

Adaptability, Yield & Potential Pests of Giant King Grass in California Desert

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- **✓What is Giant King Grass?**
- **✓** GKG trials at DREC
- **✓ Preliminary Results**
- **✓** Summary

University of California
Agriculture and Natural Resources

25th Annual Fall Desert Crops Workshop

Giant King Grass



- Prolific, perennial grass owned by VIASPACE
- Proprietary cross breed of two particular cultivars of *Pennisetum* species
- Natural hybrid-not genetically modified
- Sterile and non-invasive
- Vegetatively propagated like sugarcane
- Needs warm weather—no freezing, sufficient rainfall or irrigation-4"/mo
- Growing in California, Hawaii, St.
 Croix and eight countries



Giant King Grass



- Highest biomass yielding crop - makes it ideal for animal feed & bioenergy
- More tons per acre means low cost
- Perennial for 7-10 years
 - Promotes subsoil environment
- Dense canopy prevents soil erosion
- Grows on marginal land
 - no food crop displacement
- Requires only modest fertilizer amount
- No pesticide required



Where is Giant King Grass Biomass Applicable?



- Where electricity is needed
- Where current electricity is generated from oil or liquefied natural gas—usually outside continental US where coal & natural gas is plentiful
 - Giant King Grass electricity is reliable like oil, but substantially less expensive
 - Biomass energy is zero carbon dioxide
 - Not intermittent like solar or wind
- Where domestically grown animal feed is important
- Where there is sufficient land and rainfall or irrigation to grow Giant King Grass
 - No freezing

Giant King Grass for Electricity Direct Combustion





Giant King Grass for Electricity, Biogas from Anaerobic Digestion









Harvest every 60-90 days at 7-10 ft m tall and cut into small pieces for anaerobic digestion to produce biogas which fuels an engine generator to produce electricity. Drying is not necessary. Same Giant King Grass is excellent animal feed.

Biogas power plants are 1-4 megawatts with 250 – 1000 acres of Giant King Grass

GKG is Good Feed for Dairy Cows, VIASPACE Cattle, Camels, Goats, Sheep & Horses







Cut at 6-8 ft tall at 45-60 days

Cut & carry, or potentially Intensive grazing

Fresh, silage, hay, Meal or pellets



Part of diet for pigs, rabbits & fish







Objectives;

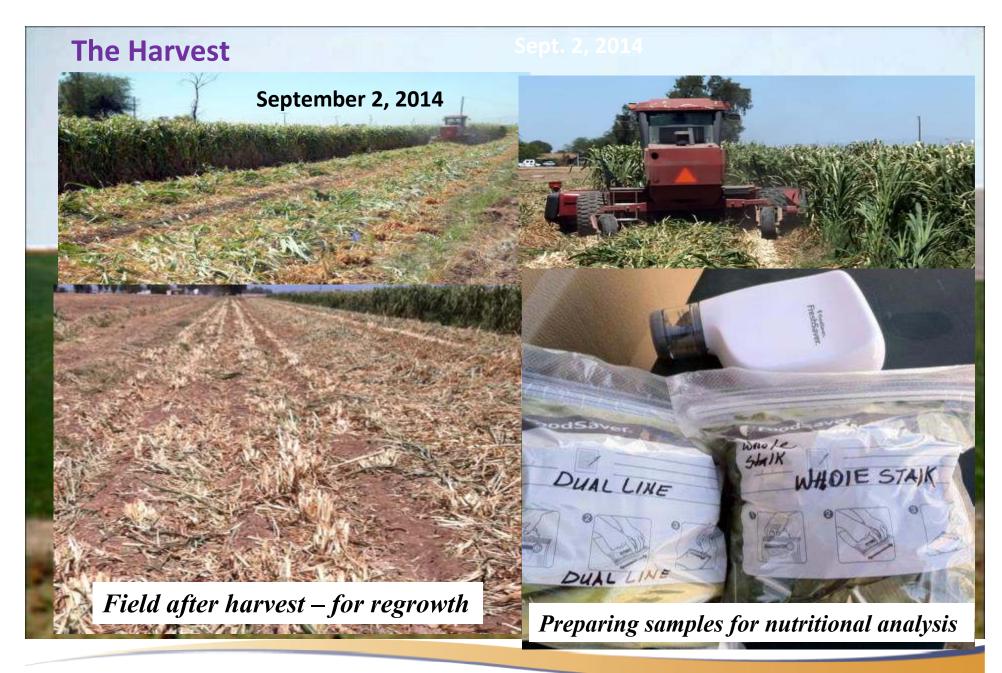
- Evaluate adaptability & growth of GKG in a very hot dry climate of the low desert
- Compare crop growth & yield using subsurface drip irrigation vs furrow irrigation
- Compare crop growth & yield under 2 cropping systems
 - ✓ Dual line (DL) planting of individual nodes vs whole stalk (WS)









