Market Potential For Feed Grains and Alfalfa Hay Produced on Reclaimed Phosphatic Clay In Florida

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ABSTRACT

This study examined the economic feasibility of producing corn, milo, soybeans, wheat and alfalfa on reclaimed phosphatic clay lands in Polk County, Florida. Livestock and poultry feed requirements were estimated for several geographic zones around Polk County and compared with production estimates. These comparisons indicate a ready market for these feedstuffs. Production costs (excluding land costs) on reclaimed phosphatic clay lands were estimated and compared with recent market prices. Alfalfa and corn generated the largest net returns per acre, follow by milo, wheat, and soybeans, respectively.

Key Words: land reclamation, phosphatic clay lands, economics, feed grains, corn, milo, wheat, soybeans, alfalfa

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INTRODUCTION

As the largest domestic producer of phosphate, the state of Florida accounts for an annual average of 75 percent of total U.S. production (McHardy, 1983). Approximately 200,000 acres of mined land in Polk County will be left after mining activities cease about the turn of the century. More than 60 percent of this land will be in the form of clay settling areas (Wood, 1986). Phosphate companies are required under state law to reclaim the mined lands. The main objective of this study is to explore alternative uses for this reclaimed land in order to compensate for the loss of approximately $2.5 million annual tax revenues currently generated by the phosphate industry (Stricker, 1987).

Preliminary research conducted by the Institute of Food and Agricultural Sciences of the University of Florida and large-scale field trials managed by several phosphate companies indicate that reclaimed phosphatic clay lands in central Florida have the potential to produce several important feed grains and high quality alfalfa hay if cultural problems unique to reclaimed phosphatic clay soils can be overcome. In field trials conducted by phosphate companies, tropical field corn has yielded about 80 bushels per acre and, in smaller test plots, University of Florida researchers have obtained yields of approximately 100 bushels per acre. Wheat and triticale yields of 40 bushels per acre have also been achieved. Test plot yields of milo (grain sorghum) have been very good, producing approximately 5,000 pounds per acre. These yields are indications that production of these crops on phosphatic clay lands is technically feasible.

This study examines the economic feasibility of producing the most promising feed grains and hay crops and estimates their market potential. Issues relevant to the marketing environment for feed grains and alfalfa hay produced on phosphatic clay and the extent to which these crops can compete with those shipped to Florida from other states are also addressed. In order to address the major objective

of this research, specific objectives were to estimate the total quantities of selected feed crops consumed annually in Florida counties by major classes of livestock, examine the long-term trend of prices as well as the seasonal price behavior for each of these feed crops, estimate the cost of producing these feed crops on phosphatic clay lands in central Florida on a commercial scale, and assess the attitudes of feed manufacturers and major livestock and poultry producers toward feed crops grown on phosphatic clay lands in central Florida.

DATA

To meet the aforementioned objectives of this research, both secondary and primary data were collected. Feed consumption for individual counties in Florida was estimated by analyzing secondary data on livestock and poultry numbers, along with feed consumption parameters for the respective livestock and poultry species. Data on livestock and poultry were obtained from the 1982 and 1987 U.S. Census of Agriculture, and recent estimates by Florida Agricultural Statistics Service. Estimates of feed consumption by species were provided by researchers in the Animal Science, Dairy Science, and Poultry Science departments at the University of Florida. Seasonal price patterns and long-term price trends were ascertained from weekly and monthly price data for the selected feedstuffs for the 1976 through 1988 period.

Primary data were augmented through a survey of licensed feed manufacturers in Florida, and several major livestock and poultry producers with their own feed mills. A detailed questionnaire was pretested on several firms and revised prior to full-scale implementation. Fifty firms were contacted for personal interviews. Owners or managers of feed manufacturing plants and farms were interviewed in person or by the telephone during August and September of 1989. A total of 30 survey questionnaires was completed. Data obtained included composition and quantities of feedstuff purchases, geographic sources, delivered prices, sources of price information, and predominant grades or specifications of

feedstuffs. Respondents were also queried as to the likelihood of purchasing selected feedstuffs produced on phosphatic clay lands.

Finally, production costs for corn, milo, wheat, soybeans and alfalfa hay produced on reclaimed phosphatic clay land in central Florida were estimated using a partial budgeting technique. The production cost estimates were based primarily on experience gained by growing these crops on research sites of the Polk County Mined Lands Agricultural Research/Demonstration Project. The budgets were constructed using cost data for north Florida as a base and adjusting these data to reflect production cost differences experienced on reclaimed phosphatic clay lands.

