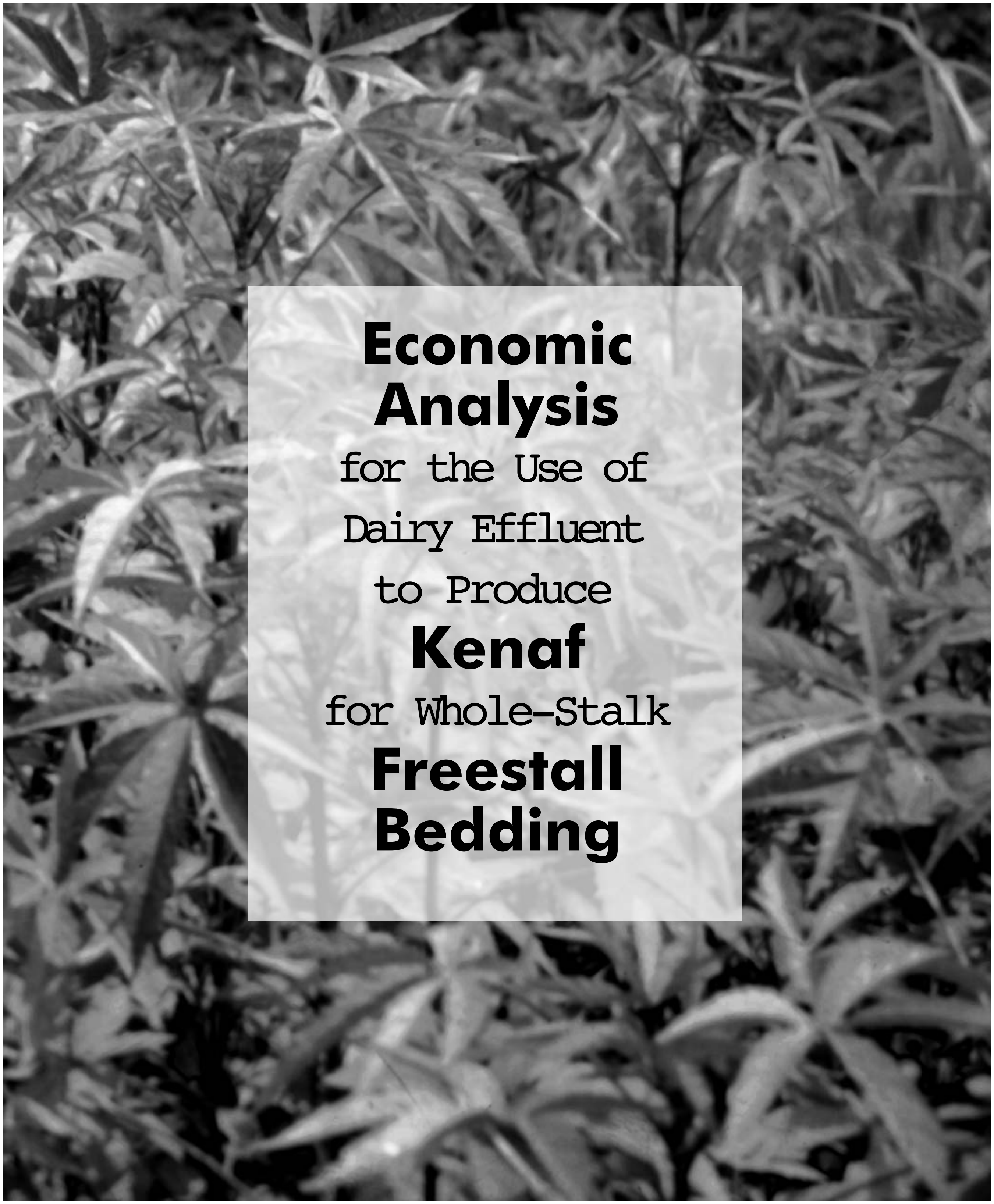
Bulletin 1097 November 2000



Economic Analysis for the Use of Dairy Effluent to Produce Kenaf for Whole-Stalk Freestall Bedding

Experiment Station
Vance H. Watson, Director

Mississippi Agricultural & Forestry Experiment Station
Malcolm A. Portera, President • Mississippi State University • J. Charles Lee, Vice President

Economic Analysis for the Use of Dairy Effluent to Produce Kenaf for Whole-Stalk Freestall Bedding

Michael Rochelle
Graduate Student
MSU Agricultural Economics

Jeanne Reeves
Postdoctoral Fellow
MSU Agricultural Economics

Marty Fuller
Associate Director
Mississippi Agricultural and Forestry Experiment Station

Warren Couvillion
Economist
MSU Agricultural Economics

For more information, contact Dr. Couvillion by telephone at (662) 325-2886 or by e-mail at couvillion@agecon.msstate.edu. Bulletin 1097 was published by the Office of Agricultural Communications, a unit of the MSU Division of Agriculture, Forestry, and Veterinary Medicine. It was edited by Robert A. Hearn, publications editor, and designed by Cottage Graphics Company. November, 2000

Contents

Economic Analysis for the Use of Dairy Effluent to Produce Kenaf for Whole-Stalk Freestall Bedding

INTRODUCTION

Background

In 1977, an amendment to the Federal Water Pollution Control Act of 1972 established the Clean Water Act. Both of these acts were concerned with restoring and maintaining the nation's waters. These acts charged the Environmental Protection Agency (EPA) with establishing a system in which any public or private entities that intended to discharge pollutants into surface waterways must obtain and comply with individual discharge permits. This system of permits was to be gradually tightened based on changing and emerging technologies. These changes coupled with prosecution of violators were intended to gradually cut down on pollution in order to restore waterways. The objectives were originally to reduce pollution so that all waterways would be feasible and swimmable by 1983 and to eliminate discharge of pollutants by 1985 *(1)*.