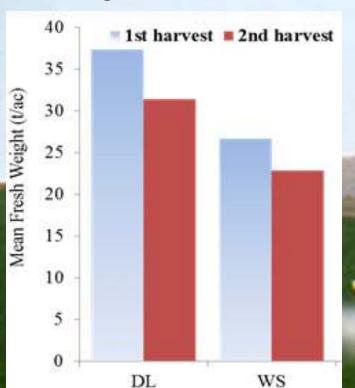


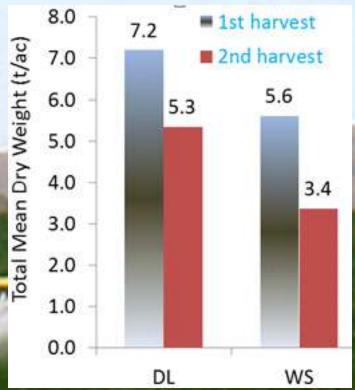
Regrowth After Sept 2 Harvest





Giant King Grass Harvested at DREC--Fresh Weight and Dry Weight

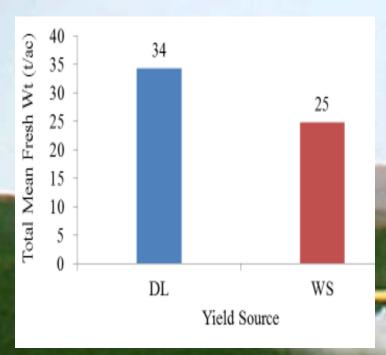


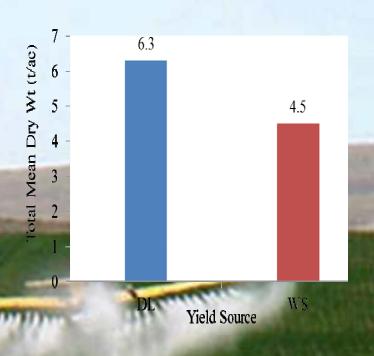


DL—Dual Line--Planted as individual plants with 24 inch plant spacing in two parallel rows spaced 12 inches apart in a diamond pattern on 40 inch furrow irrigated beds

WS—Whole Stalk— whole Giant King Grass stalks approximately 8 feet long planted end to end in single row







Yield comparisons to other crops

GKG/cutting	DL	WS	Bermuda hay	Sudan grass hay	alfalfa
Yield t/ac	34 (6.3)	25 (4.5)			
Projected yield (5 cuttings/yr)*	170 (32)	125 (23)	6.6	5.8	7.8
	Data for con	nnarican fram	****** / 2012	Imperial Coun	ty data

*Projected yield need to be confirmed with more research

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HEALTHY FOOD SYSTEMS - HEALTHY ENVIRONMENTS | HEALTHY COMMUNITIES - HEALTHY CALIFORNIANS





Giant King Grass Nutrition Dairy One



Oct. 30, 2014 Harvest – Whole stalk

oct. 50, 2014 Harvest – Whole Stark						
Sample Description H	Farm Code	Sample				
FR GRASS FORAGE		21028590				
IN GIVISS FORMSE	1200	21020330				
GIANT KING GRASS HOLTY	VILLE MHOI	LE STALK				
Analysis Res	sults					
Components	As Fed	DM				
% Moisture	84.1					
% Dry Matter	15.9					
% Crude Protein	2.3	14.7				
% Available Protein	2.2	14.0				
% ADICP	. 1	. 7				
% Adjusted Crude Protein	2.3	14.7				
Soluble Protein % CP		46				
Degradable Protein%CP		76				
_	6	3.6				
% NDICP	. 6					
% Acid Detergent Fiber	6.5	40.6				
% Neutral Detergent Fiber		63.0				
% Lignin	. 5	3.4				
% NFC	1.4	8.5				
% Starch	<0.1	. 5				
% WSC (Water Sol. Carbs.)	•	10.6				
% ESC (Simple Sugars)	1.4	8.5				
% Crude Fat	1 .3	2.2				
% Ash	1.85	11.59				
% TDN	10	62				
NEL, Mcal/Lb	.09	.54				
NEM, Mcal/Lb	.09	. 58				
NEG, Mcal/Lb	.05	.32				
Relative Feed Value		85				
% Calcium	. 05	.29				
% Phosphorus	.05	.33				
_	.03	.24				
% Magnesium						
% Potassium	.50	3.12				
% Sulfur	.03	.19				
% Chloride Ion	.18	1.16				
IVTD 30hr, % of DM		80				
NDFD 30hr, % of NDF		69				
kd, %/hr		5.17				
	4	2.4				
% Total Nitrogen	. 4	2.4				
% Lysine	.08	.51				
% Methionine	.03	.19				
Horse DE, Mcal/Lb	.13	.82				