RESEARCH RESULTS

Production and consumption estimates of feedstuffs in Florida were made to determine the annual production shortfall of these crops. The estimates of the quantities of feedstuffs utilized annually in Florida were derived using both secondary and primary data. The production deficits for the various feed crops are assumed to approximate the market potential for the respective crops. This assumption requires that relative prices for the various feedstuffs remain constant and that current producers within the state are at least as efficient as potential producers on reclaimed phosphatic clay lands.

Production of Selected Feedstuffs

The production of field corn and soybeans in Florida has sharply declined over the last ten years. However, production of wheat and hay has increased. Florida's corn production in 1988 was only about one-fifth of the production in 1979. During the same time, soybean production dropped to only a quarter of 1979 production. Hay production increased slightly over the past decade, but wheat production increased nearly five fold. Nevertheless, wheat production is still relatively small compared with corn and soybeans. Further, in absolute terms, the increase in wheat production was dramatically overshadowed by the declines in corn and soybean production. The total tonnage of these major feed items decreased by over 70 percent from 1979 to 1988 (Table 1).

Table 1.--Production of selected crops in Florida, 1979 and 1988.

Crop	Unit	1979	1988	Percent change
		(---------1,000--------)		(Percent)
Corn	bushels	17,967	3,770	-79
Soybeans	bushels	13,137	3,335	-75
Wheat	bushels	432[a]	2,035	+371
Hay, all	tons	619	729	+18

[a]Data for 1978; data from 1979 through 1988 not available.

Source: Florida Agricultural Statistics, Field Crops Summary, 1988.

Livestock and Poultry Numbers

Secondary data also indicate a decrease in all major livestock classes except sheep, but sheep represent an almost infinitesimal proportion of animal units statewide. Also, there was a decrease in three-month-old or older chicken inventory, but an increase in broilers and other meat-type chickens sold (Table 2). Secondary data for horses were not available on the county level for historical comparisons.

Table 2.--Livestock and poultry production in Florida, 1987 and 1982.

Livestock and poultry	1982	1987	Percent change
	(----------Number----------)		(Percent)
Cattle and calves:			
Inventory	2,178,552	1,879,124	-14
Beef cows	1,098,152	995,250	-9
Milk cows	194,550	176,993	-9
Sold	1,108,300	1,025,178	-8
Hogs and pigs:			
Inventory	203,231	156,137	-23
Sold	328,150	266,652	-19
Sheep and Lambs:			
Inventory	7,360	8,867	+20
Chickens (3 months and older):			
Inventory	15,374,588	12,964,760	-16
Broilers and other meat-type chickens:			
Sold	76,220,724	93,224,832	+22

Source: 1982 and 1987 Census of Agriculture, U.S. Department of Commerce, Bureau of the Census, Washington, DC, April 1989.

Overall, the increases in sheep and broiler production and the declines in cattle and hogs represents a significant reduction in the demand for most feedstuffs. Even so, comparing production data on selected feedstuffs and livestock and poultry production in Florida for the time period 1979 to 1988 shows that the rate of decrease in supplies of major feedstuffs has been considerably greater than the rate of decrease in livestock and poultry.

Consumption Estimates

Annual consumption of feed grains and alfalfa hay in Florida were estimated using livestock and poultry numbers from the 1987 Census of Agriculture. Consumption estimates were made for dairy and beef cattle, horses, swine and poultry. The estimates were based upon livestock and poultry numbers from the Census and the composition of typical feed rations provided by livestock and poultry production specialists at the University of Florida. Feed consumption was estimated by county and categorized into three geographical areas based upon distance from the greatest concentration of reclaimed phosphatic clay lands in Polk County: counties within a 100-mile radius, counties within a 100- to 200-mile radius, and counties outside a 200-mile radius (Figure 1). These classifications were made in order to identify the potential geographic markets for feed grains and hay because of the economic importance of transportation costs. Tables 3 shows consumption estimates, production, and the resulting estimated shortfall for corn, soybeans, alfalfa hay and Bermuda hay in Florida for each of the aforementioned geographical areas.