Due to unmet goals, the Clean Water Act was amended by the Water Quality Act of 1987. These amendments were designed to turn the legislative focus to control and monitoring of toxic contaminants in water *(2)*. The act categorizes pollutants in one of two ways: point source or nonpoint source. A point source of pollution is an easily identified source, and a nonpoint source is a source that is not easily identified *(3)*. In this legislation, pollution is defined as " . . . sand, cellar dirt, and industrial, municipal, and agricultural wastes . . . " *(2)*. Agricultural facilities have generally been categorized as nonpoint sources of pollution. However, under the Clean Water Act, confined animal feeding operations (CAFOs) were designated to be point sources of pollution. It is not clear if all dairies are defined as CAFOs. National Pollution Discharge Elimination System (NPDES) permit guidelines were developed in 1987 to outline the sizes and types of CAFOs that were required to obtain an NPDES permit *(4)*.

Title 40, Chapter I, Subchapter D, Parts 122 and 123, of the Code of Federal Regulations contain the basic regulations regarding the discharge of pollutants into the waters of the United States. Under these regulations, Mississippi dairy producers are subject to a "no discharge" wastewater criteria *(2)*. Mississippi is one of the states delegated with the power to enact and enforce its own regulations. EPA enforces regulations on the federal level, while the Mississippi Department of Environmental Quality enforces regulations on a state level.

Mississippi regulations eliminate the practice of allowing wastewater to run off the production facility. These regulations do not allow the use of emerging technology to set up wastewater management practices. A general permit must be obtained for any grade A dairy to outline waste management practices. For a dairy other than grade A, the owner must obtain an individual permit that outlines waste management practices specific to that dairy. These permits give legal right to operate an animal waste treatment facility, but they do not permit discharging animal wastes into state waters or onto any area likely to pollute state waters *(3)*. Section 303 of the Water Quality Act also requires the state to develop water quality based on effluent limitations. This mandate requires that the state set total maximum daily loads to ensure attainment of water quality standards. These loads include effluent limitations *(5)*.

The idea that these regulations constitute a permit to pollute serves as the impetus behind continuing efforts to strengthen pollution discharge laws. One example of efforts to strengthen the Clean Water Act is the Federal Clean Water Enforcement Act of 1997, which forces violators to pay for their violations, strengthens citizen rights to hold polluters accountable, and expands the rights of the public to know about pollution violations. Another example is the Federal Facilities Clean Water Compliance Act of 1997, which subjects federal polluters to the same enforcement standards as other facilities *(6)*. These are just two examples of the continuing legislation to strengthen the Clean Water Act.

Mississippi dairymen face regulations that are constantly susceptible to change. This fact forces dairymen to constantly reevaluate their waste management practices seeking new innovative ways of dealing with the waste.

Introduction to Kenaf

Kenaf *(Hibiscus Cannabinus)*, a dicotyledonous annual fiber crop, is a member of the Malvaceae plant family and most resembles cotton and okra. Kenaf is made up of two distinctive types of fibers, the bast and the core. The bast fiber is found in the bark and comprises between 30% and 40% of the plant. The core fiber is much shorter than the bast fiber but makes up the other 60% to 70% of the plant *(7)*. This makeup presents many different opportunities for core fiber products.

Research of the different types of fibers has shown that separation of the bast and core fibers offers the best method to exploit potential markets. A separation plant, KenGro Corporation, is in full operation in Charleston, Mississippi. Also at this site is additional processing equipment that allows for sizing, screening, heat treating, and bagging of the kenaf core.

Research at Mississippi State University (MSU) has identified many potential markets for kenaf. The potential uses for the bast fiber focus on the paper pulp and textile markets. Paper pulp is made of either whole-stalk kenaf or the bast fiber. These studies have shown promising results. Textile products, both woven and nonwoven, offer another alternative market for the bast fiber. The bast fiber, after being separated from the core, is blended with other textile materials, such as cotton, to produce a strong, usable product.

Core fiber research has revealed many potential uses as well. Some of the products that have resulted from this research are broiler litter, animal bedding, oil absorbents, a bioremediation enhancer, and board raw material. All of these products have been tested with good result *(8)*.

The overall objective of this study was to provide an economic analysis of the production of kenaf in a dairy setting using dairy effluent spread with a traveling gun. There were three specific objectives:

1. Use the Mississippi State Budget Generator (MSBG) to produce a budget of kenaf production using dairy effluent.

2. Evaluate the possibility for production of kenaf at a dairy for sale at the market price.

3. Determine the opportunities and problems associated with producing kenaf for use as a freestall bedding material for dairies.

Description of Facilities and Equipment

MSU Beardon Dairy Research Center

This section presents a physical description of the MSU Beardon Dairy Research Center (DRC), which served as the site for this study. Located in the Sessums community of Oktibbeha County in Northeast Mississippi, the DRC milks between 130 and 170 cows consistently. It is a freestall-equipped facility set up to allow for many different waste-handling techniques for research purposes.

The milking center is made up of twin herringbone double-four-cow-stationed parlors (B in Figure 1). A freestanding reservoir tank (A in Figure 1) is installed at the parlors to flush the holding pens and walkways. The DRC also used a flush system for freestall alleys and holding pens (D in Figure 1). The flush system was used after the manual removal of any foreign matter in the beds.

