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THE STORY OF SOIL CONSERVATION IN THE SOUTH CAROLINA PIEDMONT 1800–1860

UNITED STATES DEPARTMENT OF AGRICULTURE

MISCELLANEOUS PUBLICATION No. 407

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THE STORY OF SOIL CONSERVATION IN THE SOUTH CAROLINA PIEDMONT 1800–1860

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CONTENTS

INTRODUCTION

The first permanent settlements in the Piedmont section of South Carolina were made in the period from 1740 to 1760. The first cotton gin was erected in 1795, and by 1808 a few of the old settlers already had noted that the soil was washing away much more rapidly than in former times.

The land was cultivated in the wasteful manner characteristic of pioneers. Land was plentiful. One could always clear another field or sell out and move elsewhere after wearing out the first farm. The introduction of cotton culture intensified this process of cropping and abandonment. The natural result of high prices for cotton, abundant land, and a limited supply of labor was to plant as much land and to make as large a crop as possible with the labor available. New lands were cleared, and old, depleted, eroded fields were abandoned on an ever widening scale.

The culture of cotton enabled many of the pioneer farmers to become prosperous, to acquire more land and more slaves. As living conditions improved, leisure increased and the farmers began to take on the ways of life and thought of the wealthy coastal planters, some of whom were settling among them. In their newly acquired leisure, they began, also, to observe the results of their practices. Before long they realized that a permanent agriculture would

[1] This publication was prepared under the direction of Miss Lois Olson, Head, Erosion History Section, Climatic and Physiographic Division, Soil Conservation Service. Acknowledgments are due W. H. Mills of the Department of Agricultural Economics and Rural Sociology, Clemson Agricultural College, Clemson, S. C., for helpful criticism and advice, and to Miss Helen Eddy for compiling the literature cited. The greater part of the material used was selected from the files of the Work Projects Administration Erosion History Project, 701–2–240, Columbia, S. C., which was sponsored and supervised by the Soil Conservation Service.

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not be possible unless radical changes were effected in the system of farming.

The situation faced by these early South Carolina farmers was, of course, not peculiar to that region or that period. Since the eighteenth century, farmers in every part of the country, encouraged by others interested in agriculture, have been striving to overcome old wasteful habits of cultivation inherited from the pioneer era and to adopt systems that would preserve the soil from erosion and other forms of depletion. Recent united effort of the farmers, as represented in the work of the Soil Conservation Service and cooperating State and Federal agencies, is but a more effective continuation of the earlier attempts.

Craven (*26*) [2] has shown that in Virginia and Maryland, a staple-crop economy based on tobacco caused soil exhaustion and land abandonment and was followed by the adoption of more intensive farming and by soil-conserving practices. Detailed accounts of attempts to conserve the soil in Virginia, one of the oldest States, and in Oklahoma, one of the newest, have been described in two recent bulletins (*42*, *54*) of the Soil Conservation Service.

The present bulletin is an analytical account of some of these early attempts to conserve the soil in a region where cotton was the staple crop and water erosion the principal form of soil exhaustion (fig. 1).

THE AGRICULTURAL REFORM MOVEMENT IN THE SOUTH CAROLINA PIEDMONT, 1800–1860

Before cotton became the staple crop, a large portion of the area under cultivation in the South Carolina Piedmont lay on relatively flat uplands or along the flood plains of the streams. As the production of cotton increased, more of the rolling uplands were brought under cultivation. The earliest accounts of erosion and exhaustion date from this period.

The first men to till the rolling uplands of the Piedmont were not long in discovering the erosion hazards of the region. The upland areas generally began to show the effects of washing as soon as the forest litter, roots, and stumps had had time to decay, that is, the second or third year after clearing (*2*, *p. 235*). In 1802, F. A. Michaux (*56*, *p. 297*) observed that the Piedmont uplands were considered of inferior value and were soon worn out. He noted that those who cultivated uplands were forced repeatedly to clear new fields, with the result that many migrated to the cheaper and supposedly more fertile lands in the West.

The extent of the damage from erosion and the concern felt about it by 1818 was expressed by William R. Davie (*30*, *p. 218*), president of the first State-wide agricultural society in South Carolina, as follows:

> Large quantities of land have been cleared within the last twenty years, and a new tax was now imposed on the strength of the soil, compelled to bear alternate crops of corn and cotton, or successive crops of the latter. This system, if it may be so called, of perpetual exhaustion, has impoverished our lands to an alarming degree, and, if pursued for half

[2] Italic numbers in parentheses refer to Literature Cited, p. 31.

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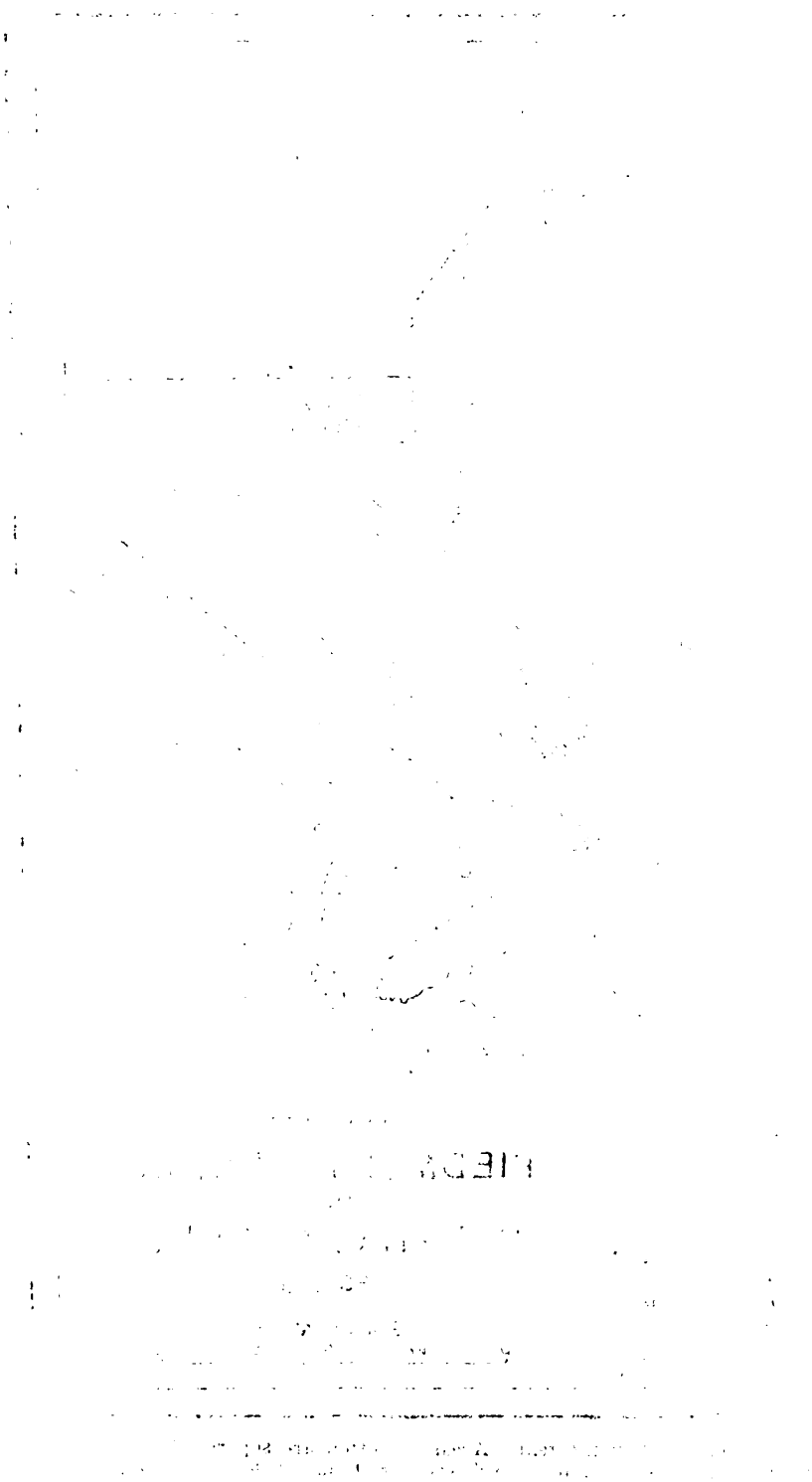