Corn production in Florida supplies only 17 percent of the estimated consumption for the state. In 1987, the statewide shortfall of corn was 32.6 million bushels, with the greatest shortfall within a 100-mile radius from phosphatic clay lands. In this geographic zone, the shortfall of corn was over 17 million bushels; in the 100- to 200-mile zone, an additional 14 million bushel shortfall was experienced. Thus, there is substantial market potential for corn and close substitutes such as grain sorghum relatively close to the reclaimed phosphatic clay lands, affording a significant transportation advantage. Soybean production and soybean meal consumption was also examined for each of the geographic regions. While

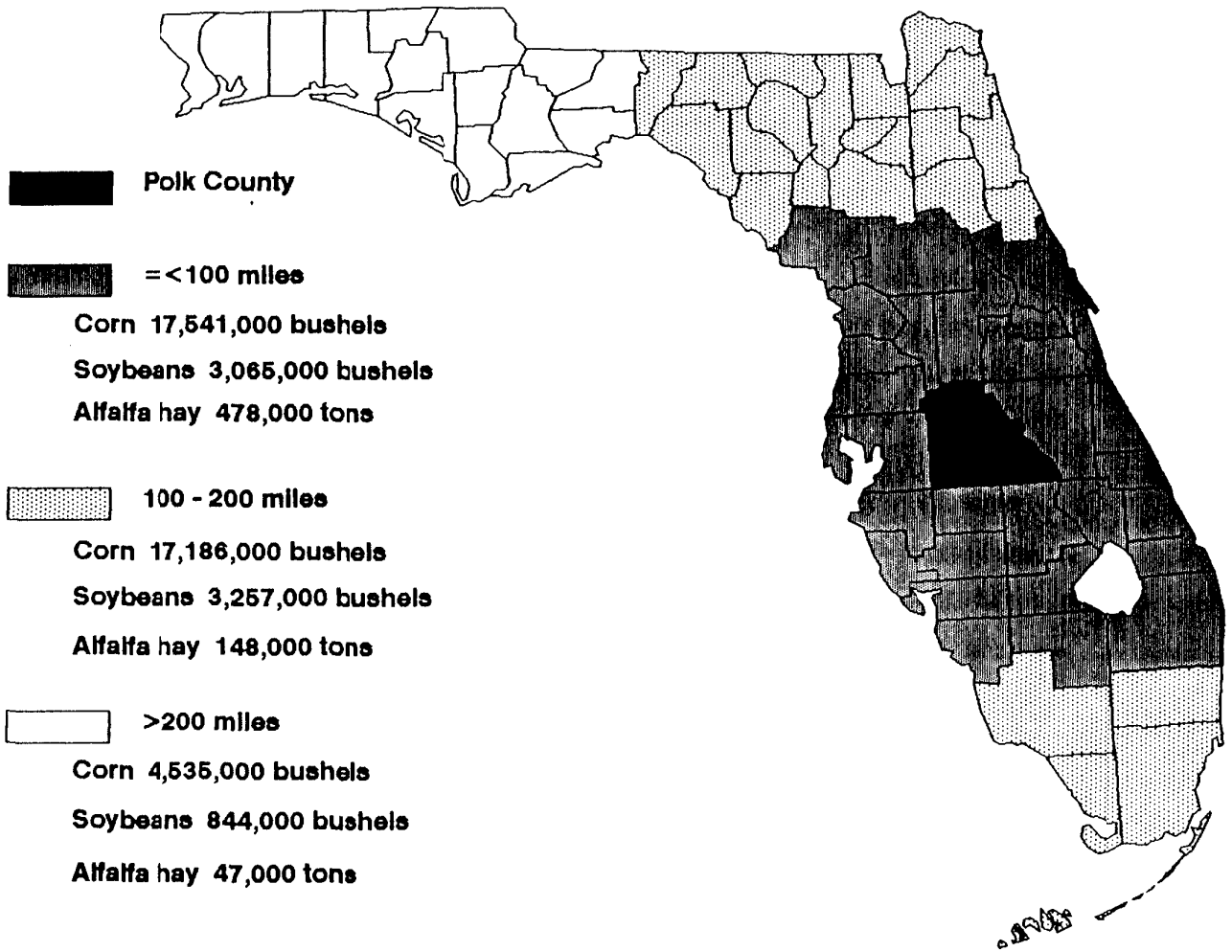

Figure 1.--Counties included in feed consumption regions around phosphatic clay lands in Polk County and consumption estimates for selected feedstuffs.

the shortfall (in soybean bushel equivalents) exceeds 5.6 million bushels, it is still substantially less than the quantity required by an economically efficient processing mill. Thus, soybean production from reclaimed phosphatic clay lands would have to be marketed through terminal markets, be transported directly to a soybean mill, or roasted and fed locally. Because the nearest terminal markets are in north Florida and the nearest soybean mills are located in Georgia, soybeans produced on reclaimed lands would be subject to substantial transportation cost disadvantages if the first two marketing alternatives were used. However, since processed whole soybeans can be fed to dairy, beef, poultry, and swine it is likely that soybeans produced in central Florida would be processed and fed locally.

