AN ECONOMIC ANALYSIS OF THE INTERTEMPORAL MONETARY BENEFITS TO COAL LAND OWNERS IN EASTERN OKLAHOMA

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Introduction

Cattle ranchers and other owners of surface and mineral rights in Oklahoma have become increasingly aware of the personal financial, social and environmental risks involved in leasing those rights to coal mining operators. The Oklahoma Mining Lands Reclamation Act of 1971 and the Federal Surface Mine Reclamation Act of 1977 (PL 95-87), were designed to attain direct benefits for society (U.S. Gov't.). But these acts also are potentially useful in reducing personal risks to surface and mineral owners. As a result, their personal monetary benefits could be greatly enhanced.

Trading coal for non-coal land and outright sale of coal land to coal companies have become recognized recently as "riskless" alternatives to leasing coal lands. Although the level of information on these three options vary by counties in the study area, their combined use has increased and may be widely adopted in the future as they become more widely known.

Several studies have addressed the question of societal benefits and costs of reclaiming strip coal mines. Randall, et al., have concluded that

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although all residual costs cannot be internalized, social benefits have exceeded social costs under existing Kentucky reclamation regulations. (Randall). Increases in local tax revenue, population, employment, and competition for land may arise depending on the size of the coal development [Leistritz, 1973 and 1974, Supalla]. Environmental benefits to society, such as a reduction in soil erosion, could arise from successful reclamation (Obiechina). Some Indiana rural communities also have been adversely affected by changes in farming practices caused by coal development (Callahan).

The objective of the study is to estimate the optimal intertemporal wealth and discounted net cash returns to cattle ranching under three alternative surface and mineral rights strategies.

Selected Trends in Oklahoma Coal Industry

A brief picture of the dramatic changes in strip coal production and coal companies from 1975, a year after the arab oil embargo, is presented in Table 1. Coal output increased substantially in the state and all the selected counties between 1975-1978. The percent increase in coal output ranged from 56.70 in Rogers to 411.0 in Okmulgee. However between 1978-1979, coal output declined in the state and in all counties except Nowata. The decrease in output ranged from 26 percent in Craig to 40 percent in Rogers. The number of coal company operators reached a peak in May 1978, with the large companies operating multiple mines in more than one county. In 1979 many coal operators were forced to close due to the intensified reclamation regulations. As a result, the number of coal operators declined from 55 in 1978 to 31 in 1979. Nine coal companies went out of business in Rogers County alone.

Table 1: CHANGES IN OKLAHOMA STRIP COAL PRODUCTION AND NUMBER OF ACTIVE COAL COMPANY OPERATORS BY SELECTED COUNTY AND STATE TOTALS, 1974–1979.

COUNTY	COAL OUTPUT Million Short Tons						% CHANGE IN OUTPUT		NUMBER OF ACTIVE COAL OPERATORS				% CHANGE IN # COAL OPERATORS	
	1974	1975	1976	1977	1978	1979	1975-78	1978-79	1974	1975	1978	1979	1975-78	1978-79
CRAIG	0.88	1.25	2.14	2.50	2.30	1.70	+84.00	−26.00	3	5	6	3	+20.00	−50.00
OKMULGEE	0.00	0.09	0.22	0.37	0.46	0.33	+411.00	−28.26	0	1	9	3	+800.00	−67.00
NOWATA	0.01	0.04	0.10	0.26	0.14	0.42	+250.00	+200.00	1	1	4	1	+400.00	−75.00
ROGERS	1.00	0.67	0.50	0.84	1.05	0.63	+56.70	−40.00	4	8	14	5	+75.00	−64.00
STATE	2.40	2.90	3.60	5.30	5.40	4.78	+86.21	−11.00	12	29	55	31	+90.00	−44.00

SOURCE: Dept. of Mines, Chief Mines Inspector, ANNUAL REPORTS, and NEWSLETTERS, 1974-1979, Oklahoma City.

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Methodology

Four counties, Craig, Okmulgee, Nowata and Rogers, in eastern Oklahoma were selected for the study. Bituminous coal mined in this area has relatively low sulfur, low ash content and high British Thermal Units (BTU) per ton. The climate is variable with temperatures ranging from 0° F to 105° F. The average annual precipitation is between 38 and 48 inches. The topography is slightly sloping or nearly level. The soil type is class III and the major enterprise is cattle ranching.

Three classes of land were identified for the study, namely land A (coal land), land B (non-coal land) and land C (reclaimed land). Land A converts to land C after mining and reclamation and land B is improved pasture. Land A has native pasture but is replaced with improved pasture by the coal operators as land C. Prior to 1978, reclamation regulations required that the improved pasture established on land C be held out of use for a period of two years.[1] This period was said to be adequate for the soil to set and the pasture firmly established before grazing was allowed.

