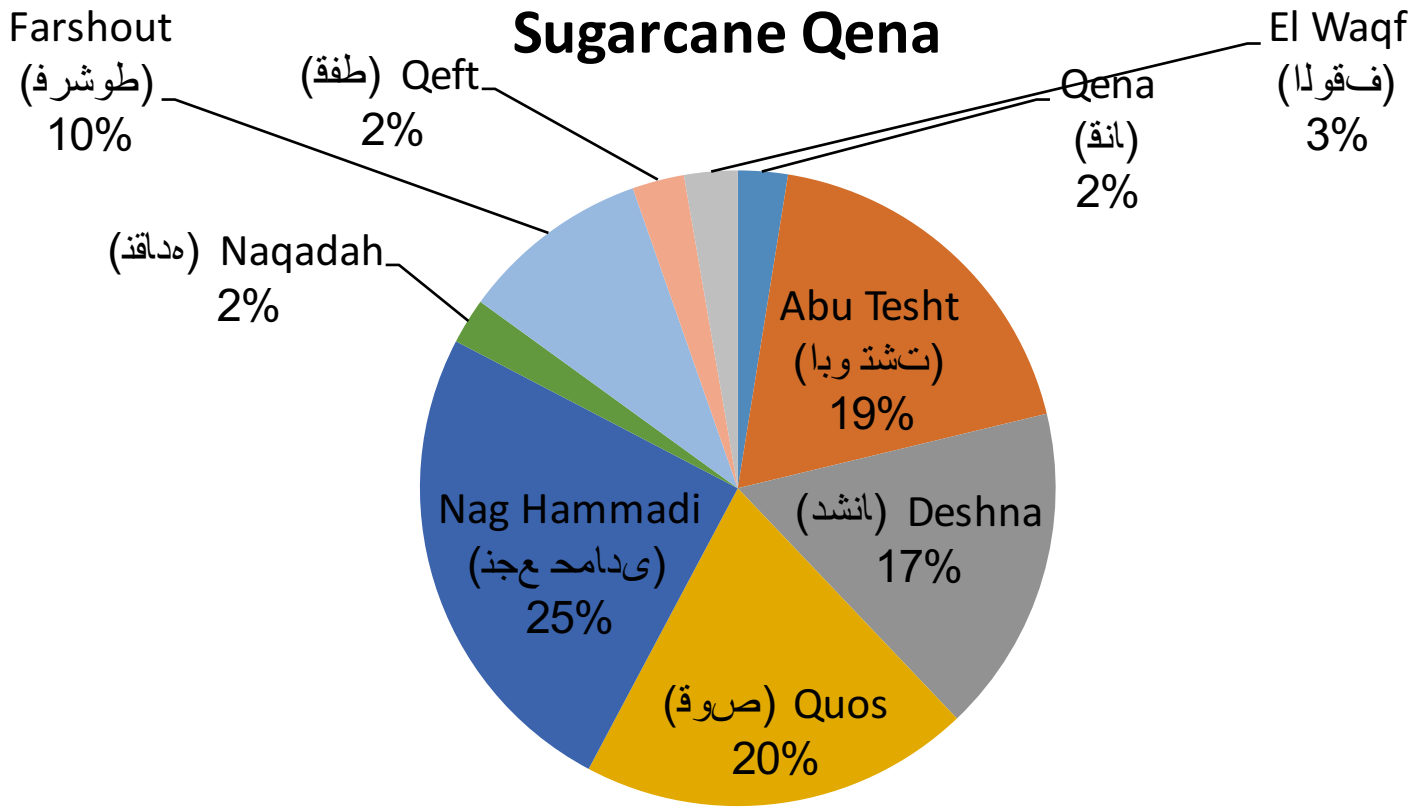
Sugar beet


Sugar beet Daqahlia
(السنبلاوين) El Sinbillawain
(المنزلة) El Manzalah
(بلقاس) Belqas
(شربين) Sherbin
7%
9%
74%
10%