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> a century more, would make this interesting portion of the state [the Piedmont] a perfect desert—exhibiting a naked barren surface, spotted here and there by a few patches of broomstraw, or starved shrubbery, and ruined from future recovery by deep washed gullies, the permanent and accusing witnesses of our apathy and indolence.

The loss of citizens to the newer States and Territories was an especial cause for alarm on the part of public-spirited persons (fig. 2). According to one writer (*57, p. 527*):

> This disposition to emigrate originated from three causes; first from the wearing out of the lands; second, from the increase of families, (requiring more land,) third, from inclination to wander, arising from exaggerated descriptions of new and better countries, which operate like a talisman upon the minds of many, particularly the more idle part of mankind.

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FIGURE 2.—In the wake of migration. Before the Civil War this was the home of a well-to-do planter.

In 1827, an observer near Augusta, Ga., saw "hordes" of cotton planters with their Negroes bound from the Carolinas and Georgia to the Gulf States "where the cotton lands [were] not worn out" (*64, v. 1, pp. 284–285*).

The farming, characteristic of the period—tillage with light one-horse plows, cultivation in straight rows regardless of topography, failure to use crop rotations, neglect of manuring—caused erosion, rapid declines in yields, and constant shifting from old to new fields and from the older Atlantic region to the newer Gulf region. Much land was "scratched over," to use a phrase current at the time, and left as worn out or exhausted.

A word of explanation is necessary regarding the use of the terms "worn out" and "exhausted" by the writers of the period. Since land was abundant, there was a tendency to farm superficially and to declare fields worn out merely because they were less productive

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than the adjacent strips of virgin timber or the newer lands in the West. A considerable acreage of abandoned land was ruined completely for agriculture by sheet wash and gullying, but over much greater areas, once under cultivation, this was not the case. Under later and more intensive methods of cultivation, these supposedly worn-out lands were found to be productive still. The volunteer growth of grasses, shrubs, and trees that came up on the old abandoned fields, and slowly renewed the soil, was in part responsible for this new productivity.

Table 1 shows that the proportion of the land under cultivation at any one time was comparatively small. In 1825, just 2 years before the observer at Augusta, Ga., noticed Carolina cotton planters fleeing from "worn-out" lands, only 8.5 percent of the South Carolina Piedmont was estimated to be under cultivation. The highest recorded percentage of improved land (cleared land used for grazing, grass, tillage, or fallow) at any one time before the Civil War was but 33.3 percent in 1860.

TABLE 1.—*Cleared, cultivated, or improved land in the South Carolina Piedmont* [1] *in percentage of total land area* [2]

Year	Percentage of total land area	Remarks
1808	12.5	Estimated cleared land.[3]
1825	8.5	Estimated acres in cultivation.[4]
1850	31.0	Improved land (cleared land used for grazing, grass, tillage, or now fallow).[5]
1860	33.3	Do.[6]

[1] By 1830, the South Carolina Piedmont had been divided into the following districts: Edgefield, Newberry, Fairfield, Lancaster, Abbeville, Laurens, Union, Chester, York, Anderson, Pickens, Greenville, and Spartanburg (fig. 1).

[2] The percentage for 1825 does not include land cleared and not in cultivation. The corresponding figure for that year logically would be between 12.5 percent for 1808 and 31 percent for 1850.

[3] From Ramsay (*69, v. 2, p. 599*).

[4] From Mills (*57, p. 211*).

[5] From U. S. Census Office (*85, table 11, p. 345*).

[6] From U. S. Census Office (*86, v. 2, p. 128*).

The figures in the table, however, do not show the amount of farm land once cleared that was returned to woodland, pasture, or farm forest. Local observation would indicate that the greater part of the farm land in the Piedmont had been cleared and cultivated at one time or another before the Civil War, although there was some virgin timber left even in 1860.

The continued emigration to the new, competing cotton areas in the Gulf region, and the continued clearing of new acres in the Piedmont and their abandonment, led many of the more progressive agriculturists to express the belief that "we must improve or we must go West" (*14, p. 8; 30, p. 218*). They became convinced that the first alternative was practicable and from this conviction a reform movement in agriculture developed in the South Carolina Piedmont.

Agricultural societies and the agricultural press of the time grew from and were in turn the chief agents of the movement for reform in farming practices. The "wanton destruction," said one writer, called "loudly for a remedy which [could] only be obtained from agricultural societies and agricultural papers" (*89*). Improved methods, including erosion-control techniques, depended upon them for

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publicity and discussion. To a certain extent, the success or failure of the movement can be measured in the fortunes of these agents. For this reason it is well briefly to consider them.

The Agricultural Society of South Carolina, the second of its kind in the United States, was formed in Charleston in 1785. Its main interest was in the lower part of the State. The period of greatest activity of the societies in South Carolina, however, came after the first decade of the nineteenth century, paralleling similar developments in other parts of the country.

The first organization in the Piedmont was the Pendleton Farmers' Society, formed in 1815 by men originally from the low country. They were apparently in close contact with and influenced by the Charleston group.[3] By 1841, there were eight local organizations in the Piedmont section of the State, many of them having been organized that year. Short-lived State societies, with headquarters at Columbia, were organized in 1818, 1826, 1839, and 1855.

At one time or another, nearly every district in the Piedmont had its local society. Most of these societies had only an ephemeral existence. Others, like the Newberry Agricultural Society and the Monticello Planters' Society of Fairfield District, lasted for several years and had considerable influence. The Pendleton Society is still a flourishing organization.[4]

One outgrowth of the activities of these societies was the establishment of the State agricultural and geological surveys. South Carolina was one of the most consistent of the States in pursuing these enterprises. There were three surveys between 1843 and 1860. The first was conducted by Edmund Ruffin, well-known because of his successful experiments with marl in Virginia. The second and third surveys were conducted by Michael Tuomey and Oscar M. Lieber, respectively.

The first societies depended upon the local newspapers, and magazines outside of the State to publish their proceedings. Thus, the Pendleton Farmers' Society was first given wide publicity by the American Farmer, published at Baltimore, Md. An outlet nearer home was found in 1828 with the establishment of the Southern Agriculturist in Charleston, S. C. Under various titles and editors, this periodical continued until 1845. Five years later, George Seaborn, planter and active member of the Pendleton Society, and J. J. Gilman, Yankee school teacher, established the Farmer and Planter at the town of Pendleton, S. C.