Although the hay production in Florida provides for almost three-quarters of the estimated consumption, virtually all of the hay shortfall in the state is within a 100-mile radius from phosphatic clay lands. Also, it is quite likely that the shortfall is particularly acute for high quality hay such as alfalfa. Thus, it appears that there is significant market potential for alfalfa hay on phosphatic clay lands.

The primary data collected from firms surveyed was generally consistent with the findings derived from secondary data. Estimates of consumption derived from survey data also indicates that poultry is the largest consumer of feedstuffs in Florida. The survey indicated that over 42 percent of volume or 44 percent of the value of the feedstuffs is consumed by poultry. Dairy cattle consume about 26 percent of the volume and value, followed by horses, accounting for 13 and 10 percent of the tonnage and value, respectively. Beef cattle and swine consume about six to seven percent of all feedstuffs. Feed consumption estimates based on secondary data show the ranking, but somewhat different percentages for some of the major classes of livestock and poultry; part of the differences are due to the lack of estimates for the miscellaneous category. Despite these differences, the survey of feed manufacturers and large farms tends to confirm the large feedstuff deficits estimated using secondary data. Corn, with an annual consumption of over 710,000 tons (more than 25 million bushels), is the most important feed ingredient used by the 30 Florida feed manufacturers interviewed. Other major ingredients include

soybean meal with about 252,000 tons, wheat mids with 140,000 tons, and alfalfa pellets and cubes with 41,000 tons annually. Significant quantities of alfalfa hay, milo and wheat bran

Table 3.--Feed grain and alfalfa hay production and consumption in Florida

	Corn		Soybeans[a]		Hay[b]	
Distance from Polk County	1000 Bushels	Percent of consumption	1000 Bushels	Percent of consumption	1000 Tons	Percent of consumption
Less than 100 miles:						
Consumption	17,541	100	3,065	100	636	100
Production	130[c]	1	2[c,d]	0	360[c]	57
Shortfall	17,411	99	3,063	100[d]	276	43
100-200 miles:						
Consumption	17,186	100	3,257	100	209	100
Production	3,158[c]	18	630[c]	19	208[c]	100
Shortfall	14,028	82	2,627	81	1[e]	0
Greater than 200 miles:						
Consumption	4,535	100	844	100	64	100
Production	3,333[c]	73	1,625[c]	193	104[c]	163
Shortfall/Surplus	1,202	27	(781)	(93)	(40)	(63)
State totals:						
Consumption	39,262	100	7,166	100	909	100
Production	6,621[c]	17	2,257[c]	31	672[c]	74
Total Shortfall	32,641	83	4,909	69	237	26

[a]Soybean meal consumption in the study area was converted to whole soybeans using a 1:1.27 conversion factor.

[b]Production includes all types of hay, whereas consumption estimates are only for alfalfa hay and Bermuda hay. Thus, estimates of the hay shortfall are conservative.

[c]Adjusted for counties with data withheld to avoid disclosing individual farms.

[d]Production represents less than 0.1 percent.

[e]Shortfall represents less than 0.5 percent.

are also used by these manufacturers and livestock producers (Table 4). Over 96 percent of the total feedstuffs tonnage handled by the firms surveyed is resold to customers. The implication is that there is little vertical integration between the mill and user level for the firms interviewed.

Table 4.--Ouantity of feedstuffs purchased by the firms surveyed.

Feedstuffs	Tons[a]	Percent[a]
Corn	710,933	61.1
Soybeans	252,449	21.7
Wheat mids	140,184	12.0
Alfalfa pellets/cubes	41,020	3.5
Wheat/bran	8,094	0.7
Milo	6,646	0.6
Alfalfa hay	4,147	0.4
Totals	1,163,473	100.0

[a]Responses based on data from 30 firms.

Feedstuff Prices

Several price series were used to provide insights as to the potential profitability of feedstuff production on reclaimed phosphatic clay lands. Long-term trends and seasonality of price fluctuations were analyzed using Atlanta prices because adequate data for major Florida markets were unavailable. However, recent price series for Tampa or for Florida production regions were used whenever available. Analysis of annual price series for corn in Atlanta and Tampa, and annual average prices received by Florida farmers, indicates a high degree of correlation among these series (Figure 2). Thus, it is likely that Atlanta prices for corn and the other feed items examined provide a reasonable indication of long-term price trends. Also, because of a lack of Florida-based data, the Atlanta price series were used to estimate seasonal price patterns as well. More recent monthly F.O.B. prices for Tampa or Florida farm prices were used as an indication of current price levels and were used to estimate net returns for the crops produced on phosphatic clay lands in Polk County.