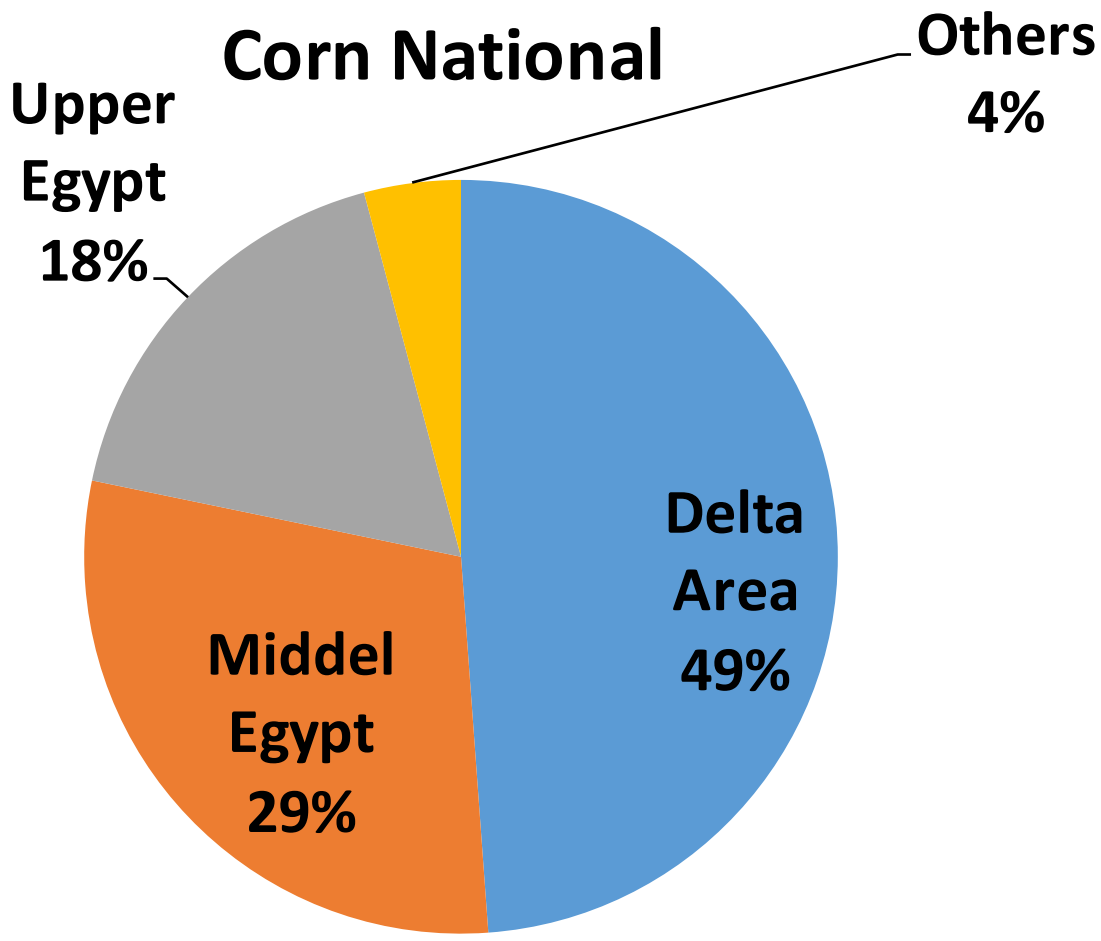
Sugarcane


Sugarcane National
Others
0%
Delta
Area
1%
Middel
Egypt
13%
Upper
Egypt
86%

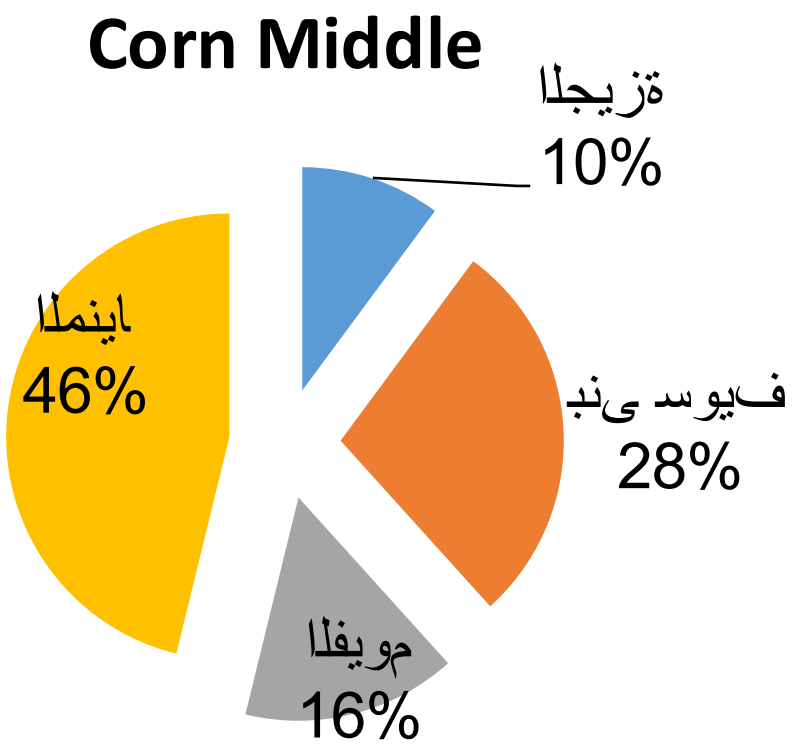
Sugarcane


Sugarcane Qena
Farshout
(طوشرف)
10%
(طفة) Qeft
2%
Qena
(انق)
2%
El Waqf
(فـقولا)
3%
(ەداقن) Naqadah
2%
Abu Tesht
(تشتوبا)
19%
Nag Hammadi
(ىدامحعجن)
25%
(انشد) Deshna
17%
(قوص) Quos
20%