Sand was used as the bedding material in the freestall area. The use of sand is a common practice for freestall-equipped dairies in Mississippi. However, using sand as bedding is seen as one of the major problems of the freestall system *(2)*. At some point, sand buildup must be dredged from the lagoons. A partial dredge can cost $5,000, and a full dredge can cost as much as $20,000. DRC officials estimated the annual cost of sand at $3,375 per year. This amount

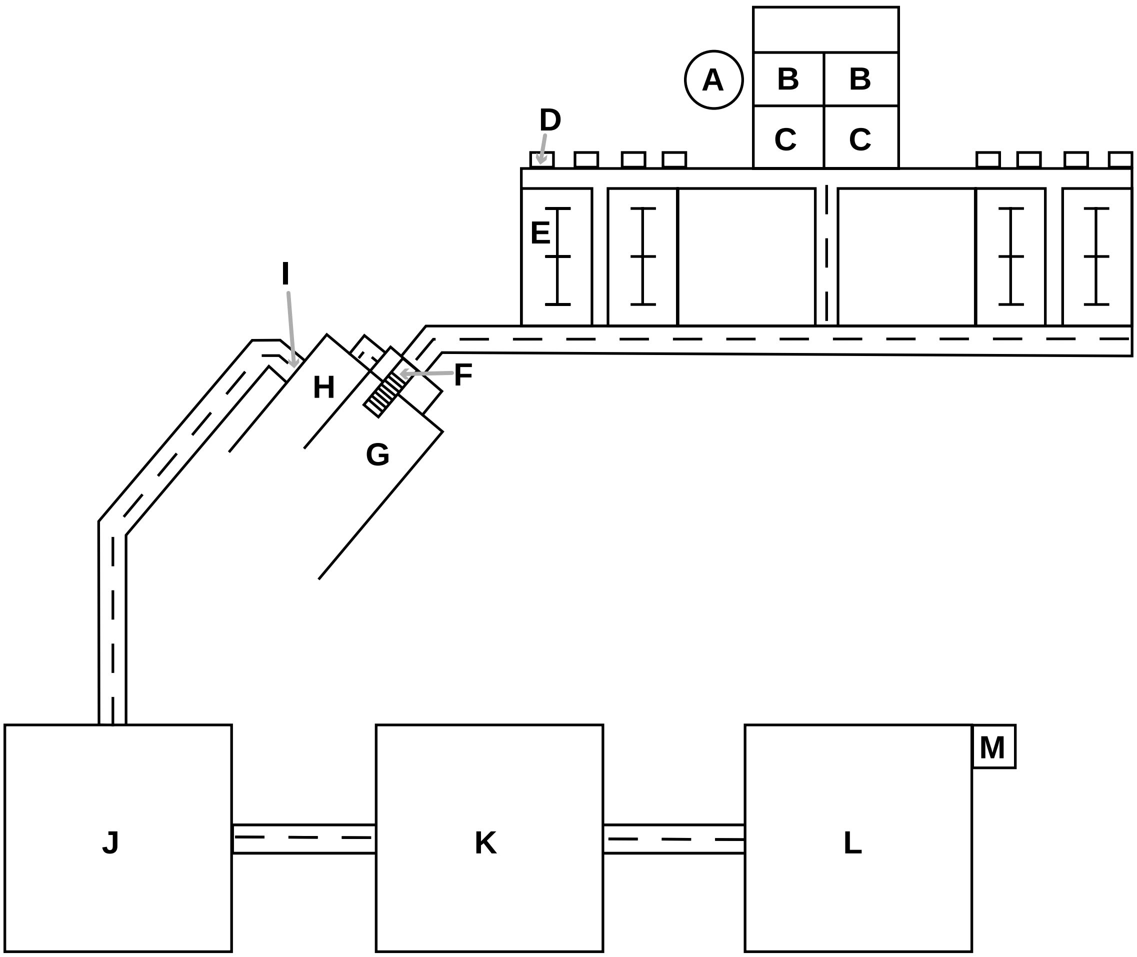


Figure 1. Beardon Dairy Research Center

A — Water Tank
B — Parlor
C — Holding Pen
D — Flush Tank
E — Freestall Area
F — Solid Separator
G — Solids Holding Pit
H — Settling Basin
I — Water Outlet
J, K, L — Lagoons
M — Recycling Pump
Drain Pipes — — —

would be equivalent to the production of 15.67 acres of kenaf based on the costs shown in the budget presented in this bulletin. The DRC is equipped with special equipment – a solid separator and a settling basin – to deal with some of the sand buildup problems (F, G, and H in Figure 1) *(2)*. This equipment could also be used in conjunction with kenaf as bedding, which could provide some unique opportunities for the recycling of bedding for use in other areas. The DRC's 200 stalls each have 15.3 cubic feet of volume. One-third of the bedding is replaced each week. Kenaf weighs 5.1 pounds per cubic foot. Thus, it would take approximately 15 acres using the 2x rate of application to provide the kenaf needed for the stalls. It appears that kenaf and sand would cost approximately the same amount (disregarding the opportunity costs associated with the land used to produce kenaf). Some additional costs, not necessary for sand, would be required to control bacteria in the kenaf.

This section discusses details of the equipment used in the process of spreading the effluent over the kenaf field. It also details equipment that could be used in conjunction with kenaf used as freestall bedding. This information is outlined in order to provide detail to some of the opportunities that can result from the use of kenaf as freestall bedding.