Long-term trends

Weekly F.O.B. Atlanta prices for corn, milo, wheat, soybeans and alfalfa pellets were analyzed for a period of 13 years, 1976 through 1988. Alfalfa pellets were used as a proxy for alfalfa hay because hay prices were unavailable. Weekly prices (unweighted) were aggregated into annual averages. Real prices (adjusted for inflation) were calculated using the 1982-84 Consumer Price Index (Table 5).

Table 5.--Average annual real[a] prices for selected crops, 1976-1988.

Year	Corn Dollars per bu.	Milo Dollars per cwt.	Wheat Dollars per bu.	Soybeans Dollars per bu.	Alfalfa pellets Dollars per ton
1976	4.96	8.29	5.64	12.30	223.61
1977	4.03	6.36	4.43	9.90	183.92
1978	4.02	6.31	4.81	10.43	162.95
1979	4.16	5.96	5.37	9.09	181.81
1980	4.08	5.87	5.29	9.59	174.42
1981	3.83	5.53	4.45	5.72	170.41
1982	3.03	4.28	3.34	5.65	137.76
1983	3.70	5.34	3.71	8.18	136.60
1984	3.55	5.98	3.62	5.96	131.81
1985	2.83	4.24	3.12	4.82	104.63
1986	2.33	3.77	2.68	4.47	104.47
1987	1.89	2.45	2.45	4.89	99.76
1988	2.30	2.45	2.95	6.32	104.62

[a]Real prices are calculated by deflating nominal prices by Consumer Price Index, 1982-84=100, taken from the Survey of Current Business, United States Department of Commerce, Bureau of Economic Analysis, various issues.

Source: Southern Dairy Review, various issues.
Feedstuffs, various issues.

Over the 13-year period, all five commodities showed significant downward trends in real prices, with most declining by 55 to 70 percent from 1976 to 1987. Milo and alfalfa pellets show sharper price decreases than soybeans. While real prices in 1988 for milo have dropped to less than a third (from $8.29 per cwt. in 1976 to $2.45 per cwt. in 1988) and for alfalfa pellets to less than one-half of the 1976 levels (from $223.23 per ton in 1976 to $104.62 per ton in 1988), real prices for soybeans dropped by about 50 percent, $12.30 per bushel in 1976 to $6.39 per bushel in 1988. Although real prices for most

of the commodities showed a slight increase in 1988 and 1989, these recent increases were attributed to the 1988 drought . On a national basis, there is little evidence to indicate that real prices for the major feedstuffs examined will regain the levels experienced in the late 1970s and early 1980s. Over the next few years, prices are likely to be similar to those experienced in the late 1980s, barring unforeseen catastrophic events.

Seasonal price patterns

Weekly prices for No. 2 yellow corn (F.O.B. Atlanta) for the 1976-1988 period were aggregated into monthly observations and analyzed to determine seasonal price patterns. Atlanta prices were selected because it is the nearest major market for which weekly prices were available; as mentioned previously, annual corn prices for Atlanta and Tampa were found to move together, and monthly prices probably do so as well (Figure 2).

Seasonal prices for corn tend to rise steadily in the months following harvests in the major corn-producing states. Thus, prices typically begin to increase in November, continuing throughout the remaining winter and spring months, with peak prices occurring in May. As substitute feedstuffs become plentiful, and as new crops of feed grains begin to be harvested, corn prices usually begin to drop in June and July, reaching seasonal lows in October.

Early planting (February) of corn for grain on phosphate clay lands in Polk County is not recommended, due to the fact that harvest coincides with the summer rainy season. A new practice, which is currently being explored, is to grow a crop of wheat or triticale from mid-November to late April and then plant tropical corn in June in the wheat stubble with a no-till planter and harvest it in November. This system permits harvest of both crops in the dry season and does not require irrigation. The harvest of tropical corn in November is when prices are about five percent below the annual average. Adequate data were not available to evaluate the economic potential of this system.

