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# Agriculture and Strip Coal Mining

By George H. Walter

*Strip coal mining does not cover much land area. Yet these operations produced about one-sixth of the total coal production of the United States in 1945. At the same time the mining operations have repercussions on the farms, the farm families, and the communities in the local areas.*

STRIP coal mining is a rapidly expanding industry competing with agriculture for the use of lands that are underlain by suitable coal deposits. Although this method of mining has been practiced for many years, it was not until the development of the steam shovel that the industry became of major importance. World War I was a great stimulus to the small industry. Later, the development of the huge electric stripping shovels and draglines made it possible to strip-mine coal of greater depth. This fact increased the acreage of land in which the companies could operate and increased the size of the industry. The low labor requirement of strip mines per ton of coal produced as compared with shaft mines gave it further impetus in World War II when labor became critically scarce.

As the industry grew and its operations removed ever-increasing areas from agricultural uses, the conflicts in the interests of the strip-coal companies and the local people became increasingly evident. To date, at least five States have passed legislation to regulate the activities of strip coal-mining companies. Proposals for regulatory legislation have been considered by the legislatures of at least as many other States. These laws and proposals usually contain provisions both for regulation and licensing of mining operations and for requiring certain types of rehabilitation work on the stripped areas. Methods proposed or required differ greatly. They often indicate lack of understanding of the real problems involved or indicate the wishes of special interests—those of strip-coal companies, or their competitors, or persons who are opposed to stripping for other reasons.

Lack of sufficient information and understanding about the great variety of conditions under which strip coal mining is done is partially responsible for the diversity of the proposals for legislative regulation. In many cases, a more

complete knowledge of the real situation would assist materially in working out mutually satisfactory solutions to problems arising out of coal-stripping operations. The following discussion of some of the problems and conditions indicates the complexity of the subject and the need for further study of a land-use problem which, although small so far as acreage affected is concerned, may have serious social effects in those areas where the coal-stripping activities are concentrated. Any future study of strip coal mining and its relationships with agriculture should consider the implications of these activities from both the private and the public viewpoint.

## Current Situation

In areas where seams of coal lie relatively close to the surface, strip coal mining competes with agriculture for the use of the land. Coal is mined by the open-cut or stripping process in about half of the States and is an especially important industry in Pennsylvania, Illinois, Indiana, West Virginia, and Ohio, where large tonnages are currently produced by this method. About one-sixth of the total coal production for the Nation is now coming from strip coal mines.

Strip coal companies are gradually acquiring title, leases, or options for future mining operations wherever land has coal of suitable quality located not more than 75 feet below the surface. This involves much agricultural land. In some areas even deeper deposits are being mined by the stripping method and future development of new types of equipment may increase the maximum depth for economical stripping operations. The maximum depth economically profitable depends on the thickness of the coal seam. An acre of land underlain by a coal deposit 1 foot thick would contain about 1,800 tons of raw coal. Economically strippable coal deposits usually range from about 2 feet to more than 12 feet in thickness.

The average strip mine recovers about 6,000 tons of coal per acre stripped, indicating an average thickness of about 4 feet for the coal seams stripped.

Mining of an acre of coal by the stripping process usually removes considerably more than an acre of land from agricultural use. In the eastern strip-coal fields of Pennsylvania, Ohio, and West Virginia, the areas of strippable coal are often strips around the sides of hills at the level of the coal outcrop. Here the overburden, as the rock and soil covering the coal is called, is usually pushed downhill as the coal is uncovered by the first cut in the stripping process. If the slope of the hill will permit later parallel cuts to be made exposing more coal without removing an excessive depth of overburden, the material from the second cut is placed where the first cut was made. Stripping covers up some land where coal is not mined and often leaves small hilltops cut off or inaccessible for agricultural uses.

Strippable coal deposits in Illinois and Indiana are usually in relatively level and compact areas containing as much as several thousand acres. As operations in these areas continue in parallel cuts until the strippable area is exhausted, proportionally less acreage of agricultural land not underlain by coal is disturbed physically by the stripping operations. Because of their compactness and relatively large size, these operations, in some cases, may have equal or more serious effects than the stripping operations on hillsides.