The Southern Agriculturist of Charleston and the Farmer and Planter were the most important agricultural journals in the State before 1861, but at least four other farm magazines were published for short intervals during the same period. Two of these were fostered by R. M. Stokes, a publisher of Laurensville and Columbia, S. C., in cooperation with A. G. and William Summer, planters in Lexington and Newberry Districts. After the failure of his first two magazines, Stokes, with the editorial assistance of William Summer, brought the Farmer and Planter from Pendleton to Columbia, where he continued its publication from 1859 to 1861.

[3] The first president of the Pendleton Farmers' Society was Thomas Pinckney, Jr., whose grandmother, Eliza Lucas Pinckney, had introduced indigo culture into South Carolina.

[4] The hall of the Pendleton Farmers' Society, Pendleton, S. C., built in 1826–28, is presented on the cover of this bulletin.

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SOIL CONSERVATION THROUGH REVEGETATION

GRASSLANDS

In pre-colonial times, the mixed pine and hardwood forest of the Piedmont was sufficiently open to permit the growth of grasses and legumes. Canes seem to have predominated on the low grounds. The various forage plants formed the basis for the extensive range livestock industry that flourished in the colony. Cattle were allowed to graze through the woods and were rounded up periodically for branding and for driving to market at Charleston or northern cities (*50, p. 108; 52, pp. 7–8; 56, p. 299*).

Gradually, as the human and animal population increased, the range failed. The decrease in natural forage was beginning to be noticed in the early part of the nineteenth century (*57, p. 782*), and by the 1850's the once important range plants were to be found only in isolated spots inaccessible to cattle or in areas adjacent to the Blue Ridge (*52, p. 9; 62, p. [183]*). In 1836, James Davis (*31, p. 618*) of Richland and Fairfield Districts said that he could remember the time when "almost the whole surface of [South Carolina's] soil, especially in the upper country, was a rich natural meadow, of the most succulent and nutritious herbage and grasses." He believed it was "absurd to suppose" that the area could not again produce grass, but he feared that many native species had already become extinct.

The alteration in the natural environment meant distinct loss in terms of soil fertility. In 1841, a writer (*22, p. 231*) drew a vivid comparison of the native conditions with the conditions then prevalent. Quoting a pioneer who had come to Abbeville District about 1756, he said:

> "A walking stick might then with care be thrust far into the ground, and a wild turkey could be tracked a whole day, so mellow was the soil, and the pea vines, which grew thick, could be tied over a horses back."
>
> When [the writer continued] we contrast that description with the state of things as they are now found, the difference is great; for the properties which characterize the generality of land, that has been under tillage for any length of time, are great avidity for water, and sensitiveness to drought, tenacity and disposition to bake, which requires rapid workings, and more of them * * *.

As more and more attention was devoted to clean-tilled crops of cotton and corn, farmers began to regard grass as a pest to be rooted out, rather than as a resource to be fostered. Except for corn fodder, South Carolina's production of forage was small. By the third and fourth decades of the nineteenth century, hay was imported from the Northeastern States, and hogs and cattle were driven over the mountains from Kentucky to supply the plantation areas.[5] Under such conditions it was not hard for the farmer to accept the widespread opinion that the South was not a grass country.

In many instances, this view was merely a rationalization of the existing agricultural system. On the other hand it had some basis in fact, for, as the literature cited indicates, the soil over large areas had been altered by the removal of the organic layer and by the de-

[5] In 1852, a South Carolinian visiting in eastern Tennessee, where extensive meadows were to be seen, was looked upon with derision as being from a country where they "pulled fodder" (*16, p. 38*).

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terioration of soil structure as a result of tillage, and many native plants had become rare or extinct.

Progressive agriculturists such as James Davis hoped that by reestablishing grasses they would not only prevent erosion and restore the mellow character of the soil, but would render South Carolina independent of outside sources of livestock and feed. Such a course was difficult because it was confronted with the inertia of the average farmer, the tendency to increase rather than decrease the tilled areas, and the radical change that had already taken place in the natural environment.

Progressive farmers hoped, too, that the success of clover culture in the Northern States could be repeated in the Piedmont. White clover (*Trifolium repens* L.) had spread widely as a volunteer over the section (*57, p. 782*), but the adaptability of red clover (*Trifolium pratense* L.) to the southern climate was more in question (*78*). In 1802, "some pleasant meadow grounds" were to be found in Lancaster, Chester, and York Districts, and in the last-named district red clover was used in the meadow mixture (*35, p. 142*).

There are records of the successful culture of red clover by John E. Calhoun of Pendleton District, a group of farmers in Abbeville District, Henry M. Earle of Greenville District, T. J. Summer of Newberry District, and a few others. Calhoun found that the red clover came up and flourished 20 years after the original planting, even though various other crops had been raised on the land in the meantime (*24*). Those who raised clover to any extent sowed it either in the spring with oats or in the fall with oats, wheat, or rye.

The most successful clover culture in Abbeville District was on soil types now classed as Iredell, Mecklenburg, and Davidson (*49*). The first two are often called "blackjack lands." These soils were also found well-suited to clover in Chester District (*70, p. 93*). One Abbeville planter calculated that on his eroded and worn-out land 4½ acres of unmanured clover yielded more hay in bulk than he could get in fodder from 70 acres of corn, and the horses preferred the former to the latter. Furthermore, clover protected the rolling land upon which it grew from heavy rains in the spring of 1833, whereas surrounding lands were considerably damaged (*61, pp. 581–582*).

In spite of the encouragement given by these experiments, many farmers continued to believe that red clover was not of value in this region. True, on small, fertile lots and under high culture, especially in the blackjack lands, it yielded satisfactorily, but on the extensive uplands of most of the Piedmont, and under the ordinary methods of cultivation, it did not do well (*13; 20, p. 41, 41, pp. 232–233*).

In addition to red clover, some grasses were introduced from the Northern States. The most successful experiments with them were made in the districts adjacent to the Blue Ridge, notably by H. Montague Earle (*37*) and A. B. Crook (*27*). Various mixtures including clover, timothy (*Phleum pratense* L.), orchard grass (*Dactylis glomerata* L.), and redtop (*Agrostis spp.*) (*47*),[6] were used in these

[6] Redtop (*Agrostis spp.*) is also called herds-grass in the South, but not to be confused with timothy, the herds-grass of New England (*Phleum pratense L.*)

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districts (*16, pp. 39–40; 37, p. 93*). Sometimes these were mixed with the native grasses also. Redtop was a successful pasture grass not only in the upper districts, but on moist grounds in the lower Piedmont as well (*70, App., p. 9; 76, p. 80*).

While some farmers were attempting to adapt northern plants to the southern Piedmont, others were busy propagating native species or species introduced from warmer regions. In the early years of the nineteenth century, farmers of Pendleton District were cultivating a meadow grass they called red grass (*69, v. 2, p. 579*). During the growing season crabgrass or crop grass (*Digitaria sanguinalis* (L.) Scop.) was a pest with which the farmer had to contend, but after the crops were harvested it served as an important source of feed for the cattle. After harvest the fence rails were let down and cattle were allowed to graze the cultivated fields. Crabgrass and other weeds, supplemented by such forage as could be secured from woodland pastures, furnished the principal winter sustenance of cattle on many plantations. Crabgrass was also one of the principal sources of wild hay (*35, p. 142; 40, p. 273*).

One advocate of revegetation as a means of preventing erosion suggested that lucerne or alfalfa (*Medicago sativa* L.) be set in strips across hillsides, each strip having a fall sufficient to carry off the water. He also suggested Bermuda grass, or a grass closely resembling it, as an erosion preventive (*22, pp. 226–227*).