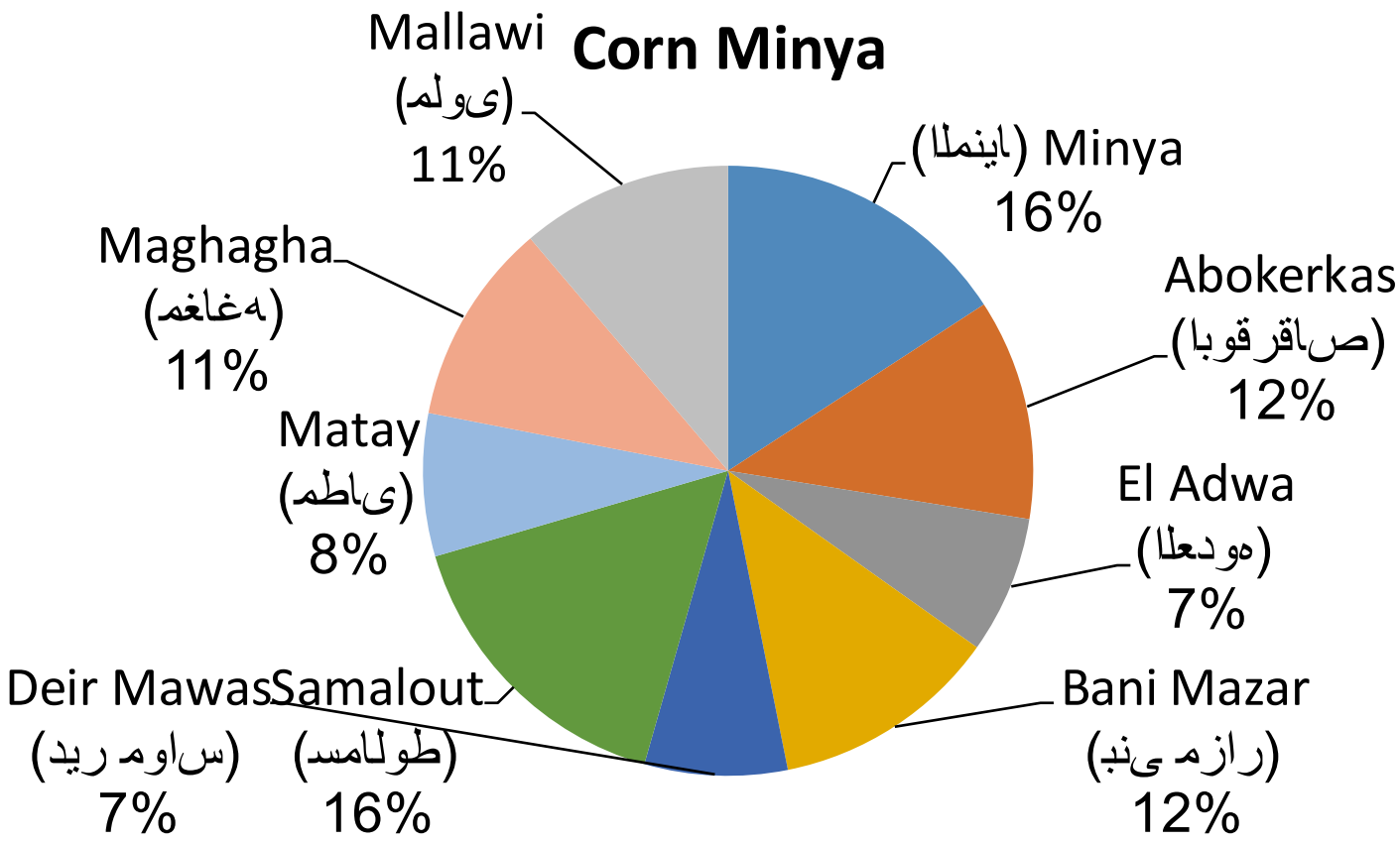
Corn


Corn National
Others
4%
Upper
Egypt
18%
Delta
Area
49%
Middel
Egypt
29%

Corn

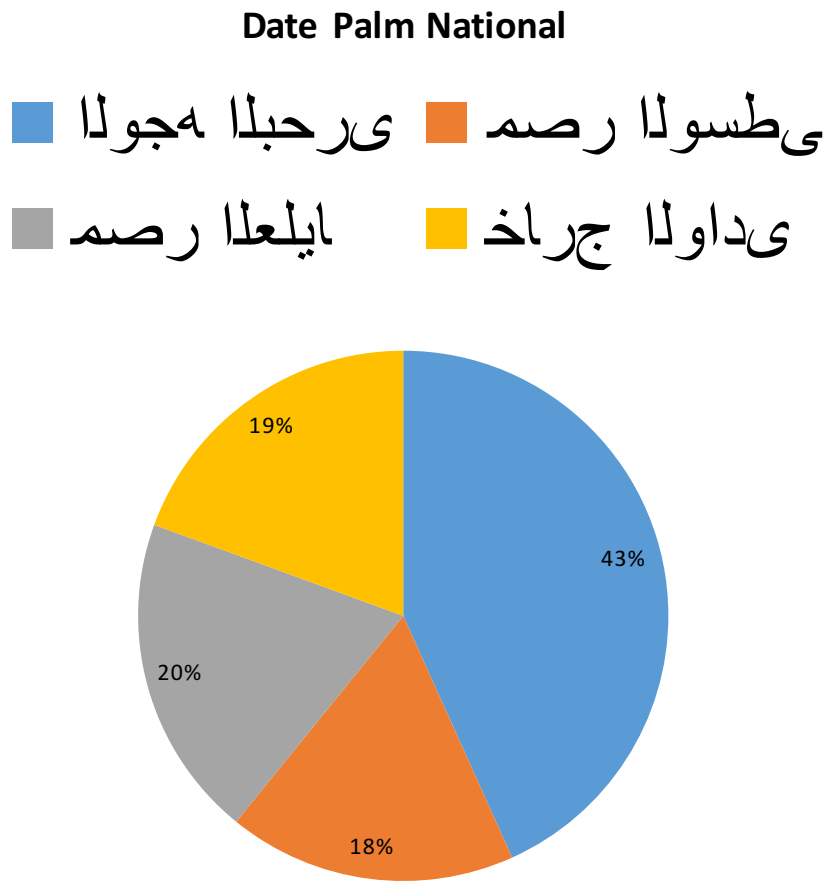


Corn

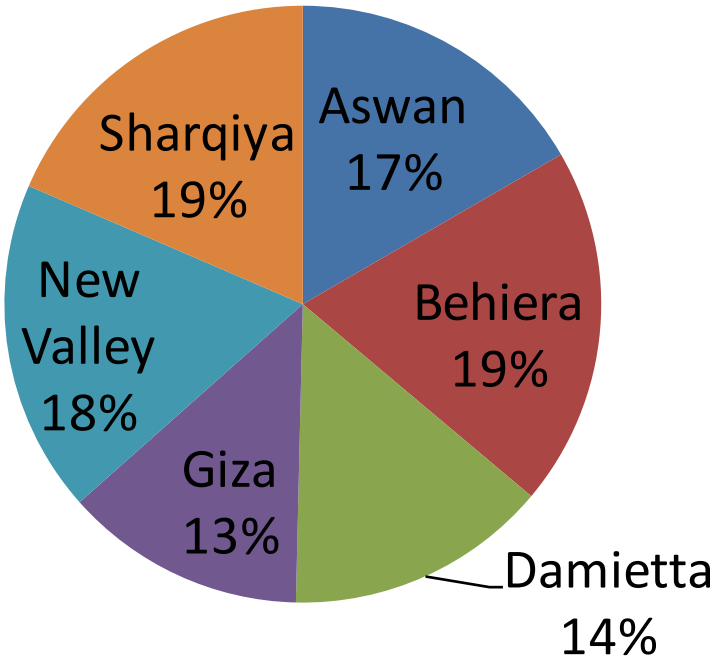

Corn Minya
Mallawi
(ملوى)