The coal companies seldom have much difficulty in obtaining the rights to strip-coal lands. Where most or all of a tract of farm land is underlain by coal, the companies usually purchase title to the land. They may pay as much as \$500 per acre for the property; the price usually depends on the thickness of the coal seam, its location, and the bargaining position of the seller. If the quantity of strippable coal is quite uncertain or if only a small part of a farm is underlain by strippable coal, a royalty lease may be made providing for a payment to the landowner of from 5 to 25 cents per ton of coal removed. Total payments per acre of coal are often higher from a royalty lease than from a purchase of the land title, but the payment per acre disturbed by operations may reduce the advantage of leasing over selling. To assure themselves of a future supply of strippable coal, companies secure options or purchase coal

rights far in advance of actual stripping operations.

The agricultural value of lands underlain by strippable coal vary greatly. Many of the strippable areas that have been worked in the Eastern States were either forest or pasture lands. The strip-coal deposits of southern Indiana and southern Illinois usually are under relatively poor clay-pan soils. In contrast, some of the areas being stripped in western and northern Illinois contain very highly productive prairie soils. Most of the strip-coal deposits of Missouri and Kansas are under medium to low-grade agricultural lands.

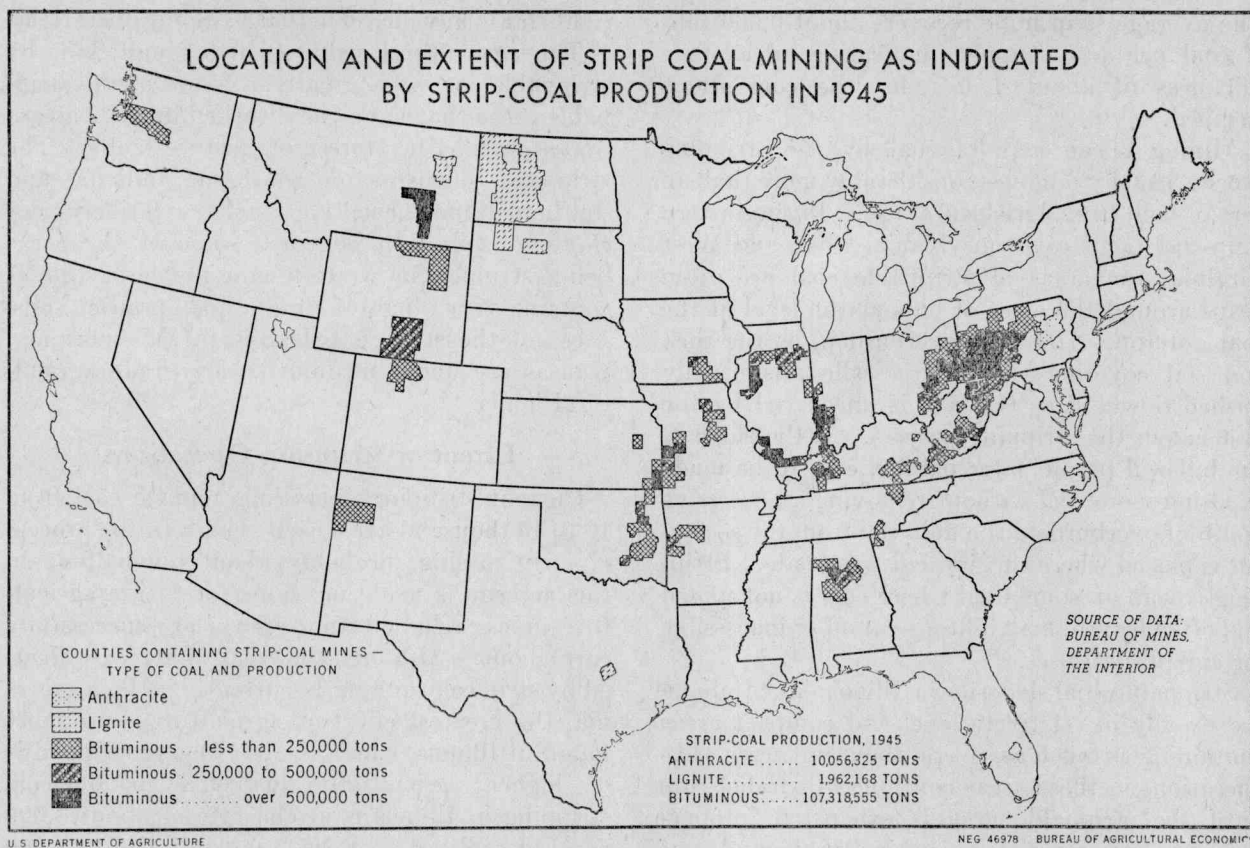
### Extent of Stripping Operations

Current stripping operations remove coal from 10 to 15 thousand acres each year. In the process of strip mining, probably about one-half again this acreage is made unusable for future agriculture unless rehabilitation efforts are successfully carried out. Although the greatest acreage affected by strip coal mining is currently in Pennsylvania, the greatest effect on agriculture is probably found in Illinois, where the land being stripped is of higher agricultural quality. Current coal stripping in Illinois is at the rate of about 3,000 acres of coal per year, with possibly 500 to 1,000 additional acres changed from agricultural to mining uses in the stripping process. About two-thirds of the Illinois lands now being stripped were in cultivated crops before they were bought by the coal companies. The remaining third was primarily pasture. To date, about 38,000 acres have been stripped in this State.

The effect of removing these lands on the national or State agricultural production is negligible so far, when compared with the total production of any crop. The dollar value of the agricultural production from the land before the stripping would be far less than the value of the 6,000 tons per acre of coal obtained by stripping. In both cases, however, there are costs which must be subtracted from the gross income before proper comparisons can be made. Too, agricultural income is a re-occurring benefit, whereas coal stripping consumes almost the entire value of the land. No figures are available on costs of strip coal mining, so it is now impossible to assess from a public viewpoint the relative net benefits.

From the public standpoint, strip coal mining is an example of competition between producers of





**FIGURE 2**

two types of natural resources, both of which are currently in high demand. Strip coal mining is a means of utilizing coal resources which either could not be recovered by underground or shaft mining or, where they could be mined by an underground operation, only between half and two-thirds of the coal could be so recovered. Any social assessment of the merits of strip coal mining must consider whether current coal production is of greater importance than the continuous crop production from the strip-coal lands.