From ante bellum times to the present, Bermuda grass, sometimes called wire grass (*Cynodon dactylon* (L.) Pers.), has been recommended as a pasture grass and as a restorative for eroded fields, but it has always met with considerable opposition. The very characteristics that make it useful in soil preservation—its ability to spread and the tenacity with which it holds the soil—made it an object of suspicion and dread by planters of any clean-tilled crop. There was always the fear that if set on an untilled, eroded field, or in a pasture, it would soon claim the cultivated fields as well and render the entire plantation valueless.

When an enthusiast for improvement made bold to write to the Southern Cultivator in 1848 and 1849 suggesting the cultivation of the grass, the ensuing discussion by correspondents evoked as many suggestions for getting rid of it as commendations of its use. It was pointed out that many plantations in the Georgia Piedmont had been abandoned because of it. There were not many farmers like R. F. Simpson of the Pendleton locality who desired to make South Carolina a rival of the Blue Grass region of Kentucky by the propagation of Bermuda (*6, 48, 77*).

Somewhat similar was the experience with Johnson grass, or Means grass (*Sorghum halepense* (L.) Pers.). This was introduced (whether accidentally or by design is not definitely known) into the South Carolina Piedmont from the Mediterranean region in the early nineteenth century. It grew luxuriantly on the plantation of Governor John Hugh Means in Fairfield District, where it was valued for forage and grazing. Ten acres of bottom land set with Means grass on this plantation kept 70 head of cattle of all ages in excellent condition. Nevertheless, it was soon found to be an implacable enemy of cotton-

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fields (*15; 77, p. 41*). In a letter to his brother in the Southwest, in 1850, Means[7] declared:

> It would be impossible for me to sell my lands for any price that would be an inducement to me to sell, for the big grass has inspired such a terror that no one will even look at it. I have thought therefore that the best plan would be to cut it nearly all down to get the good out of it, & when the grass runs me off, then I must seek a home in the west, & then I will try to get near you.

James Davis was one of the principal advocates of native plants, as opposed to those introduced from the North. Most of his experiments in the culture of red clover, orchard grass, redtop, and the like, ended in failure, his only success with introduced grasses being with the greensward or Kentucky bluegrass (*Poa pratensis* L.), which he found to do well on stiff river-bottom land and which he recommended for sheep pastures. Davis concluded that attention should be turned to the indigenous plants that had once covered the region so luxuriantly. He advocated that farmers make a united effort to encourage plant exploration in their own neighborhoods to prevent native grasses and other plants from becoming entirely extinct. Although he did not want to discourage the introduction of foreign plants, he believed that such plants should come from the tropical and semitropical parts of the New World.[8]

The principal grass advocated by Davis was the gamagrass (*Tripsacum dactyloides* (L.) L.). He claimed that this grass would thrive on any site, upland or lowland, in the State, would make excellent forage, would prevent washing of the soil, and would restore the organic matter in the exhausted fields if allowed to grow for several years. Since the devotion of much time or money to grass culture was not to be expected of cotton planters, the gamagrass was well adapted to their needs because, said Davis, when once set it would propagate itself for years without further attention. Its principal draw-back was the difficulty of collecting the seed, but the need for this could be obviated by the use of root cuttings (*31*).

Gamagrass enjoyed considerable popularity in the 1830's. William Ellison found it growing in the bottoms of Dutchman's Creek in eastern Fairfield District and proclaimed its virtues. He received requests for seed and information about the grass from many persons in South Carolina and adjoining States.[9] Its cultivation was rather widespread throughout the Piedmont, but the enthusiasm with which

[7] John Hugh Means to William Burney Means, January 25, 1850. A copy of this letter was furnished through the courtesy of Miss Elizabeth D. English of the University of South Carolina Library. D. H. Eargle of the Soil Conservation Service says that in localities adjacent to the old Means plantation Johnson grass is now called "Mange grass." Although the term is obviously a corruption of "Means grass," it accurately describes the average farmer's opinion of the plant. The name "Johnson grass" is derived from a certain Col. Johnson of Alabama who is said to have secured seeds of the grass from Fairfield District.

[8] In many respects modern practice bears out Davis' contention. Witness the increasing use of plants native of warm climates or climates in other respects similar to that of the Southeast. Some of these plants are Dallis grass (*Paspatum dilatatum* Poir.). Bermuda grass, carpet grass (*Axonopus compressus* (Swartz) Beauv.), and the introduced lespedezas.

[9] Ellison claimed that he had converted a doubting public to gama's value. Yet, like Means, he feared that an extensive acreage of grass on his plantation would turn prospective buyers away. For this reason he did not cultivate gamagrass as Davis and others did, but merely fostered its natural growth (*39*).

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it was first greeted by progressive farmers had abated somewhat by the 1860's.

Rice cutgrass (*Leersia oryzoides* (L.) Swartz) was found on the marshy borders of streams, and was frequently used for hay when the land was firm enough for it to be mown. C. C. Pinckney, Jr., maintained an artificially flooded meadow of this grass near the town of Pendleton in the period of 1833–41, and in some years he secured hay at the rate of 4 tons to the acre. About the same time, Richard Sondley of Newberry District sold rice cutgrass hay on the Columbia market (*66*). This was another of James Davis' favorite grasses.

The Japan clover or common lespedeza (*Lespedeza striata* (Thunb.) H. and A.) was spreading inland from the seaboard in this period and was beginning to be noticed in the lower Piedmont a few years before the Civil War, but it did not attract general attention at that time (*25*).

Various other grasses were introduced or "discovered," received considerable notice in the agricultural press for a time, were tried and declared to be either godsends or humbugs, and were then to some extent forgotten. Such was the record of rescue grass (*Bromus catharticus* Vahl. (?)). It appears to have spread into the Southeastern States from the West under the name Texas oat. A certain Iverson of Georgia called it rescue grass, advertised its virtues widely, and is said to have made a large profit from the sale of the seed. Some who tried it found it to be a good winter forage grass, but the claims supporting it were so extravagant and the prices charged by Iverson were so high that farmers tended to be suspicious of it (*40, p. 274*).

In review, it is seen that these attempts to introduce hay and forage culture into an area devoted to cotton and corn were significant, although sporadic and ineffectual. The farm economy of the time and place contained two dominant elements that were unfavorable to grass crops, namely, clean tillage and comparatively short tenure. The farmer did not desire grass on any of his land because, on the one hand, he feared that it would spread to cottonfields while he was still the owner; and, on the other, he feared that the presence of grass would make difficult a sale of the land to other prospective cotton planters. There was indeed an impressive increase of 380 percent in the production of hay in the South Carolina Piedmont between 1839 and 1859, but the total amount produced even at the latter date was comparatively small. The area of improved land preserved from erosion by close-growing crops was comparatively small at any time, and the region continued to depend upon other sections for a good part of its meat and hay. The work of the ante bellum devotees of hay and pastures pointed out a way that few were to travel until recent times.

Forests

Throughout the Piedmont, especially in the districts nearest the Blue Ridge, there were bodies of virgin, uncleared land even at the time of the Civil War (*51, p. 97*). Nevertheless, clearing in areas regarded as fertile or accessible to markets progressed steadily.