Because of the high degree of substitutability between corn and milo and a great deal of overlap

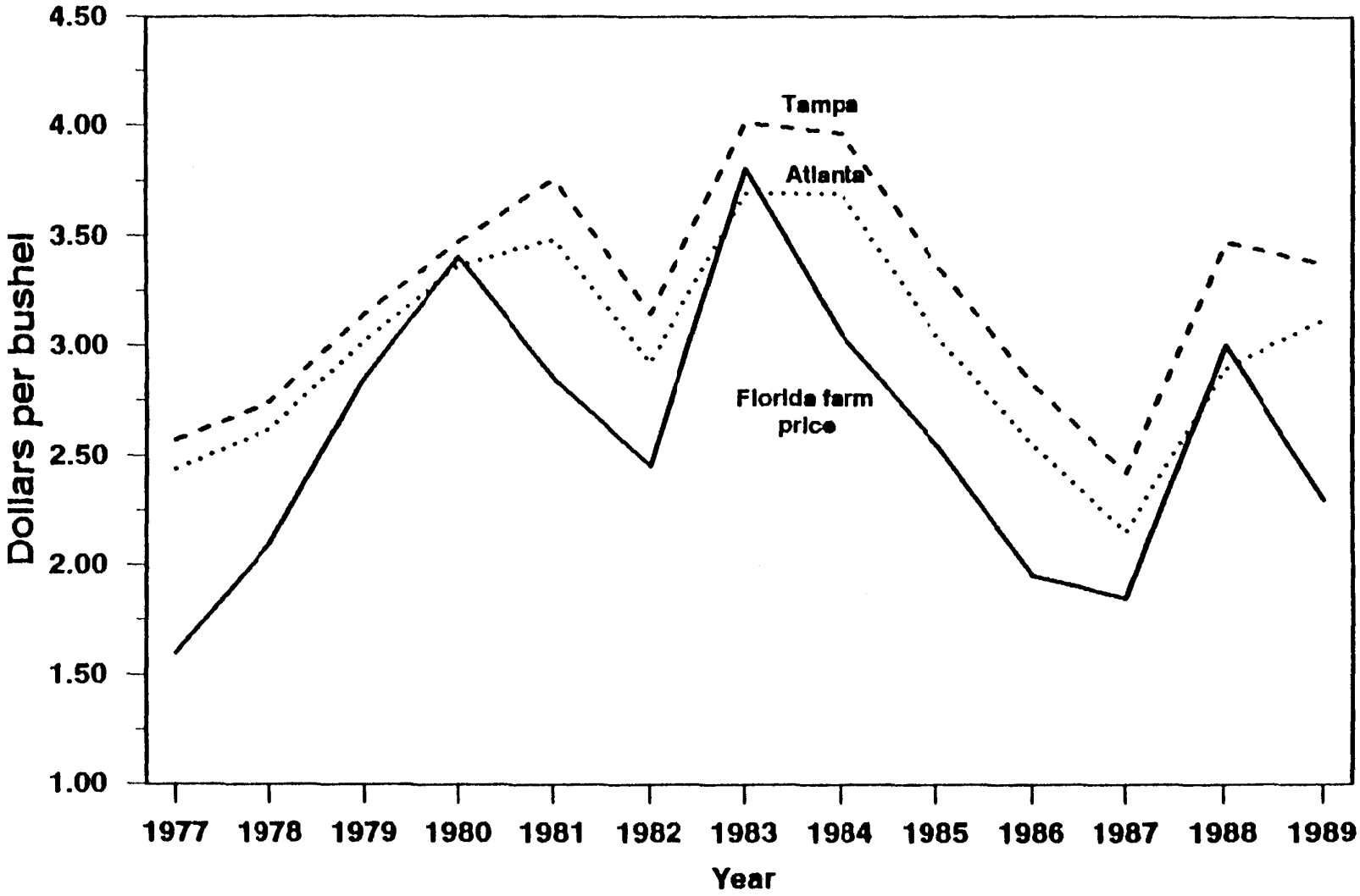

Figure 2.--Nominal corn prices for Tampa and Atlanta and annual farm prices received by Florida farmers, 1977-1989.

in their harvest seasons, the seasonal price patterns for milo are similar to those of corn. Peak milo prices in Atlanta typically occur in June and July, and seasonal lows in October and November. Unfortunately, harvest on reclaimed phosphatic clay lands would most likely coincide with the seasonal low prices.

Seasonal prices for wheat indicate a more favorable situation for production in Polk County. The expected harvest period on the phosphatic clay lands would be April, nearly two months prior to harvests in major production regions of the U.S. An April harvest would result in prices that are near seasonal highs.

Alfalfa hay production in Polk County appears to be technically feasible during two distinct periods, March through June and October through November. A limited data series for alfalfa hay prices in Tampa indicates that the spring harvest would probably be sold at prices that are somewhat below the annual average, but the fall harvest would command prices that are likely to be above the annual average.