11%
(اينملا) Minya
16%
Maghagha
(مغاغه)
11%
Abokerkas
(ابوقرقاص)
12%
Matay
(مطاى)
8%
El Adwa
(هودعلا)
7%
Deir Mawas
(ديرموا س)
7%
Samalout
(طوللامس)
16%
Bani Mazar
(ىنب رازم)
12%

Date Palm

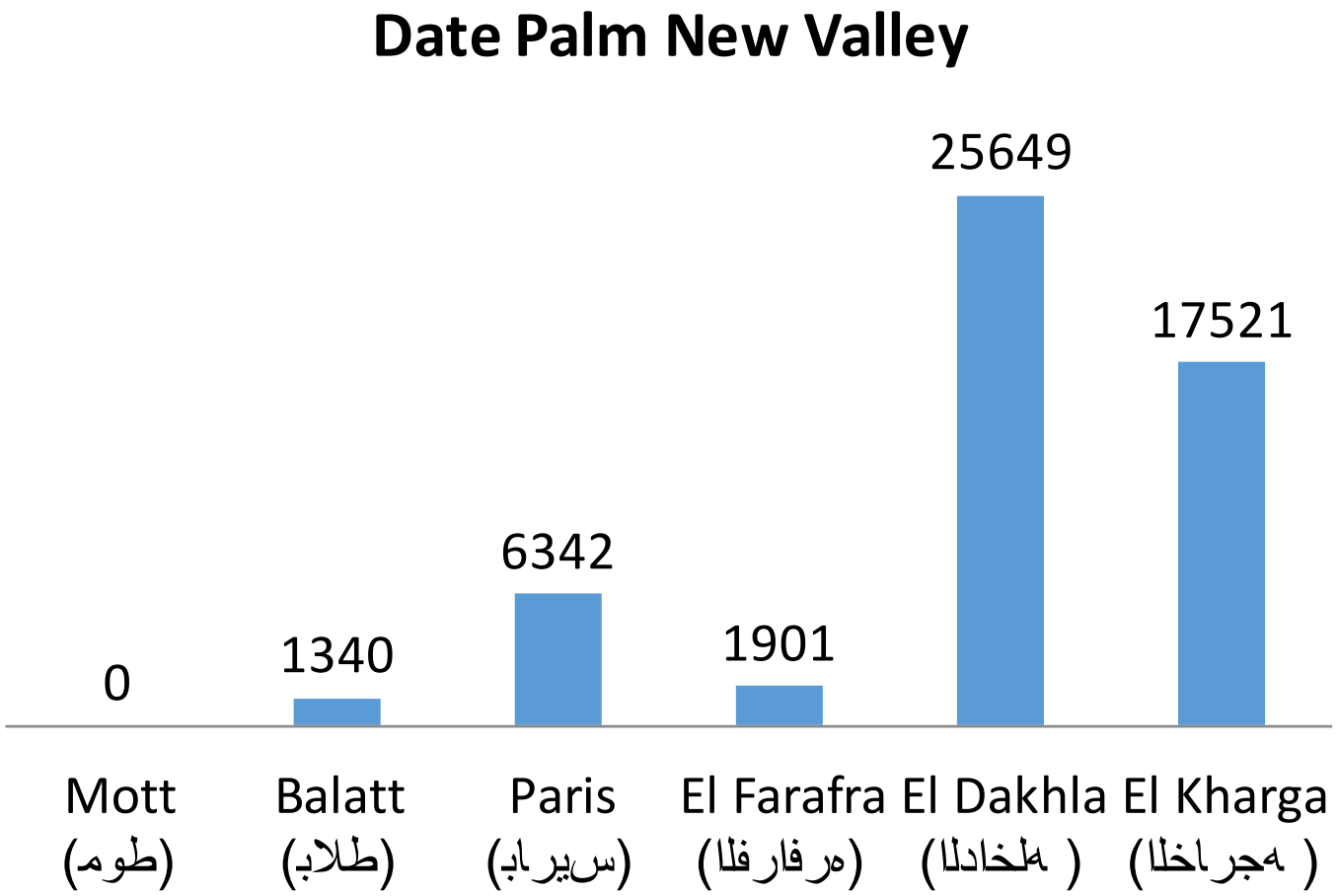
- Date palm trees produce huge amount of agricultural wastes in the form of dry leaves, stems, pits, seeds etc.
- A typical date tree can generate as much as 20 kilograms of dry leaves per annum while date pits account for almost 10 percent of date fruits