Cow-calf and pasture production budgets for land A in the pre-mining stage and for land B have been developed by the Agricultural Economics Department at Oklahoma State University, Stillwater. Cow-calf and pasture budgets for land C were based on modifications of land B budgets. Agronomists, animal scientists, and agricultural economists were involved in identifying production coefficients. The carrying capacity, hay production and the supply and demand of animal unit months (A.U.M.'s) for the three

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[1] The Public Law 95-87 amendments in 1978 require the land to be held out of agricultural production for a period of four years after reclamation and revegetation. Agricultural Extension Specialists and others feel this period is too long.

land classes are presented in Table 2. Above average management and fall calving are assumed. The ranchers in this study do not use hired labor because of the small size of their operation and the preference of area workers for jobs in the coal fields. Land C carrying capacity of 5 acres per head was obtained from survey results. However the same land without mining but replaced with improved pasture would require only 3 acres per head.

Two multi-period linear programming models were used to identify optimal strategies associated with leasing, selling, or trading coal land. The introduction of the three alternatives to surface and mineral right transfers necessitated the use of a model with a 40-year planning horizon. The planning horizon was divided into five time periods - years 1, 2, 3, 4, and 5-40. The first four years are required to incorporate a four year mining lease that consists of two years' mining plus a two-year required "hold back" period before reclaimed land can be utilized for grazing. The first model (OBJ 1) maximizes the total wealth. It was assumed that land A appreciates at 10 percent, lands B and C appreciate at 12 percent, and surplus cash can be invested at 8 percent annually. The second model (OBJ 2) maximizes the present value of discounted cash returns from the ranch business. A discount rate of 10 percent was utilized.

Six broad categories of resource restrictions are used in each period of the model, namely land, wealth, cash, labor, pasture and hay. The wealth and cash restrictions are the special features in OBJ 1 designed to estimate wealth (WLTH). WLTH A, B and C are attributed to land A, B and C. Cash is defined as CASH (cash at hand) and CFMLVG (cash for family living). CASH represents the net cash returns to the different activities in the model. CFMLVG starts at $8,000 and is increased by 8% per year. Similarly the activities in each period include family living

Table 2: COMPARATIVE CARRYING CAPACITY, HAY PRODUCTION, SUPPLY OF AND DEMAND FOR A.U.M.'s FOR THE THREE LAND CLASSES.

LAND CLASS (1)	ACRES/HEAD (2)	NUMBER HEADS (3)	HAY PRODUCED (tons) (4)	PASTURE (5)	SUPPLY A.U.M.			DEMAND A.U.M.		
					OCT.-MAR. (6)	APR.-SEPT. (7)	TOTAL (8)	OCT.-MAR. (9)	APR.-SEPT. (10)	TOTAL[a] (11)
LAND A	8.0	1.12	---	Native	0.46	0.75	1.21	7.80	6.45	15.96
LAND B	3.0	1.12	0.50	Fescue/Bermuda	2.40	5.50	7.90	6.00	6.00	13.44
LAND C	5.0	1.12	0.28	Fescue/Bermuda	1.34	3.07	4.41	6.00	6.00	13.44

[a] Total Demand=Col. 3x(Col 9 + Col 10)

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expenses and transfer columns for accumulated wealth and cash. Wealth is expected to appreciate at the rate of 10% for land A, 12% for land B and C and 8% for cash, per year. In OBJ 2, the WLTH and CASH features are deleted. The OBJ values are discounted net cash returns. CFMLVG is calculated period by period as follows:

$$PV = C + \frac{C(1.08)}{1.1} + \frac{C(1.08)^2}{(1.1)^2} + \frac{C(1.08)^3}{(1.1)^3} + \sum_{t=4}^{39} \frac{C(1.08)^t}{(1.1)^t}$$

where:

PV = present value of cash for family living

C = $8,000 (starting cash) for current period

t = 4, 5, 6, 7 . . . 39 years

Empirical Results

Survey results showing representative or typical area data are in Table 3. Three types of mineral right transfers between coal company operators and land owners are practiced. About 72% of those interviewed leased their land for two years to the coal company; 17% traded one acre of coal land (Land A) for 2.5 acres of non-coal land (Land B) or one acre of coal land (Land A) for four acres of reclaimed land (Land C); and, 11% had an outright sale of the surface and mineral rights to the coal operators. Coal output was estimated at 2,000 tons per acre at a royalty payment of one dollar per ton. This coincides with an average coal seam of 18 inches. One of every three acres mined was reclaimed. The market or dollar value of trading depends on the bargaining skill of the mineral rights owner. An acre of coal land (sell 1) sells for $2,000 while an acre of reclaimed land (sell 2) sells for $400.