As early as the period 1784–96, enough clearing had taken place in the Piedmont for the effects to be noticeable along the lower course of the Santee River. The unprecedented freshets of the period did

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great damage to the indigo and rice plantations along that stream and were attributed in part to forest clearing in the upper watershed (*69, v. 2, pp. 571–572*). Robert Mills and his collaborators (*57, pp. 491, 553, 653*) in 1825 commented upon "the rapid disappearance of our forest trees" and suggested that the farmers of Chester District follow the Pennsylvania Dutch practice of leaving the tops of the hills in woods in order to protect the valley bottoms from silting.

Upon removal of forest cover, valuable bottom lands were silted over and stream beds were choked. Farmers, in clearing their fields, threw trunks and limbs into the nearby small stream branches, causing these to become choked also. As a result clear swift streams, with fairly

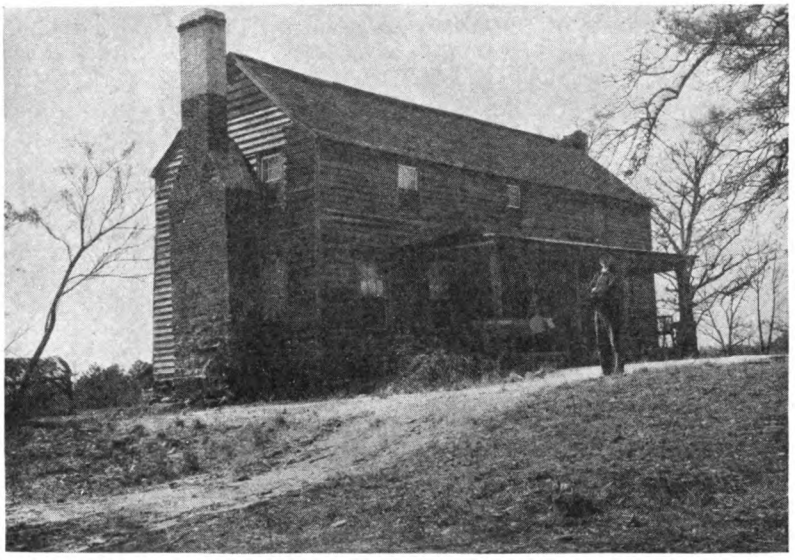

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FIGURE 3.—The Wylie plantation, Fairfield County, S. C., in the hands of the same family since shortly after the Revolution. This house, built about 1832, replaced an earlier one that stood in the creek bottom behind it. According to local tradition, clearing and cultivation of the creek watershed had caused the bottom to become so unhealthful that the move was necessary.

steady flow at all seasons, became muddy torrents in time of heavy rains and stagnant pools in time of dry weather, while bottom lands became swampy and unfit for cultivation.

Influenced by the very old belief that intermittent fever, that is, malaria, was produced by decaying vegetation and the presence of swampy areas, men declared that the silting of the streams and the presence of the rotting trunks and limbs in the stream courses had caused this malady to increase since colonial times (*70, pp. 95–97*). This idea occasionally found practical expression in the removal of an original home site from the valley bottom to an adjacent ridge (fig. 3).

When the belief in miasma was extended to cover the decaying forest litter in the remaining woodlands, the cause of soil and water conservation was not so well served. Burning the litter annually had

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been practiced by Indians and early settlers in the belief that this would improve the grazing for game and livestock. Later the custom was rationalized on the grounds that it would improve the health of the neighborhood. Even such a reputable conservationist as Judge O'Neall (*60, p. 109*) lent his support to this line of reasoning, and the custom continued to be widespread until recent years.

The necessity for securing rails for fencing caused the despoiling of much timberland. Colonial and early State fence laws recognized the importance of the range livestock business. The range was left unobstructed while the farmer was made responsible for fencing his cultivated fields against trespass by livestock. In order to constitute a lawful guard against trespass a fence was required to be 6 feet in height.

At the beginning of the nineteenth century the original Piedmont forest was still sufficiently widespread for oak and chestnut trees to be felled and split into rails almost along the line of the fence (*35, p. 114*). By the 1850's, however, the making of fences from disappearing woodland reserves was becoming a burden. Lieber said that many valuable plantations were being abandoned because they did not include enough timberland to keep up the fences. In parts of Chester District, for instance, woodlands were selling at double the value of cleared lands.

Lieber and others agitated for a repeal of the fence law. The arguments used were that many animals were lost by being allowed to roam at large, that pure breeds of livestock were difficult to maintain under the system, that no manure could be saved, and that the destruction of woodland necessary to keep up fences caused erosion and silting. All these arguments seemed to indicate that the fence law no longer met the needs of the community, but a reform in the law was to await the post bellum period (*5; 50, pp. 105–106, 124–129*).

William Summer (*80*) in 1859 wrote an "Essay on Reforesting the Country," in which he pointed out that it was unprofitable to cultivate much of the rolling land of the Piedmont because of its erodibility, and that only the level lands should be retained in cultivation, whereas the hilly lands should be retired to forest growth. To compensate for the lands retired, the remaining tilled lands should be worked more intensively by deeper plowing and manuring with green crops and leaves.

Summer observed the process of natural plant succession that was taking place on abandoned fields about him, and reasoned that man should aid this process. He believed that fields to be retired from cultivation should be sown down with small grain in the fall as a nurse crop for the young pines that would spring up naturally the following year. After a number of years, oak, hickory, dogwood, elm, holly, and red cedar would come in among the pine.

As a practical example of what could be done Summer described a deliberate attempt at reforestation that had been commenced in 1815 by Micajah Buchanan on steep lands facing Broad River, near Pomeria. Upon finding that these lands were eroding, Buchanan had sown them with acorns. By 1859 the resulting "new forest" was about 6 acres in size, and consisted of oak, pine, hickory, and dogwood. The three last-named types had been seeded naturally

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from the surrounding forest. The pines were 2 feet in diameter in 1859 and the oaks 22 to 23 inches.

Summer argued that the restored forests would renew soil fertility, as well as prevent washing. By retaining moisture in the soil they would also prevent the wide fluctuations between drought and flood then prevalent. The numerous small streams that had once flowed at all times of the year but that were then dry during certain seasons would be restored.[10]

There were probably few others who followed Summer's precept or Buchanan's example. The process of reforestation was indeed widespread, but was not deliberate on the part of the farmers, for eroded or depleted fields were thrown out of cultivation to reclaim themselves as best they might by second-growth pine (fig. 4).

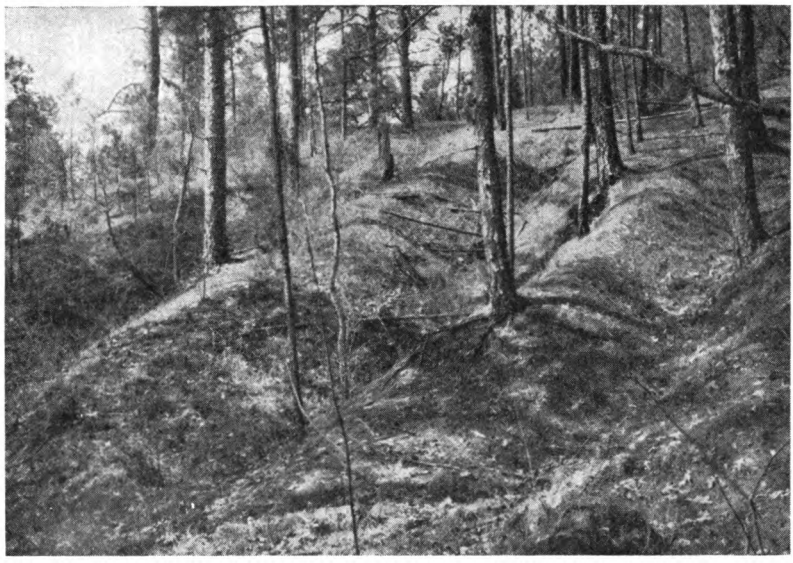

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FIGURE 4.—Old fields in the South Carolina Piedmont. The gullies, now healed over, are evidence of faulty tillage or neglect of the field after it was abandoned. The age of the pines (50–65 years) indicates the approximate time that the field has been out of cultivation.