#### **Usual Effects on Immediate Locality**

Strippable coal deposits are usually concentrated in rather compact and limited areas where one or more valuable coal seams are near the surface. The importance of strip coal mining to the people in these limited localities greatly outweighs its importance on the national level. The physical nearness of stripping operations affects local people both financially and emotionally and it affects them as a community. Misinformation and the relative newness of large-scale stripping

operations have been responsible for many exaggerations and misstatements concerning the destructive effects to be expected on the local economies as a result of strip coal-mining operations. Groups representing coal interests stress the benefits of strip mining. Local farmers or civic groups usually stress the disadvantages to the group they represent. The public often becomes bewildered and may promote legislation without having sufficient basis for their efforts or sufficient evidence to guide them.

#### **Studies Made**

To understand better the conflicting interests when a currently more profitable land use, such as strip coal mining, displaces agricultural use, a detailed study of three important strip coal-mining areas in Illinois was undertaken jointly by the Illinois Agricultural Experiment Station and the Bureau of Agricultural Economics. The results indicated that (1) coal-stripping operations have several noteworthy local effects and (2) few of these will be felt very far beyond the

trading areas or vicinities in which the mines are located.

The widespread effects of strip coal mining include competition with shaft mining and other fuels, movements of population into areas to supply trained mining personnel, and associated effects on business. Local effects include a gradual decrease in farm production and farm employment as the land is stripped, associated changes in service industries, and changes in requirements in public services and costs.

### Early Effects

For any specific area in which a large-scale stripping operation is begun, the immediate effect is an influx of specialists to construct the mine plant usually known as a tippie, to operate the stripping and coal-processing machinery, and to make geological explorations to determine the exact limits of the coal deposits. Only a few farmers are displaced in these initial operations and they are often included among the local people employed in semi-skilled or unskilled jobs around the mine. Local concerns benefit from the influx of workers, the local purchase of supplies, and the increased employment of local people. Within a year, local taxing units benefit by additions to the assessment rolls of new construction and property of the coal companies.

Local farm people first notice the effect of the coal mining when lands are optioned for purchase by the coal companies. Speculation on coal possibilities may increase the local land values and have a disturbing effect on the communities. Farmers who have given options to mine their land no longer keep up improvements and are likely to lose interest in the community affairs. As mining progresses, it disrupts the neighborhood exchange of labor, road transportation, and school-district organization and operation in the areas adjoining and including the stripping operations.