Mechanical Separator

The mechanical separator consists of a small elevator-type separator and a concrete holding pit that stores separated solids. The floor of the holding pit is sloped to aid the accumulation of waste products. Filter screens in the separator catch solids suspended in the water as the water flows into an attached holding tank. The elevator lifts and carries solids into an adjacent holding pit *(2)*. In this case, sand is too heavy to be suspended in the water and caught by the filter screens, so it travels to the settling basin. It is in this process that the use of kenaf could possibly be advantageous, as will be discussed later in this bulletin.

Traveling Gun

The traveling gun is used to apply effluent to the kenaf field. Adjusting the pump rate, travel speed of the gun, or the size of the nozzle can regulate the amount of effluent. A feeder line is run from the lagoons to the kenaf fields. This line can be installed permanently or temporarily. The traveling gun was chosen in order to apply both nutrient-rich effluent and water to the kenaf. Because the goal of this study was to determine how well kenaf dealt with the added nutrients, the nutrient-rich effluent was the primary focus. The irrigation water was an added benefit to the experiment. An outline of the specific equipment is provided in Appendix Table 1.

The traveling gun is estimated to have a 20-year life with no salvage value. It was assumed that the motor on the traveling gun would be replaced every 5 years and the hoses on the traveling gun would be replaced in year 10. Motor replacement costs were estimated at $1,000 per motor, and the replacement cost of the hose was estimated at $5,000.

METHODS AND PROCEDURES

The data in this research came from four major sources: the DRC, Department of Agricultural Economics, Department of Agricultural and Biological Engineering, and Department of Plant and Soil Sciences. These departments gathered information regarding their respective fields of study, then distributed and shared data in order to organize the research.

The DRC provided the site for the experiment as well as invoices and operation outlines for the budget. These invoices included costs associated with the traveling gun and its components. DRC personnel also helped in the operation of the traveling gun.

Members of the Department of Agricultural Economics provided assistance with the use of the Mississippi State Budget Generator (MSBG). They also provided help in the collection and analysis of the data. Last, they provided background information on kenaf and the related industry.

Members of the Department of Agricultural and Biological Engineering helped install the traveling gun and its components. They identified the system that should be used and helped in the design and placement of the equipment. They also provided the specifics for the amounts and types of equipment to be used.

Scientists and graduate assistants from the Department of Plant and Soil Sciences oversaw the experiment. They gathered the data on all field operations and inputs. They outlined the times and amounts when applications were made to the kenaf field. They also collected data on yields and results of the applications.

Data collected by these departments provided the basis for the budget. The operations and their approximate per-acre cost were put into the MSBG. The MSBG was then used to create a budget for the production of kenaf. Certain inputs had to be added to the MSBG's memory in order to generate an accurate budget.

Results

Production for Use at the Dairy

The experiment produced 12.8 acres of kenaf. The field was divided into four plots where one was a control (0x), one received one application of effluent (1x), one received two applications (2x), and one received three applications (3x). The applications' dates and amounts are outlined in Appendix Table 2. Due to scheduling problems with the wastewater application, the entire field received 30 pounds of N per acre 8 weeks after planting. An analysis of the wastewater showed that the treatments received the following amounts of nitrogen: 1x, 130 pounds of N per acre; 2x, 234 pounds of N per acre; and 3x, 364 pounds of N per acre. The control plot produced the lowest kenaf yield (5.45 tons per acre), while the 2x plot produced the highest (7.67 tons per acre). The 3x plot could not efficiently handle the nitrogen provided. For this reason, the applications associated with the 3x plot were not used in generating the budget. The only yield that was used in generating the budget was the 2x-plot yield. These budgets are shown as Appendix Tables 2-10.

The traveling gun was obtained under a lease agreement, which made it a custom operation in the MSBG. This generated a large cost per acre. If the traveling gun and its components were purchased and the costs could be allocated over a useful life of 20 years, then the cost could be reduced. The amount of the traveling gun and its components was $53,590. Another assumption in an actual dairy is that this irrigation system could be used on other areas such as pastureland in order to make its cost feasible. It was assumed that the system was used on pasture as well as kenaf. Total acreage was 100 acres.

The budget tables in the Appendix outline the per-acre cost for kenaf production at the dairy. Results indicated that $214.08 per acre is the cost of producing kenaf with two applications of effluent at a rate of 1.8 acre-inches per application.

Feasibility for Dairies in Mississippi

At the time of this study, it would be economically feasible for a representative dairy farm in Mississippi to produce kenaf for bedding. A representative Mississippi dairy farm is approximately the size of the DRC. More research is needed to determine the technical feasibility of using whole-stalk kenaf. For example, further research must be conducted to determine the types of bacteria associated with kenaf, compared with those that inhabit the traditional bedding material, sand. It also appears that cattle prefer sand to whole-stalk kenaf. The technical and economic feasibility of using kenaf core and selling the bark must also be examined.

Opportunities and Problems

There are potential opportunities for using kenaf as freestall bedding. Kenaf could be produced using dairy effluent, which would be a good form of waste management. Kenaf could also be used as bedding in conjunction with a solid separator. The kenaf would then be a nutrient-rich product that could be recycled as potting material or mulch. These are just two possibilities for the use of the kenaf. If kenaf is valued at $55 per ton and production totals 7.66 tons per acre, the returns per acre above specified expenses are estimated to be $207.55

With this system, it was assumed that there was no difference in the cost of irrigating kenaf or pasture. It was also assumed that the irrigation system was used on 100 acres with two applications per acre. These factors could vary depending on individual dairies. The system was assumed to have a 20-year life with the large irrigation hose being replaced at 10 years and the motor being replaced at 5-year intervals. An additional $100 per year was added for other repairs and maintenance to the system.