DIVERSIFICATION AND THE MAINTENANCE OF SOIL FERTILITY

Although the introduction of cotton, the increasing use of slave labor, and the enlargement of landholdings wrought a profound change in the social and economic conditions of the Piedmont at the beginning of the nineteenth century, they did not bring about any essential change in the system of farm management. Both before and after the introduction of cotton, the object of the system was to obtain the greatest immediate return, regardless of the treat-

[10] In view of the soundness of most of Summer's paper we may overlook his contention that forests would increase the rainfall, an idea that has since been proven false.

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ment given the land. Methods of tillage, of planting and cultivation, and of caring for livestock that had originated in the pioneer era survived into the cotton era. The end result was a system that was not designed to maintain soil fertility or preserve the soil from erosion. From the standpoint of conservation the separate elements of the farm-management system were poorly integrated.

As Davie pointed out in 1818, cotton or corn was planted on the same fields years in succession, or the two crops occasionally were alternated if the soil seemed suitable. Often, wheat and oats, the two crops next in order of importance, were combined in rather haphazard rotations with the two tillage crops. Thus, by the 1840's, a rotation in widespread use consisted of first, 1 year of cotton; second, 1 year of corn; and third, small grain in the winter following the corn. Another common practice, in use especially in the districts near the mountains where cotton was not of such great importance, was simply to alternate corn and small grain. The other important field crop, cowpeas,[11] was customarily planted among the corn. This had been the practice since colonial times.

If a field began to decline in productivity, but was still well enough preserved from erosion to continue in cultivation, it was allowed to "rest" for one or more years. Sometimes a year of rest was included regularly in the rotation following the winter crop of small grain. As has been said, the fences of a cultivated field often were thrown down in the winter time so that the livestock could graze on it. Grazing was also allowed on the field when it was resting (*1, v. 1, pp. 448–450; 4, pp. 643–645; 8; 9*).

It is evident that these systems possessed resources for the conservation of soil, but that they were not used for this purpose. There were potential cover crops and green manures—small grains, the grasses and weeds of resting fields, and cowpeas; but the practices of grazing the fields and of planting cowpeas only in hills, or checks, with the corn nullified most of the good that might have been expected from these crops. In addition, the succession of cotton, corn, and small grain without other attempts to restore fertility was almost as exhausting as no rotation at all. The livestock was a potential source of manure for at least a part of the farm, but the free range allowed the animals prevented the manure from being conserved for use on croplands. It was the task of the agricultural reformers to demonstrate that each of these separate elements of a farming system could be made to support the others in building up fertility and preventing erosion.

Early thought on the subject of rotations and manuring showed the influence of John Taylor of Caroline County, Va. The main points of Taylor's system were: the "inclosing" of fields, that is, the strict separation of the tilled and the grazed parts of the farm, so that a plant cover could be kept on the resting fields; the plowing under of this cover, as well as pea vines and other green manures; and the confining of cattle in littered pens so that manure might be saved to spread on the fields (*81, pp. 78–84; 96, pp. 186–204*). South Carolina agriculturists adapted this system to their own needs (*30, p. 218; 57, p. 684*).

[11] The term "pea" as used in this publication, refers only to the cow-pea or pea of the South (*Vigna sinensis* (L.) Endl.) and not to the garden pea (*Pisum sativum* L.) or the field pea (*Pisum arvense* L.).

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In 1818, Thomas Pinckney, Jr., sowed barley, turnips, rye, and oats on fallow land, to be turned under in the spring as green manure. He also made compost heaps and urged farmers to keep cattle off old fields so that there would be a good growth of weeds to be plowed under. Few farmers kept enough livestock to make compost for the entire farm, said Pinckney, but the turning under of vegetable manure would supply the deficiency (*68*). The opinion expressed by Pinckney that barnyard composts would supply only a limited area of the farm was shared by many others. Even with improved methods that would enable him to keep a larger number of livestock, C. C. Pinckney, Jr., planned to apply barnyard manure to only one-eighth of his tilled land every year (*65, p. 341*).

In addition to spreading straw and cornstalks in the cattle pens to receive the dung, progressive farmers scoured the woods for oak leaves and pine needles for the purpose, but as the timbered area became smaller this resource failed (*53, pp. 154–155*). Nevertheless, the practice of making compost increased in popularity, and by 1853 Dr. O. R. Broyles (*20, p. 42*), of the Pendleton Society, found it necessary to restate the major recommendation of Thomas Pinckney, declaring that the plowing under of stubble, grass, and weeds was not only less laborious but more remunerative than making compost.

Outstanding among those who were successful with composts, as opposed to green manures, was Dr. John N. Herndon (*46*) of Newberry District. His compost was made up of the usual ingredients, with an occasional addition of guano. It was applied to the first crop of his rotation, corn interplanted with peas. The next crop was wheat or oats, manured with cottonseed or guano; the third was cotton, unmanured. This practice of manuring the grain crops but leaving the cotton unmanured was quite widely followed. Cottonseed, when used as a fertilizer, was applied chiefly to the small grains, and less generally to corn.

The men engaged in developing the new science of agricultural chemistry did not yet know about soil bacteria or nitrogen fixation, but practical farmers had long regarded leguminous plants as the best agents for obtaining what they called "atmospherical manure" (*81, pp. 84–94*). As we have seen, many southern farmers thought that red clover was not adapted to their climate, but nearly all regarded the cowpea as the "clover of the South" (fig. 5). The first members of the Pendleton Society resorted to pea-vine hay to supplement corn fodder and the open range (*59, pp. 138–140; 67, pp. 152–154*).

By the 1830's and 1840's, it was the accepted practice among better farmers to harvest only the pods when peas were interplanted with corn, leaving the vines to be turned under. If pea-vine hay was desired, a separate piece of land was devoted exclusively to peas, sown broadcast. The taking of the entire plant from the field was regarded by some as exhausting to the soil, but others considered that the land was benefited even when both pods and vines were removed (*11, p. 320; 21; 88, p. 453*).

Edmund Ruffin of Virginia (*72, p. 40*) admitted that he fully realized the value of peas as a manure only after seeing them used in South Carolina. The luxuriant crop of broadcast peas among the corn at Fort Hill, John C. Calhoun's home near Pendleton, suggested to Ruffin an improvement in the usual rotation. He advised the

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farmers of Pendleton District to change from the customary sequence of corn, small grain, and rest to one consisting of first, corn interplanted with peas; second, small grain; and third, peas alone sown broadcast. One of the pea crops in this course could be given to the land and the other used as fodder (*71, pp. 84–85*). Likewise, in Laurens District, where one of the principal rotations included cotton, corn, and small grain, a writer suggested that the course be: First, cotton; second, corn and peas; and third, small grain and clover mixed. A dressing of gypsum was recommended for clover (*8*). Previous to

(Courtesy Extension Service)

FIGURE 5.—Stacking cowpea hay on collapsible curing racks in the South Carolina Piedmont.

this, in 1839, William J. Alston (*3*) of the Monticello Planters' Society had demonstrated by experiment that the pea crop itself was greatly benefited when gypsum was applied.