### Farmer Displacement Slow

When coal companies option or purchase lands underlain by coal, they usually offer to pay more than the current value for purely agricultural lands in that neighborhood. As the farm-land owners seldom know the extent of the acreages underlain by strippable coal and as coal companies option many acreages that have questionable underlay, the effect is often to cause an

immediate inflation in farm land values in the vicinity of stripping operations. Owners who sell land often find it necessary to go some distance to buy other land at its agricultural value. There is also evidence of considerable speculation in land in areas adjoining or near strippable coal fields.

A typical large strip-coal mine in Illinois removes coal from under the equivalent of about one medium-sized farm per year. Operations at any one time follow coal deposits and normally cross parts of what have been several farms, but the rate of farmer displacement is relatively slow. The farmers are usually displaced so slowly that no major relocation problems occur.

A strip coal mine that has operated for several years will usually have completely stripped at least a part of the coal field. The boundaries of the coal deposits will be known and conditions will begin to stabilize. The unstripped portions of mine holdings are usually either rented to local farmers or farmed in connection with other land holdings of the coal companies or their officers, or they are left idle.

### Land Values and Taxes

As long as the coal companies continue to operate in the area, total taxes paid by coal companies on their holdings will continue to be greater than were the taxes paid on the acreage before the stripping. Values on lands not underlain by coal either return to the agricultural level or to a lower level that reflects the usual disinclination of prospective purchasers to own land near the spoil piles of strip mines.

When a strippable coal deposit becomes exhausted, the coal companies move on, removing their equipment and improvements. The remaining spoil piles and the final cuts where coal was removed have little productivity. In nearly every State, except Illinois, such stripped lands are reassessed after stripping at levels far below their former assessed values when in agricultural uses. Insofar as services, as for roads and schools, can be cut by corresponding amounts as a result of a reduction of needs, the reduced tax base would have no effect. Often, however, removal of the mining industry results in unemployment for these local workers until adjustments take place in population. Unless reorganization is carried through, school costs continue at high levels. Too often in the past roads that should have been



abandoned as unneeded have been replaced after the stripping is done, in their old location, with a resulting expense for continuing maintenance costs that is far in excess of their use value. Adjustments take time and add to the costs of local government during the transition period. Local people expect a larger part of the tax burden to be carried by the remaining nonstrip mine property in the area than the acreage carried before the operations.

As most farmers consider strip-mine spoil piles to be "poor neighbors," owners of adjoining farms often claim that their land values are lowered, thus causing them an uncompensated-for loss of equity value. These same landowners often fear that their taxes after the mining ceases will be increased to replace the revenue no longer obtainable from the strip-mine lands. Few of these owners recognize that although their claims regarding the future may be true, they benefit while the strip mines operate from lower tax rates than probably could be expected if the coal companies had not added materially to the tax base.

Abandonment of some local roads and schools in the mined areas may necessitate some reorganization of local government functions. Temporarily this may inconvenience local people but the final result may be to facilitate or speed up needed reorganization of local government functions.

### Possibilities of Rehabilitation

Farmers and other local people dislike to see good agricultural lands reduced to spoil piles. Objections to strip coal mining are usually more pronounced in areas where the land being stripped is relatively good cropland than in areas where stripping is largely in forest lands, pasture lands, or poor croplands. In nearly all areas, however, there is significant public support for requiring coal companies to rehabilitate lands after stripping operations have been completed. Coal companies often undertake some kind of rehabilitation efforts on the stripped areas.

Kinds of rehabilitation advocated range from requiring complete restoration of the original topography, including replacement of topsoil, to the less intensive practice of planting of the stripped areas to grass or trees. To date, efforts of the companies toward rehabilitating stripped areas have consisted primarily of planting trees. A few areas, especially in Illinois where soil con-

ditions are favorable, have been seeded to pasture. Such seedings have been made both on partially leveled spoil piles and on ungraded spoil piles. Some experimental leveling has also been done in Illinois and other States and a few companies have made limited experiments to learn the relative suitability of leveled, partially leveled, and unleveled spoil piles for field crops, pasture and hay, forest trees, orchards, and vineyards. A few stripped areas have been developed as recreational areas and as game refuges.

The type of machinery that has been used and the nature of the overburden greatly influence the selection of rehabilitation practices. When the entire layer of overburden is removed by an electric shovel, the roughness of the spoils increases with the depth of the coal. However, new methods of mining, involving tandem operations (a dragline and an electric shovel working together), often result both in more selective replacement of overburden with the rock covered by the finer soils formerly on top and in less rugged spoil piles. Areas where these new methods have been followed may offer far more favorable conditions for all types of rehabilitation measures. Future developments in mining methods will influence efforts toward rehabilitation.