For the use of kenaf as bedding to be feasible, the value of the kenaf would have to be approximately the same as the cost associated with a sand-based bedding system. If the in-field bark separator is used and bark could be sold commercially, then results would also be different. Also, some problems need to be addressed. When an organic bedding material is used, additional costs could be incurred in preparing it for use as bedding. Organic bedding materials can lead to high microbial counts, which can lead to disease in the lactating cows. Precautions would probably be required to treat the kenaf against these microorganisms. Another problem could be the absorption ability of the plant. Kenaf could hold too much waste and lead to high ammonia levels.

CONCLUSIONS

Several conclusions can be drawn from an analysis of data from this study:

1. From an economic point of view, it appears that the cost of sand and kenaf would be approximately the same.

2. According to DRC personnel, cows like sand as a bedding material better than kenaf. Bark in whole-stalk kenaf appears to scratch the cattle and make them less comfortable than sand.

3. Additional research is needed to determine the acceptance of kenaf core as a material if a viable commercial outlet is available for the bark.

4. Additional research is needed to assess the forage potential of kenaf. Could it be partially grazed and then allowed to grow?

BIBLIOGRAPHY

(1) **Chatto, Chris.** March 1997. The Clean Water Act: Progress and Unfulfilled Promise. Public Interest Group. Available Online: <http://www.pirg.org/enviro/water/dws97/cwa.htm>.

(2) **Barnes, Michael Allen.** May 1997. Economic Analysis of Dairy Wastewater Treatment in Mississippi. Mississippi State University.

(3) **Bonner, Jimmy.** April 1996. You and Animal Waste Regulations. Mississippi State University Extension Service. Available Online: <http://www.ces.msstate.edu/pubs/is1480.htm>.

(4) **Miller, John W., J.L. Outlaw, R.D. Knutson, R.B. Schwart Jr., and J.W. Richardson.** 1994. The Impacts of Dairy Waste Management Regulations on the South. Texas A&M University.

(5) **Mississippi Department of Environmental Quality Office of Pollution Control.** August 1995. Wastewater Regulations for National Pollutant Discharge Elimination System (NPDES) Permits, Underground Injection Control (UIC) Permits, State Permits, Water Quality Based Effluent Limitations and Water Quality Certification (amended). Commission on Environmental Quality.

(6) **Chatto, Chris.** March 1997. Legislation in the 105th Congress. Public Interest Research Group. Available Online: <http://www.pirg.org/enviro/water/dws97/let105.htm>.

(7) **Baldwin, Brian, Mark Kurtz, Carl Hovermale, and S.W. Neil.** 1996. Kenaf: A Guide for Production in Mississippi. Mississippi Agricultural and Forestry Experiment Station Research Report, Vol. 21, No. 8. Mississippi State University.

(8) **Goforth, Catherine E., and Marty J. Fuller.** 1994. A Summary of Kenaf Production and Product Development Research 1989-1993. Mississippi Agricultural and Forestry Experiment Station Technical Bulletin 1011. Mississippi State University.

Appendix

Appendix Table 1. Traveling gun and components cost analysis.[1]

Manure handling & distribution system containing the following:	
Engine drive traveler unit with computerized speed control and gun nozzle	
Drive system: Honda 5.5 hp	
Gun cart lifting mechanism	
Turntable: heavy duty	
Shut-off bar and mis-wrap protection	
Brake assembly	
Sprinkler gun: Nelson SR 150-21 with ring	
Nozzle set	
Towing hitch	
TOTAL	**$25,930.00**
Trailer-mounted John Deere 4.45T diesel slurry pump	
No. 9 hand primer	
Hoses and various attachments	
Implement tires	
40 sections – 6-inch high pressure circle lock	
Fittings/clamp and gasket for each joint	
High-pressure circle lock fittings	
4 – 45-degree hplc elbows	
4 – 90-degree hplc elbows	
2 – hplc end plugs with circle lock clamps	
TOTAL	**$23,735.00**
1 pt prop agitator	
1 horizontal liquid manure paddle mixer and aerator	
1 forged steel, three-blade, 28-inch propeller	
TOTAL	**$3,925.00**
GRAND TOTAL	**$53,590.00**

[1]Obtained from 1995 DRC invoice.

Appendix Table 2. Estimated resource use and costs per acre for field operations (Kenaf Production Budget, Dairy Research Center, Mississippi, 1997).[1]

Operation/	Size/	Tractor	Perf.	Times	Month	Tractor cost		Equipment cost		Allocated labor		Operating input			Total
operating input	unit	size	rate	over		Direct	Fixed	Direct	Fixed	Hours	Cost	Amount	Price	Cost	cost
						$	$	$	$		$		$	$	$
No-Till Plant	4R-40	125 hp	0.176	1	May	2.04	2.17	0.75	1.68	0.352	2.35				9.01
Kenaf Seed	lb											8.00	2.50	20.00	20.00
Spray (Broadcast)	27’	145 hp	0.061	1	May	0.78	0.83	0.14	0.19	0.092	0.64				2.57
Gramoxone Extra	pt											0.75	4.05	3.04	3.04
Spray (Broadcast)	27’	145 hp	0.061	1	June	0.78	0.83	0.14	0.19	0.092	0.64				2.57
Fusilade DX	oz											1.20	0.87	1.04	1.04
Fert. Appl. (Liquid)	4R-40	125 hp	0.147	1	June	1.70	1.82	0.63	1.74	0.221	1.53				7.42
N-Sol 32%	lb N											30.00	0.20	6.00	6.00
Travel Gun (Dairy)	pull			1	July			3.50	21.32	0.320	1.88	1.00			26.70
Travel Gun (Dairy)	pull			1	August			3.50	21.32	0.320	1.88	1.00			26.70
Boll Buggy	4 bale	145 hp	0.220	1	March	2.82	3.00	0.94	2.75	0.220	1.65				11.16
Module Builder	32’	125 hp	0.220	1	March	2.55	2.72	1.07	3.16	0.440	2.94				12.44
Module Tarp (prorate)	each			1	March							1.00	35.00	35.00	35.00
Custom Harvest	acre			1	March							1.00	40.00	40.00	40.00
TOTALS						10.68	11.38	10.66	52.34	2.056	13.51			105.08	203.65
INTEREST ON OPERATING CAPITAL															5.22
UNALLOCATED LABOR															5.97
TOTAL SPECIFIED COST															**214.85**