Oct. 30, 2014 Harvest – dual line

Sample Description						
GIANT KING GRASS HOLTVILLE ROW 3						
Analysis Results						
Components	As Fed	DM				
% Moisture	82.8	 I				
% Dry Matter	17.2					
% Crude Protein	3.0	i (17.3)				
% Available Protein	2.8	16.4				
% ADICP	1 .2	. 9				
% Adjusted Crude Protein	1 3.0	17.3				
Soluble Protein % CP	I	45				
Degradable Protein%CP	I	75				
% NDICP	i .6	3.7				
% Acid Detergent Fiber	6.6	38.5				
% Neutral Detergent Fiber	10.5	60.9				
% Lignin	. 6	3.6				
1% NFC	•	7.2				
% Starch	i <0.1	.2				
% WSC (Water Sol. Carbs.)	1.8	10.5				
% ESC (Simple Sugars)	i 1.5	. 8.7				
1% Crude Fat	i . 4	2.1				
I% Ash	i 2.15	12.53				
% TDN		61				
NEL, Mcal/Lb	.09					
NEM, Mcal/Lb	i .10	.56				
NEG, Mcal/Lb	i .05	.31				
Relative Feed Value	i	90				
1% Calcium	i .04	.25				
% Phosphorus	.06	.34				
% Magnesium	i .03	i .19				
% Potassium	•	3.37				
% Sulfur	.04	.22				
% Chloride Ion	.20	1.18				
 IVTD 30hr, % of DM		l 82				
NDFD 30hr, % of NDF	I	i 70				
kd, %/hr	i	5.55				
% Total Nitrogen	.5	2.8				
 % Lysine	.10	l l .60				
% Methionine	.04	.22				

Giant King Grass Nutrition

> Excellent nutrition

- ✓ Ideal for ruminants-cattle, sheep, goats & camels, also for horses, pigs, rabbits & some fish
- ✓ Nutrition better/comparable to other hay
 - ✓ High yield means low cost
 - ✓ Reduces need for expensive feed crops & concentrates / serves as alternative forage crop
 - ✓ Can be used as fresh chop, silage, hay, meal or pellets

	Giant King Grass 58 days 10/30/14 harvest	Individual plants	Whole stalks	Oat hay	Sorghum	Sudan grass
	Crude protein %	17.3	14.7	8.3	9.2	12.9
	ADF %	38.5	40.6	37.6	34.6	37.7
	NDF%	60.9	63.0	59.2	56	62.1
١	TDN digestible energy	61	62	59	61	58
	NEL mcal/lb	0.55	0.54	0.54	0.57	0.51
	Relative feed value	90	85	95	106	90
	NDFD 30hr % of NDF	70	69	46	57	60

All nutrition data from Dairy One. Ithaca New York / 2013 Imperial County data

Giant King Grass Pests

- > No Known pest observed in the low desert
 - ✓ Being new, may not yet have specialized pests
- However some pests of GKG were identified in Nicaragua
 - ✓ Growing adjacent to Rice plantation Rice pests found on GKG
 - Armyworm (Spodoptera flugiperda_ causes minor leaf damage, but no economic consequence





GKG Pests identified in Nicaragua ... / cont...

- ✓ Sogata (Sogatodes orizicola)
 - transmits white leaf virus in rice damage is of high economic importance in rice
 - No literature information, but not observed to be a threat to GKG





Summary

- o GKG is very high yielding perennial crop
 - ✓ Can be harvested every 60 days for animal feed
 - ✓ Longer growing season (90–180 days) for anaerobic digestion of biogas or direct combustion power plant
- Initial results--Dual line planting yields more biomass & crude protein than whole stalk planting
- So far there is no threat from pests, hence no pesticide application required
- Further investigation of productivity, # of cuttings & pest identification is necessary
- Good adaptability & yield for the Low Desert of CA





Thank you & Luestions Wescome -mail: <u>obachie@ucanr.edu</u>