H. Montague Earle of Greenville District successfully introduced both peas and clover into his rotation. He sowed the land to peas and followed this by clover sown in the fall with wheat or rye. When the clover was about 5 inches high he applied slaked lime to it. This system was similar to that practiced in the North (*37, pp. 92–93*). Earle and the few others who cultivated clover were about the only ones to introduce a winter legume into their rotations. Such crops as the vetches, Austrian winter peas, crimson clover, and bur-clover, that have come into increasing use in late years, were either unknown or not used for this purpose. Except for such cover as was provided by small grains and volunteer plants, the ground was left unprotected from the winter rains.

The results of Justus von Liebig's work in agricultural chemistry was first made known to South Carolina farmers through the agri-

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cultural surveyors, Tuomey and Lieber. Liebig's much-discussed theory that the object of manuring was to return to the soil the exact chemical constituents taken from it by the crop was laid before the public but was not acepted wholeheartedly either by the scientific surveyors or by the practical farmers. Opposition to the theories of Liebig was implied in the following statement by a Laurens District farmer (*13, p. 92*) made in 1857:

> Do vegetables impart to the soil any thing more than they have taken from the soil? * * * A mass of decaying vegetable matter, mixed intimately with the soil, is a chemical laboratory, in which more changes are going on than is, I suspect, dreampt of in our philosophy.

Some agriculturists seem to have thought that the State would benefit greatly by detailed analyses of soils, but the surveyors warned that this was not the only thing needful. Such analyses, said Lieber, could give the farmer nothing that he could not more readily obtain for himself by industry and common sense (*51, p. 97; 83, pp. 221–223, 231–232, 244*).

The question of the rightness or wrongness of Liebig's theory was an academic one for the ordinary farmer, but there were some who attempted to put the teachings of agricultural chemistry into practice. As has been said, cottonseed, used as a manure, was generally applied to small grain or corn. Lieber suggested a change in this practice. He said that the elements taken from the soil by the cotton crop should be returned directly to that crop in the form of the seed fertilizer. This was a feature of the system practiced by O. T. Haskell (*44*) about 1856.

Most of the compost made on Haskell's plantation was applied to galled spots in the fields, but all of the cottonseed was applied to the cotton crop. He employed two rotations, one for cotton land and one for grain land. On the cotton land the first crop was cowpeas the vines of which were turned under in preparation for the second, or cotton crop; another year of cotton followed, manured with the stalks and seed of the first cotton crop. Rye or wheat might be sown after the last year of cotton to prevent the land from washing. The first crop on the grain land was corn and peas. In order to prevent washing, planting was done in drills rather than in the customary checks. Corn and peas were followed by wheat, and, after the harvest, hogs and cattle were allowed on the field for a short time. The third year was devoted to rest, with no livestock on the field.

With the one exception noted, Haskell advocated keeping stock on separate permanent pastures, away from the tilled part of the plantation. Haskell also practiced subsoil plowing and hillside ditching. His system may not have measured up to that of some other farmers in certain particulars, but in general it represented the best practice of the time.

Sources for fertilizers other than compost, green manures, and cottonseed were rather limited before the Civil War. Edmund Ruffin's work stimulated interest in calcareous manures, and in the Coastal Plain where lime and marl were more readily available a number of experiments in their use were carried out.[12]

[12] Notably by J. H. Hammond of Silver Bluff plantation on the Savannah River.

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The limited supply of limestone in the Piedmont area tended to discourage its use there. When Alston made the experiments with gypsum and cowpeas cited above, he also attempted to get some lime for experiments, but found that none was available. In the report on his agricultural survey in 1843, Ruffin (*70, pp. 59–63*) enumerated several limestone localities in the Piedmont, but added that the price of burned lime was high at the quarries and that no interest was felt in its use for agricultural purposes. About 9 years after Ruffin's visit, a Laurens District farmer reported that he knew of no extensive use of lime on land in his neighborhood. Whether it would benefit the soil was still an open question thereabout (*33, p. 402*).

Peruvian guano came on the market about 1845 and the first manufactured fertilizers about 2 years later. Owing to the high cost of transportation they were used very little in the Piedmont (*82*). Even aside from this difficulty, many persons were suspicious of such fertilizers. It was felt that, with so many farmers neglecting other means of improvement nearer at hand, guano and manufactured fertilizers certainly could not be expected to cure the ills of southern agriculture (*51, p. 114*).

To what extent were better rotations and more thorough fertilization practiced and what were the general results obtained? An exact answer to either part of this question is impossible but such estimates of the production per acre of different crops as are available may shed some light on the problem. A general adoption of the practices advocated should have resulted in increases in the average production per acre, but the estimates do not indicate increases. The range in estimates of production per acre at any one time from 1820 through 1860 does not differ greatly from that of any other time within that period. It appears that the average production of ginned cotton per acre was from 100 to 250 pounds, and of corn from 10 to 50 bushels, corn production of course being much greater on bottom land than upland. The production of wheat was from 6 to 15 bushels, and of oats, from 6 to 30 bushels.[13]

Some individuals obtained yields greatly exceeding these amounts. For example, two farmers of Fairfield District, about 1825, made some 650 pounds of ginned cotton per acre by manuring. In 1850, 20 bushels of wheat per acre was sometimes produced in Laurens District with the aid of compost and cottonseed. Yields of from 50 to 75 bushels of corn were made on the best land or with the aid of manure. The stimulating example of the Pendleton Farmers' Society seems to have resulted in increased yields in that area, at least among the better farmers.

It was said that in southern Pickens District the 20 years preceding 1857 had witnessed considerable increases as a result of sowing peas and manuring. Whereas the former yield of wheat had been about 10 bushels, better farmers in 1857 were making from 32 to 44 bushels (*87, p. 76*). These examples indicate that there were a number of farmers who increased their individual yields by the use of improved methods; but on the other hand, the productivity per acre of the region as a whole remained about the same.

[13] These estimates are from the various sources cited and from the manuscript schedules of the Seventh and Eighth Censuses of the United States (1850 and 1860) deposited in the South Carolina State Library at Columbia, S. C.

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The advocates of crop rotation and manuring visualized a greater diversification of agriculture, as against full concentration on cotton. The prevalence of diversified agriculture in the region is, accordingly, another partial indication of the extent to which improved practices were adopted. Diversification found other strong support besides the conservation of soil to recommend it. Nearly every major crisis in economics, politics, and meteorology became an occasion for expressing these arguments. A few examples will suffice to illustrate this.

During the tariff nullification controversy in 1828 and 1829, the Anti-Tariff Agricultural Society of Broad River was formed in Fairfield District for the purpose of promoting self-sufficiency as a means of combatting the tariff (*18*). In other parts of the State, farmers were urged to buy no cattle or horses from States that had supported the protective tariff, and once again the advantages of the middle and upper parts of South Carolina as stock-raising regions were pointed out.

The continued low price of cotton for many years following the depression of 1837 caused planters to think of measures to restrict the crop or to seek other staples in place of cotton. Just as prosperity was returning, a great natural reduction in the crops was effected by the unprecedented drought of 1845. The cotton and corn crops were scarcely one-third of normal production that year, and farmers had great difficulty raising enough food or feed (*32*). Another period of drought came in the year 1860, accompanied by scarcity and admonitions to raise more wheat, oats, rye, barley, and turnips, rather than to concentrate on cotton and corn (*55*).