Where the surface of the spoil piles contains a high proportion of soil materials with little rock or shale or toxic and acid pyrites, pastures can be developed within a few years after the surface is seeded to sweetclover and other legumes and to grasses. The same type of area is sometimes suitable for orchards, or vineyards, or forest. Whether partial leveling before these types of rehabilitation are undertaken is economically justified will depend on local conditions, including the nature of the spoil piles.

Spoil piles of a suitable physical nature can be profitably developed for pasture if they can be used in conjunction with adjoining cropland. Limited experience by farmers in Illinois, Indiana, and Ohio indicates that spoil-pile pastures are more suitable for beef cattle than for other types of domestic meat animals. Successful utilization of any pasture development often depends on whether adjoining landowners are interested in using such pastures for beef cattle.

For the many spoil banks that are left rough and rocky when the mining is finished, forest and wildlife are the most suitable uses. During the

last 25 years, coal companies have made forest-tree plantings on stripped areas with varying degrees of success. Other areas have been left to become reforested by nature. Early plantings were primarily of black locust, and later damage by borers was very destructive. Later plantings have included greater proportions of conifers. None of these conifers have reached maturity but some of the stands in southern Indiana and Illinois seem promising. Natural reseeding often results in thin stands, frequently containing a large proportion of cottonwood, intermixed with other locally common hardwoods. As reforestation requires no leveling it has been the most popular type of rehabilitation with the mining companies. Experimental research by the U. S. Forest Service, State conservation departments, and the coal companies, is under way in the North Central States to determine the types of trees best suited to each of the major types of spoil piles. Wildlife, both vegetative and animal, gradually develops in stripped areas that are not used for pasture but neither trees nor wildlife are likely to restock naturally in areas used for pasture.

In some cases, where strip mining has resulted in the development of artificial lakes, in the final cuts, or in roadways, or among the spoil piles, the tract has been developed for recreational uses by private or governmental units. Water is usually the principal attraction of these parks, for, so far, they have been in localities that lack natural lakes or other recreational outdoor places. The roughness of the spoil piles limits their attraction for hikers and hunters, and picnic parties usually prefer more developed sites.

Naturally revegetated spoil piles furnish suitable cover for wildlife. Where wildlife refuges are needed they could be further developed for such uses. A few areas, however, will not be suitable even for wildlife as their spoil piles contain acids or other toxic substances that limit or make impossible nearly all types of plant growth. Such piles will remain barren wastes until the toxic or acid substances have leached away. Fortunately, so far a relatively small proportion of the strip-mine spoil piles have been chemically unsuited to plant growth.

#### Leveling Activities

Only a few small stripped areas have been leveled and returned to farm uses. Strip coal-

mining companies have seldom leveled land they own after the coal has been removed. In a few known cases, farmers owning lands underlain by coal have permitted mining on a royalty agreement which also provided for the leveling of the spoil piles. The inclusion of this requirement reduced the royalty payments per ton of coal removed. It appears that these reductions in royalties have ranged from \$400 to \$1,000 per acre—amounts usually far in excess of the prevailing prices for other lands of comparable quality in the area. Coal companies claim that the cost of leveling is greater than the value of the resulting lands and, for this reason, they oppose legislation requiring them to level after the stripping is completed. Arguments advanced against leveling point out the high rock content of much of the overburden, the low nitrogen and organic matter content of the resulting soils, and the problems of drainage and settling. Where leveled areas have been planted to field crops or orchards, and a moderate quantity of nitrogen fertilizer has been used, results appear physically promising. Whether the production from leveled acreages can justify the cost is open to question. To date, the total area that has been leveled is probably less than 500 acres.

#### Conclusions

Strip coal mining is an extractive industry which will probably continue as long as suitable coal deposits exist. It is increasingly recognized by both companies and citizens that the industry has an obligation, however, to help so far as possible to minimize the effects of its operations on the people in the communities in which it operates. It is of importance not only to the local people and the coal companies but to the general public as well that the stripped lands be returned to an economically sound and productive use after mining operations cease. Society has the ability through legislation to protect the interests of any individuals or the public as a whole if future research discloses such need. Effort should be made, however, to avoid discriminatory or penalty legislation that is not in the interest of either the strip-coal companies or the public as a whole. In order to best serve all interested parties, considerable additional information and analyses must be obtained relative to the effects of coal-stripping operations and the practicable uses for stripped lands.