[1]Cost of production estimates are based on 1998 input prices.

Appendix Table 3. Estimated resource use per acre for field operations (Kenaf Production Budget, Dairy Research Center, Mississippi, 1997).[1]

Operation/ operating input	Size/ unit	Tractor size	Times over	Month	Operator input	Equipment	Tractor	Allocated labor	Unallocated labor
					amount	*hr*	*hr*	*hr*	*hr*
No-Till Plant	4R-40	125 hp	1	May		0.176	0.176	0.352	0.158
Kenaf Seed	lb				8.00				
Spray (Broadcast)	27’	145 hp	1	May		0.061	0.061	0.092	0.055
Gramoxone Extra	pt				0.75				
Spray (Broadcast)	27’	145 hp	1	June		0.061	0.061	0.092	0.055
Fusilade DX	oz				1.20				
Fert. Appl. (Liquid)	4R-40	125 hp	1	June		0.147	0.147	0.221	0.132
N-Sol 32%	lb N				30.00				
Travel Gun (Dairy)	pull		1	July	1.00			0.320	
Travel Gun (Dairy)	pull		1	August	1.00			0.320	
Boll Buggy	4 bale	145 hp	1	March		0.220	0.220	0.220	0.198
Module Builder	32’	125 hp	1	March		0.220	0.220	0.440	0.198
Module Tarp (prorate)	each		1	March	1.00				
Custom Harvest	acre		1	March	1.00				
TOTALS						**0.885**	**0.885**	**2.056**	**0.796**

[1]Cost of production estimates are based on 1998 input prices.

Appendix Table 4. Estimated costs per acre for field operations (Kenaf Production Budget, Dairy Research Center, Mississippi, 1997).[1]

Operation/ operating input	Size/ unit	Direct cost						Direct cost to date	Fixed cost	Total cost
		Op. input	Fuel	R&M	Labor	Interest	Total			
		$	*$*	*$*	*$*	*$*	*$*	*$*	*$*	*$*
No-Till Plant	4R-40		1.26	1.54	3.54	0.55	6.88	6.88	3.86	10.74
Kenaf Seed	lb	20.00				1.73	21.73	28.61		21.73
Spray (Broadcast)	27’		0.48	0.44	1.05	0.17	2.14	30.75	1.02	3.16
Gramoxone Extra	pt	3.04				0.26	3.30	34.05		3.30
Spray (Broadcast)	27’		0.48	0.44	1.05	0.15	2.12	36.17	1.02	3.14
Fusilade DX	oz	1.04				0.08	1.13	37.29		1.13
Fert. Appl. (Liquid)	4R-40		1.05	1.29	2.53	0.38	5.24	42.54	3.55	8.80
N-Sol 32%	lb N	6.00				0.47	6.47	49.01		6.47
Travel Gun (Dairy)	pull			3.50	1.88	0.38	5.76	54.77	21.32	27.08
Travel Gun (Dairy)	pull			3.50	1.88	0.34	5.72	60.48	21.32	27.04
Boll Buggy	4 bale		1.73	2.02	3.14	0.05	6.94	67.43	5.76	12.70
Module Builder	32’		1.57	2.05	4.43	0.06	8.11	75.54	5.87	13.99
Module Tarp (prorate)	each	35.00				0.28	35.28	110.81	35.28	
Custom Harvest	acre	40.00				0.31	40.31	151.13	40.31	
TOTALS		**105.08**	**6.57**	**14.77**	**19.48**	**5.22**	**151.13**		**63.72**	**214.85**

[1]Cost of production estimates are based on 1998 input prices.

Appendix Table 5. Estimated costs and returns per acre (Kenaf Production Budget, Dairy Research Center, Mississippi, 1997).[1]

Item	Unit	Price	Quantity	Amount	Your farm
		$		$	
INCOME					
Kenaf	ton	55.00	7.6660	421.63	________

TOTAL INCOME				**421.63**	________
DIRECT EXPENSES					
CUSTOM					
Custom Harvest	acre	40.00	1.0000	40.00	________
FERTILIZER					
N-Sol 32%	lb N	0.20	30.0000	6.00	________
HERBICIDE					
Gramoxone Extra	pt	4.05	0.7500	3.04	________
Fusilade DX	oz	0.87	1.2000	1.04	________
SEED/PLANTS					
Kenaf Seed	lb	2.50	8.0000	20.00	________
OTHER					
Module Tarp (prorate)	each	35.00	1.0000	35.00	________
OPERATOR LABOR					
Tractors	hour	7.50	0.8850	6.64	________
HAND LABOR					
Implements	hour	5.87	0.5305	3.11	________
IRRIGATION LABOR					
Travel Gun (Dairy)	hour	5.87	0.6400	3.76	________
UNALLOCATED LABOR	hour	7.50	0.7965	5.97	________
DIESEL FUEL					
Tractors	gal	0.82	8.0073	6.57	________
REPAIR & MAINTENANCE					
Implements	acre	3.66	1.0000	3.66	________
Tractors	acre	4.11	1.0000	4.11	________
Travel Gun (Dairy)	pull	3.50	2.0000	7.00	________
INTEREST ON OP. CAP.	acre	5.22	1.0000	5.22	________