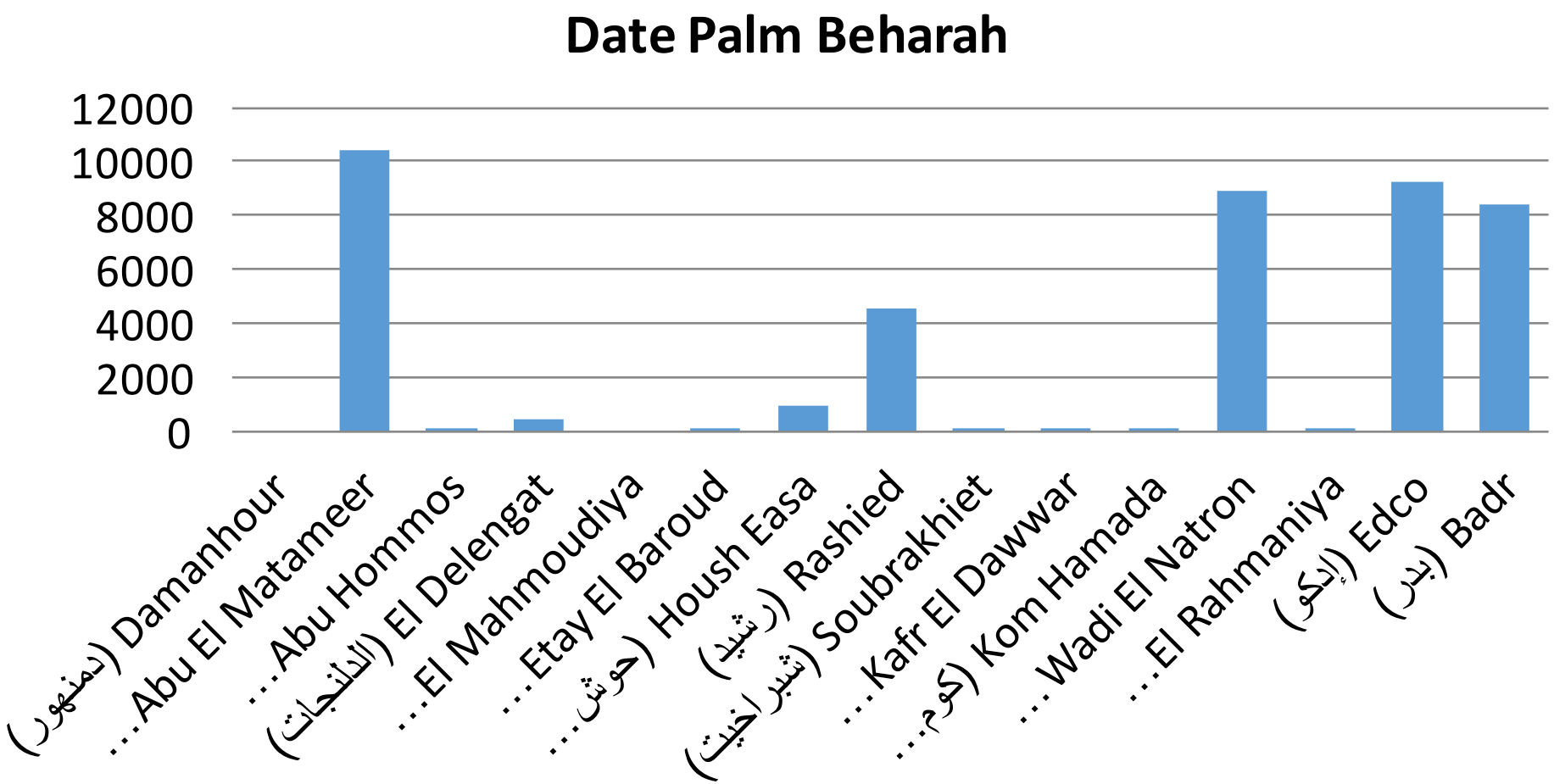
Date Palm


Date Palm Clusters
Aswan 17%
Behiera 19%
Damietta 14%
Giza 13%
New Valley 18%
Sharqiya 19%

Date Palm


Date Palm New Valley
25649
17521
6342
1901
1340
0
Mott
(طوم)
Balatt
(طلاب)
Paris
(سيراب)
El Farafra
(هرفارفلا)
El Dakhla
(هلخادلا)
El Kharga
(هجراخلا)

Date Palm


Date Palm Beharah
12000
10000
8000
6000
4000
2000
0
(دمنهور) Damanhour
...Abu El Matameer
...Abu Hommos
(اللالنجات) El Delengat
...El Mahmoudiya
...Etay El Baroud
...(حوش) Housh Easa
(رشيد) Rashied
(شبرا خيت) Soubrakhiet
...Kafr El Dawwar
...(كوم) Kom Hamada
...Wadi El Natron
...El Rahmaniya
(إدكو) Edco
(بدر) Badr