Costs of production

The costs of production estimates for the selected feedstuffs were based primarily on data from research plots of the Polk County Mined Lands Agricultural Research/Demonstration Project in Bartow. Land costs have been excluded from these budgets because, at the present time, there is no good means for establishing rents or amortized development costs for phosphatic clay lands for agricultural use. Due to the adequate amounts of phosphate, potash and lime in phosphatic clay soil, fertilizer costs are lower. Further, the water-holding capacity of the clay reduces or eliminates the need for irrigation. However, machinery costs will probably be higher than state averages because the heavy, sticky clay requires more time and energy for most cultural practices, resulting in greater wear on machinery. Thus, it seems that the fertility and irrigation advantages are going to be offset by higher labor and machinery costs.

Estimated returns

Recent market prices and estimated production costs were analyzed for corn, milo, wheat, soybeans and alfalfa hay. Estimated net returns for each of these crops appear below (Table 6).

Corn.--In order to incorporate the effects of the Polk County area's transportation cost advantage, recent Tampa F.O.B. prices were used as the anticipated market prices for corn. Because of limited data and price volatility during the 1987-89 seasons, prices for each year are shown rather than a mean price. Tampa F.O.B. price for 1989 for the month comprising the likely harvest period for corn on the reclaimed phosphatic clay lands was $3.31 per bushel. At a conservative yield of 80 bushels per acre, production costs are approximately $2.34 per bushel, resulting in estimated net returns of $77.60 per acre. It is likely that the 1989 prices were somewhat elevated due to the 1988 drought; if future prices revert to 1987 levels, net returns would only amount to $8 per acre.

Milo.--Milo prices were not available for the Tampa market, so Tampa F.O.B. prices for No. 2 yellow corn were adjusted to reflect the historical price differential between No. 2 yellow corn and milo in the Atlanta market for the 1976-1988 period. On a weight-equivalent basis, the milo price is typically about 82 percent of the corn price. Thus, the estimated market price of milo in the Tampa market in the October-November 1989 harvest period was about $4.63 per hundredweight. At a yield of 4,000 pounds per acre, production costs were estimated at $3.82 per hundredweight, resulting in net returns of slightly over $32.00 per acre. However, at 1987 corn prices, milo production would result in a net loss of nearly $12.00 per acre.

Wheat.--Local (Tampa) market prices were not available for wheat. However, published price estimates of season average prices received by Florida farmers were available. Although most Florida wheat production occurs in the Panhandle region and in north Florida, it is assumed that Polk County producers could obtain similar prices because wheat grown in the central Florida would be treated as

a feed grain and utilized locally. In 1989, the average price received for wheat by Florida farmers was $3.50 per bushel. Production costs on the Polk County phosphatic clay lands, at a yield of 40 bushels per acre, would be approximately $2.96 per bushel, resulting in net returns per acre of $21.60. If wheat prices drop to pre-drought 1987 levels, returns would be negative. Triticale, a wheat-rye cross, also appears to have similar or even better potential as a feedgrain. Production research on triticale is currently underway.

Table 6.--Estimated net returns per acre for corn, milo, wheat, soybeans and alfalfa hay.

Crop	Estimated yield per acre/units	Production costs	Market prices	Estimated net returns
	(----------Dollars per unit----------)			(Dollars per acre)
Corn	80 bu.	2.34	3.31[a]	77.60
Milo[b]	40 cwt.	3.82	4.63[b]	32.40
Wheat	40 bu.	2.96	3.50[c]	21.60
Soybeans:				
local sales	30 bu.	4.96	5.45[c]	14.70
N. Florida delivery	30 bu.	5.60	5.45	(4.50)
Alfalfa hay	4 tons	69.64	167.50[a]	391.44

[a] 1989 Tampa F.O.B. price for harvest period, Southern Dairy Review (various issues).

[b]Estimated average price for Tampa for 1989 for the harvest period. The milo price is based upon 82 percent of the corn price on a per-pound basis. This is the price differential experienced in the Atlanta market for the 1976-1988 period.

[c]Season average prices received by Florida farmers in 1989, Florida Agriculture: Field Crops.

Soybeans.--Because soybeans are neither grown in the Tampa region in commercial quantities nor widely consumed in an unprocessed state, there is no local market and hence no local price series. However, unprocessed soybeans can be incorporated into cattle rations, and a relatively low-cost "roaster" used to increase their feed value to livestock. Thus, it appears that a local (south and central Florida) market could be developed for whole soybeans. The only other market alternative would be

to haul the soybeans to the nearest north Florida terminal markets, which would add approximately $0.75 per bushel in marketing costs.