TOTAL DIRECT EXPENSES				**151.13**	________
RETURNS ABOVE DIRECT EXPENSES				**270.50**	________
FIXED EXPENSES					
Implements	acre	9.70	1.0000	9.70	________
Tractors	acre	11.38	1.0000	11.38	________
Travel Gun (Dairy)	acre	42.64	1.0000	42.64	________

TOTAL FIXED EXPENSES				**63.72**	________

TOTAL SPECIFIED EXPENSES				**214.85**	________
RETURNS ABOVE TOTAL SPECIFIED EXPENSES				**206.78**	________

[1]Cost of production estimates are based on 1998 input prices.

Appendix Table 6. Summary of estimated costs and returns per acre (Kenaf Production Budget, Dairy Research Center, Mississippi, 1997).[1]

Item	Unit	Price	Quantity	Amount	Your farm
		$		$	
INCOME					
Kenaf	ton	55.00	7.6660	421.63	________
TOTAL INCOME				**421.63**	________
DIRECT EXPENSES					
CUSTOM	acre	40.00	1.0000	40.00	________
FERTILIZER	acre	6.00	1.0000	6.00	________
HERBICIDE	acre	4.08	1.0000	4.08	________
SEED/PLANTS	acre	20.00	1.0000	20.00	________
OTHER	acre	35.00	1.0000	35.00	________
OPERATOR LABOR	hour	7.50	0.8850	6.64	________
HAND LABOR	hour	5.87	0.5305	3.11	________
IRRIGATION LABOR	hour	5.87	0.6400	3.76	________
UNALLOCATED LABOR	hour	7.50	0.7965	5.97	________
DIESEL FUEL	gal	0.82	8.0073	6.57	________
REPAIR & MAINTENANCE	acre	14.77	1.0000	14.77	________
INTEREST ON OP. CAP.	acre	5.22	1.0000	5.22	________
TOTAL DIRECT EXPENSES				**151.13**	________
RETURNS ABOVE DIRECT EXPENSES				**270.50**	________
TOTAL FIXED EXPENSES				**63.72**	________
TOTAL SPECIFIED EXPENSES				**214.85**	________
RETURNS ABOVE TOTAL SPECIFIED EXPENSES				**206.78**	________

[1]Cost of production estimates are based on 1998 input prices.

Appendix Table 7. Estimated costs per acre (Kenaf Production Budget, Dairy Research Center, Mississippi, 1997).[1]

Item	Unit	Price	Quantity	Amount	Your farm
		$		$	
DIRECT EXPENSES					
CUSTOM					
Custom Harvest	acre	40.00	1.0000	40.00	_________
FERTILIZER					
N-Sol 32%	lb N	0.20	30.0000	6.00	_________
HERBICIDE					
Gramoxone Extra	pt	4.05	0.7500	3.04	_________
Fusilade DX	oz	0.87	1.2000	1.04	_________
SEED/PLANTS					
Kenaf Seed	lb	2.50	8.0000	20.00	_________
OTHER					
Module Tarp (prorate)	each	35.00	1.0000	35.00	_________
OPERATOR LABOR					
Tractors	hour	7.50	0.8850	6.64	_________
HAND LABOR					
Implements	hour	5.87	0.5305	3.11	_________
IRRIGATION LABOR					
Travel Gun (Dairy)	hour	5.87	0.6400	3.76	_________
UNALLOCATED LABOR	hour	7.50	0.7965	5.97	_________
DIESEL FUEL					
Tractors	gal	0.82	8.0073	6.57	_________
REPAIR & MAINTENANCE					
Implements	acre	3.66	1.0000	3.66	_________
Tractors	acre	4.11	1.0000	4.11	_________
Travel Gun (Dairy)	pull	3.50	2.0000	7.00	_________
INTEREST ON OP. CAP.	acre	5.22	1.0000	5.22	_________

TOTAL DIRECT EXPENSES				**151.13**	_________
FIXED EXPENSES					
Implements	acre	9.70	1.0000	9.70	_________
Tractors	acre	11.38	1.0000	11.38	_________
Travel Gun (Dairy)	acre	42.64	1.0000	42.64	_________

TOTAL FIXED EXPENSES				**63.72**	_________

TOTAL SPECIFIED EXPENSES				**214.85**	_________

[1]Cost of production estimates are based on 1998 input prices.

Appendix Table 8. Summary of estimated costs per acre (Kenaf Production Budget, Dairy Research Center, Mississippi, 1997).[1]

Item	Unit	Price	Quantity	Amount	Your Farm
		$		$	
DIRECT EXPENSES					
CUSTOM	acre	40.00	1.0000	40.00	_________
FERTILIZER	acre	6.00	1.0000	6.00	_________
HERBICIDE	acre	4.08	1.0000	4.08	_________
SEED/PLANTS	acre	20.00	1.0000	20.00	_________
OTHER	acre	35.00	1.0000	35.00	_________
OPERATOR LABOR	hour	7.50	0.8850	6.64	_________
HAND LABOR	hour	5.87	0.5305	3.11	_________
IRRIGATION LABOR	hour	5.87	0.6400	3.76	_________
UNALLOCATED LABOR	hour	7.50	0.7965	5.97	_________
DIESEL FUEL	gal	0.82	8.0073	6.57	_________
REPAIR & MAINTENANCE	acre	14.77	1.0000	14.77	_________
INTEREST ON OP. CAP.	acre	5.22	1.0000	5.22	_________

TOTAL DIRECT EXPENSES				**151.13**	_________
TOTAL FIXED EXPENSES				**63.72**	_________

TOTAL SPECIFIED EXPENSES				**214.85**	_________

[1]Cost of production estimates are based on 1998 input prices.