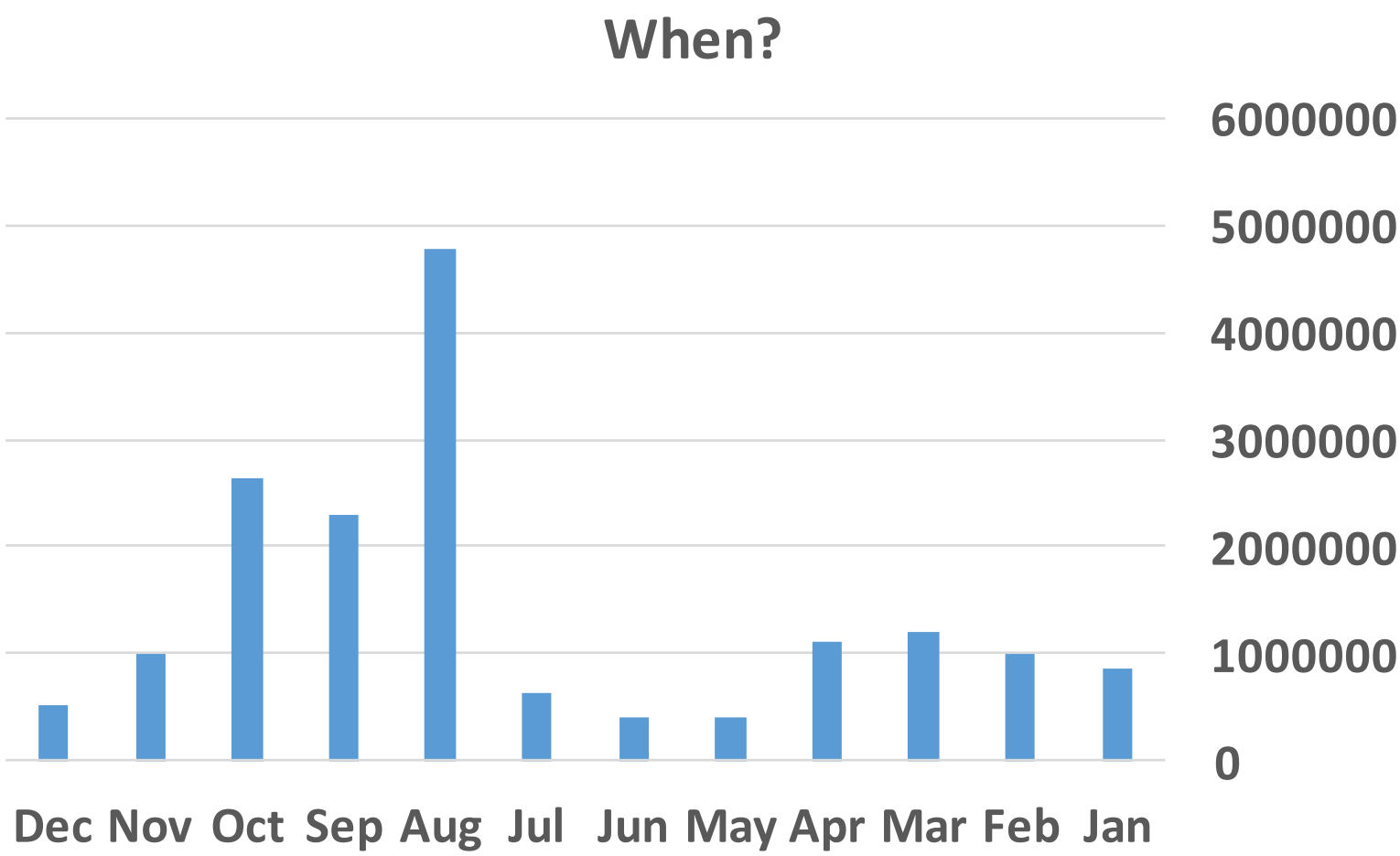
Physical and chemical structure?

Product/units	Calorific value (Mmbtu/ton)	Ash Content (%)	Moisture (%)
Tree Trimmings	15.6	3.8	< 16
Cotton Stalks	15.2	3.1	< 16
Corn Stalks	13.6	7.5	< 16
Rice Straw	12.8	15.9	< 16
Sugar Cane	14.8	9	< 16

Volume

Sector/Type of waste	Sugar Cane residues (ton /year)	Cotton stalk(ton /year)	Corn stover (ton /year)	Rice(1) straw(ton /year)	Tree Pruning Wastes(ton /year)	Total Agricultural waste(ton /year)
Total Northern	32,000	638,000	1,485,000	2,179,000	1,208,364	5,542,364
Total Central	49,000	180,000	1,667,000	1,543,000	814,525	4,253,525
Total Eastern	3,000	143,000	995,000	1,144,000	866,098	3,051,098
Northern Upper	596,000	178,000	1,513,000	2738	105,954	2.395.692
Southern Upper	3,483,029	49,000	987,000	15.454	238,603	5.732.660
Total Waste Generated	4,163,029	1,188,000	6,647,000	4.890.986	3,233,544	20,032,559

When?


When?
6000000
5000000
4000000
3000000
2000000
1000000
0
Dec
Nov
Oct
Sep
Aug
Jul
Jun
May
Apr
Mar
Feb
Jan