Table 3: TYPE OF MINERAL TRANSFERS, ACRES INVOLVED AND ROYALTY FOR OKLAHOMA COAL MINING OPERATIONS, 1974-1979.[a]

Mineral Transfer	Share	Mined (acres)	Reclaimed (acres)	Period	Royalty	Coal/Acre	Ratio Trade
Lease	72.0	100	35	1970-79	$1.00/ton	2,000 ton	---
Trade A for B	17.0	---	--	1970-79	---	---	1:2.5
Trade A for C				1970-79	---	---	1:4.0
Sell 1	11.0	---	--	1970-79	$2,000/acre	---	---
Sell 2	--	---	--	1970-79	$400/acre	---	---

[a] Data obtained from 1978 and 1979 survey of land owners and coal company operators.

The optimal wealth and discounted net cash return including selected activities and resources obtained from the solutions to the linear programming models are presented in Table 4. Total increase in wealth from land and cattle is $19.5 million. In OBJ 1, thirty head of cow-calf units are grazed on eighty-four acres of the best pasture (land B). All land A is either traded or leased out in the first period. Thus land C increased by 263 acres in the first period and by thirty-four acres in the final period. Total land, therefore, increased from 332 acres to 529 acres. Four hundred and forty-five acres of this total is not grazed mainly due to labor limitation.

The present value of the discounted net cash return from operating land and cattle is $319,000. This is a return to land, capital, overhead, operator's labor, risk and management. In OBJ 2, thirty head of cow-calf units are grazed on eighty-four acres of pasture B, per period. However all 100 acres of land A are leased out in the first period and received back as land C but not grazed in the final period. The leasing of land to a coal company represents a transfer of land between land classes but does not increase total acres owned.

Summary and Conclusions

The result of the study indicate that significant personal monetary benefits are realized by surface and mineral right owners if they trade and/or lease their coal land to reliable and financially sound coal company operators. Reclamation regulations which lead to restoration of land A to its former productive capacity or better enhances this personal monetary benefit. Such improved reclaimed land may sell for as much as land

Table 4: Summary of Wealth and Discounted Net Cash Returns From Solutions to Models OBJ 1 and OBJ 2.

	Unit	Initial Resource	OBJ 1: Wealth					OBJ 2: Discounted Net Cash Return				
Period	Year		1	2	3	4	5-40	1	2	3	4	5-40
OBJ Value	dol(000)						19,518.42					319.30
Accumulated With	dol(000)		339.43	375.20	414.25	456.94	19,518.42					
Disc. Net Cash Return	dol(000)											319.30
Activity:												
Livestock	head		30.17	30.17	30.17	30.17	30.17	30.17	30.17	30.17	30.17	30.17
Resource Use:												
Land A	ac	100.00										
Pasture	ac		—	—	—	—	—	—	—	—	—	—
Trade A for B	ac		—	—	—	—	—	—	—	—	—	—
Trade A for C	ac		65.85	—	—	—	—	—	—	—	—	—
Lease out A	ac		34.15	34.15	34.15	34.15	—	100.00	100.00	100.00	100.00	—
Sell A	ac		—	—	—	—	—	—	—	—	—	—
Total	ac		100.00	34.15	34.15	34.15	—	100.00	100.00	100.00	100.00	—
Land B	ac	197.00										
Pasture	ac		84.47	84.47	84.47	84.47	84.47	84.47	84.47	84.47	84.47	84.47
Trade A for B	ac		—	—	—	—	—	—	—	—	—	—
Rent in B	ac		—	—	—	—	—	—	—	—	—	—
Non-Use	ac		112.53	112.53	112.53	112.53	112.53	112.53	112.53	112.53	112.53	112.53
Total	ac		197.00	197.00	197.00	197.00	197.00	197.00	197.00	197.00	197.00	197.00
Land C	ac	35.00										
Pasture	ac		—	—	—	—	—	—	—	—	—	—
Trade A for C	ac		263.38	—	—	—	—	—	—	—	—	—
Non-Use	ac		35.00	298.38	298.38	298.38	332.53	35.00	35.00	35.00	35.00	135.00
Total	ac		298.38	298.38	298.38	298.38	332.53	35.00	35.00	35.00	35.00	135.00
Land Summary												
Grazed	ac		84.47	84.47	84.47	84.47	84.47	84.47	84.47	84.47	84.47	84.47
Non-Grazed	ac		445.06	445.06	445.06	445.06	445.06	247.53	247.53	247.53	247.53	247.53
Total	ac	332.00	529.53	529.53	529.53	529.53	529.53	332.00	332.00	332.00	332.00	332.00

B per acre. However, a high foreclosure rate for the smaller coal compa-
nies unable to cope with the new reclamation laws and unsuccessful/
incomplete reclamation may jeopardize the basic livelihood of mineral
right owners if the land was leased. A great advantage of trading over
leasing and selling is that it avoids capital gains tax and the higher
price of replacing the land sold to the coal companies. Land prices in
the coal producing areas have been found to be higher than in the
surrounding non-coal areas. As long as the larger coal companies have a
backlog of own reclaimed land to be traded, trading may be to the mutual
benefit of buyer and seller.

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