Appendix Table 9. Estimated monthly income and expense flows per acre (Kenaf Production Budget, Dairy Research Center, Mississippi, 1997).[1]

Item	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March
	$	$	$	$	$	$	$	$	$	$	$	$
TOTAL INCOME	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	421.63
DIRECT EXPENSES												
CUSTOM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	40.00
FERTILIZER	0.00	0.00	6.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HERBICIDE	0.00	3.04	1.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SEED/PLANTS	0.00	20.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OTHER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35.00
LABOR	0.00	4.59	3.57	1.88	1.88	0.00	0.00	0.00	0.00	0.00	0.00	7.56
FUEL	0.00	1.74	1.53	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.30
REPAIR & MAINTENANCE	0.00	1.98	1.72	3.50	3.50	0.00	0.00	0.00	0.00	0.00	0.00	4.08
INTEREST ON OP. CAP.	0.00	2.71	1.09	0.38	0.34	0.00	0.00	0.00	0.00	0.00	0.00	0.71
TOTAL DIRECT EXPENSES	0.00	34.05	14.96	5.76	5.72	0.00	0.00	0.00	0.00	0.00	0.00	90.64
NET INCOME	0.00	-34.05	-14.96	-5.76	-5.72	0.00	0.00	0.00	0.00	0.00	0.00	330.99
NET INCOME TO DATE	**0.00**	**-34.05**	**-49.01**	**-54.77**	**-60.48**	**-60.48**	**-60.48**	**-60.48**	**-60.48**	**-60.48**	**-60.48**	**270.50**

[1]Cost of production estimates are based on 1998 input prices.

Appendix Table 10. Estimated returns per acre for various price/yield combinations (Kenaf Production Budget, Dairy Research Center, Mississippi, 1997).[1]

Kenaf yield	$41.25	$44.00	$46.75	$49.50	$52.25	$55.00	$57.75	$60.50	$63.25	$66.00	$68.75
	$	$	$	$	$	$	$	$	$	$	$
3.83 tons	6.98	17.52	28.06	38.60	49.15	59.69	70.23	80.77	91.31	101.85	112.39
	-56.74	-46.20	-35.66	-25.12	-14.58	-4.03	6.51	17.05	27.59	38.13	48.67
4.60 tons	38.60	51.25	63.90	76.55	89.20	101.85	114.50	127.15	139.80	152.45	165.09
	-25.12	-12.47	0.18	12.83	25.48	38.13	50.78	63.43	76.07	88.72	101.37
5.37 tons	70.23	84.98	99.74	114.50	129.26	144.01	158.77	173.53	188.28	203.04	217.80
	6.51	21.26	36.02	50.78	65.53	80.29	95.05	109.81	124.56	139.32	154.08
6.13 tons	101.85	118.71	135.58	152.45	169.31	186.18	203.04	219.91	236.77	253.64	270.50
	38.13	54.99	71.86	88.72	105.59	122.45	139.32	156.18	173.05	189.92	206.78
6.90 tons	133.47	152.45	171.42	190.39	209.37	228.34	247.31	266.29	285.26	304.23	323.21
	69.75	88.72	107.70	126.67	145.64	164.62	183.59	202.56	221.54	240.51	259.48
7.67 tons	165.09	186.18	207.26	228.34	249.42	270.50	291.58	312.66	333.75	354.83	375.91
	101.37	122.45	143.54	164.62	185.70	206.78	227.86	248.94	270.02	291.11	312.19
8.43 tons	196.72	219.91	243.10	266.29	289.47	312.66	335.85	359.04	382.23	405.42	428.61
	133.00	156.18	179.37	202.56	225.75	248.94	272.13	295.32	318.51	341.70	364.89
9.20 tons	228.34	253.64	278.93	304.23	329.53	354.83	380.13	405.42	430.72	456.02	481.32
	164.62	189.92	215.21	240.51	265.81	291.11	316.40	341.70	367.00	392.30	417.60
9.97 tons	259.96	287.37	314.77	342.18	369.58	396.99	424.40	451.80	479.21	506.61	534.02
	196.24	223.65	251.05	278.46	305.86	333.27	360.68	388.08	415.49	442.89	470.30
10.73 tons	291.58	321.10	350.61	380.13	409.64	439.15	468.67	498.18	527.70	557.21	586.72
	227.86	257.38	286.89	316.40	345.92	375.43	404.95	434.46	463.97	493.49	523.00
11.50 tons	323.21	354.83	386.45	418.07	449.69	481.32	512.94	544.56	576.18	607.81	639.43
	259.48	291.11	322.73	354.35	385.97	417.60	449.22	480.84	512.46	544.08	575.71

[1]Kenaf yield in this table ranges from 50% to 150% with 7.67 tons as the standard yield (100%). Crop prices range from 75% to 125% with $55 as the standard price (100%). The top number in each cell is Returns Above Direct Expenses. The bottom number in each cell is Returns Above Total Specified Expenses. Cost of production estimates are based on 1998 input prices.

Mississippi State UNIVERSITY

Printed on Recycled Paper

http://www.mafes.msstate.edu **16422/900**