If soybeans can be sold to local users at the 1989 state farmer price of $5.45 per bushel, the estimated net returns per acre are $14.70, assuming a yield of 30 bushels per acre. However, if the beans have to be transported to a north Florida buyer, a net loss of $4.60 per acre is likely.

Alfalfa hay.--Monthly price estimates for alfalfa hay (F.O.B. Tampa) were available for several years. The weighted average price for 1989 for the anticipated harvest periods was $167.50 per ton. When establishment costs are prorated over a three-year period and yields are conservatively estimated at four tons per acre, production costs for alfalfa hay are just under $70.00 per ton. At these costs and prices, the net return per acre is just under $400 per acre.

Even if market prices were to decline to the 1987 levels, net returns would approach $250 per acre. Thus, alfalfa hay appears to be one of the most promising crops for the reclaimed lands. It should be noted, however, that there are still many unresolved land reclamation and cultural practices that could adversely affect the estimates of net returns.

Quality considerations

Most of the feed mill operators expressed their interest and willingness to purchase any of the selected feedstuffs produced on phosphatic clay lands in central Florida. However, their expressed likelihood was subject to two main conditions: quality, and price competitiveness of the feedstuffs produced on phosphatic clay lands with those shipped to Florida from other states. Almost all of the feed mill operators were extremely concerned that Florida-produced corn would have high levels of aflatoxin because of climatic conditions. They were also adamant about getting high quality alfalfa hay with low moisture levels. Interestingly, only one of the interviewees brought up the matter of radionuclides, and wanted to know the radionuclide levels on crops grown on reclaimed phosphatic clay lands. Others did not seem very concerned, or did not know anything about this issue.

SUMMARY AND CONCLUSIONS

Florida is a feedstuffs deficit state. Annual consumption far surpasses the state production for most of feed grains and alfalfa products. Statewide, there is a shortfall of over 32 million bushels of corn, almost five million bushels of soybean, along with shortfalls in alfalfa products and other feedstuffs. The production deficits are particularly large within a 200-mile radius of Polk County, indicating a potential market for these crops if produced on the reclaimed phosphatic clay lands. However, it should be noted that, due to the homogeneity of the competitive environment in the feedstuff market, producers will be required to compete on quality and price with crops from other parts of the nation. In assessing the economic potential of the production of feedstuffs on the reclaimed phosphatic clay lands, the following items should also be considered:

* There have been unfavorable long-term price trends for virtually all hay and grain crops. Further, technological advances such as genetic engineering may result in increased production efficiency in traditional growing areas, with little benefit accruing to growing areas like Polk County. This could increase feed supplies and lower market prices.

* Phosphatic clay lands provide several production advantages for feedstuffs, but some disadvantages as well. Richness in plant nutrients and reduced need for irrigation may be offset by higher labor and machinery costs bur research with minimum tillage has been successful and offers promise of holding costs down.

* Transportation costs enhance the competitive position on most items. However, the transportation advantage is lost for soybeans if they must be transported to a crushing mill for processing into soybean meal because the nearest terminal market is in north Florida. It is feasible to "cook" or "roast" soybeans to enhance their feed value and this may be a viable alternative for some Florida feeding operations.

* Quality is another significant factor in determining market opportunities. Aflatoxin and moisture levels in Florida-produced corn and alfalfa hay are concerns to feed manufacturers. Most were not concerned with radionuclides. However, radionuclide may emerge as a negative factor even though most evidence to date indicate that food and feed products produced on reclaimed mined phosphatic clay lands pose virtually no health risks. Future production research should also attempt to objectively measure the quality of hay and grain products from reclaimed phosphatic clay soils.

* Total production costs discussed in this report are understated because land reclamation and preparation costs allocable to agricultural production or rental rates are not addressed. For milo, wheat and soybeans, imposition of a modest land charge would result in negative returns.

* Production costs and yields should be viewed as tentative because they were derived from relatively small research trials over a relatively short time period. Expansion to a commercial scale and adoption of no-till or minimum tillage system may yield different results.

In conclusion, this study indicates that there is a ready Florida market for the feedstuffs examined. Based upon the limited cost and yield data, there appears to be greatest promise for economical production of corn and alfalfa. However, as cultural problems on reclaimed lands are solved and as additional data are obtained from research, costs and returns should be reexamined for all feed items.

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