Talk of rotations, diversification, and more intensive farming also met with opposition, arising not only from the very human tendency to resist change, but also from conditions inherent in the economic system. In 1861, after some 40 years of agitation, far too many farmers continued to allow grazing on the cultivated fields, and to sow an exhausted cottonfield to wheat or oats for one season as their only concession toward a system of rotation (*14, p. 9*). Manuring was said to be unprofitable in view of the great reserves of virgin land beyond the mountains (*2, p. 236*). It was feared that rotations and green manuring would divert too much labor from the all-important cotton and corn (*29*). When urging one year of rest and one devoted to pea vines for every 3 years of grain and cotton, Edmund Ruffin (*72, p. 40*) often heard the exclamation: "What! lose two crops in every 5 years? I cannot afford to lose even one."

Such objections indicated that the average farmer was extremely reluctant to curtail his only money crop. Even in times of lowest price it would bring some cash, whereas there was little market demand for other crops. A few experimenters had attempted to draw attention to such exotic staples as vines, rice, or silk as a source of income; but in the Piedmont these were unsuccessful. Although South Carolina imported livestock and grains, it was believed generally that these did not offer prospects as sources of income. In the Piedmont nearly every farmer produced enough of them to fill at least a part of his own requirements. Thus, the local market was uncertain, and if the region attempted to produce for outside consumption, it would have to compete with regions better equipped and better established in livestock or grain production (*12, p. 44; 51, p. 106*).

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Even the most zealous reformers hesitated to recommend that cotton be abandoned altogether, but they did advocate its incorporation into a more balanced farm economy. In 1845, a committee of the State Agricultural Society opposed a scheme for boosting the price of cotton by crop reduction. The committeemen looked upon it as being impractical and against the best interests of the planter, but believed instead that a program of self-sufficiency on the farm and the introduction of manufactures would induce the return of prosperity (*74*).

One advocate of crop rotation and diversification looked with suspicion upon those who proposed restricting the cotton crop, fearing that these men either pursued the system of planting too much cotton themselves, or else did not plant at all. He declared (*12, pp. 44–45*):

> While we repudiate the principle of sacrificing Carolina's hills for Florida's hammocks, or Louisiana's bayous, solely for the purpose of increasing the capacity of our purses, we by no means condemn those heads of families who emigrate southward and westward to obtain the means of settling their children around them. So, in the cultivation of crops, we are opposed to the monopoly of "King Cotton", though equally averse to the exclusive cultivation of small grain and raising stock. Each deserves our attention, and no one more than the other should receive it.

In reality, agriculture was much more diversified before the Civil War than it has been since. W. H. Mills (*58, p. 177*) has said that "probably the decade, 1840 to 1850, saw the best balanced agriculture ever practiced in South Carolina." Apparently this decade saw the peak in the development of all-round farming, at least in the Piedmont. Table 2 indicates that even during this period and continuing until the eve of the Civil War there was a trend away from diversification in the region. While the per capita production of cotton increased considerably between 1839 and 1859, that of the principal provision crops—corn, oats, and wheat—declined or remained about the same. The per capita production of peas, beans, and potatoes increased, but they occupied only a small part of the entire cultivated area at all times.

The extension of railroad communication into the Piedmont in the late 1850's and after the War and the cheaper commercial fertilizers made available in the late nineteenth century rendered it profitable to extend cotton cultivation to new lands near the Blue Ridge and to bring old lands back into cotton cultivation again. All this paved the way for a one-crop exploitation overshadowing anything seen in the ante bellum period.

TABLE 2.—*Per capita production of principal crops, Piedmont districts of South Carolina, 1839, 1849, and 1859*[1]

Year	Cotton	Corn	Wheat	Oats	Peas and beans	Potatoes and sweet-potatoes
	Pounds	*Bushels*	*Bushels*	*Bushels*	*Bushels*	*Bushels*
1839	171.1	33.8	3.2	3.8	----------	1.3
1849	241.1	32.9	3.2	6.4	0.8	4.2
1859	226.3	25.8	3.5	2.2	2.1	4.0

[1] Data computed from the Sixth, Seventh, and Eighth Censuses of the United States (*84, 85, 86*).

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MECHANICAL EROSION-CONTROL PRACTICES

Plowing

The plow most commonly used by early southern farmers was a light, one-horse implement without a moldboard, called a shovel plow. It stirred the ground to a depth of only 2 or 3 inches. Such tilth afforded little absorptive capacity for the heavy rains that occurred during the growing season. It was customary to lay off straight furrows regardless of the topography of the field, and often the rows extended straight up and down the slope. Corn was planted in checks, or hills, with sufficient distance between them for cultivating in both directions. If the last cultivation happened to be up and down the slope, the erosion hazard was of course very great. The combination of shallow plowing and straight rows extending up and down slopes was especially harmful on the sloping lands of the Piedmont.

Rarely did an advocate of agricultural improvement speak or write on the subject without depreciating these practices. Attention was constantly directed to the very reasonable propositions that deep plowing, by increasing the absorptive capacity of the soil, would retard run-off and erosion in rainy seasons and afford moisture to the roots of plants in times of drought; and that it was the only practicable method of turning under green manures. One enthusiast also believed that, by allowing the atmosphere to penetrate to greater depth, greater facility was offered for chemical action and the process of soil formation (*20, pp. 6–9*). N. Herbemont of Columbia (*45*) made experiments with moistened earth in containers to prove to himself and his neighbors that loose earth would absorb a greater depth of water than compact earth.

Deep plowing necessitated the use of better implements than the ordinary light shovel plows. Two-horse plows with moldboards capable of turning the land completely over, such as the bar-share plow (fig. 6), were in use on plantations of wealthier men during the late eighteenth century, but they were expensive and were not available to farmers of ordinary means, even as late as the 1830's (*65, p. 342*).[14]

Another factor retarding the adoption of deep plowing was the fear of burying the topsoil with a layer of the relatively unproductive, clayey subsoil. In a region like the Piedmont where the topsoil was naturally thin over extensive areas, this objection seemed reasonable. To overcome it the practice of subsoil plowing was introduced.

The subsoiler was a long blade of iron that followed in the furrow behind the regular turning plow, penetrating and stirring the clay layer, but not bringing it to the surface. Subsoil coulters and subsoil plows were in use in Virginia by 1822 or earlier, but no reference to their use in the Piedmont of South Carolina before 1842 has been found (*53, p. 155*). In the late 1840's, Dr. Broyles developed a subsoil plow that attained rather wide popularity. It had a wing extending out from the lower end of the blade so that the subsoil on either side of the furrow could be broken. George Sea-

[14] Selected manuscript inventories of estates. Offices of clerks of court in the various South Carolina counties.

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born found in an experiment with this plow that a patch of land subsoiled yielded about 40 percent more corn than an equal area not subsoiled. However, Seaborn (*73*) remarked that even in as progressive a community as Pendleton few farmers were interested in experimenting with Broyles' plow. The experiences of Broyles and others indicated that subsoiling yielded best results on land underlain by stiff red clay, perhaps soils now classed in the Cecil series; but that wet lands, or lands underlain by sandy subsoils, did not profit by it (*36*).

Plowing on the contour, or "horizontally," was first practiced in South Carolina about 1815 or 1820, perhaps shortly after Thomas Jefferson and his son-in-law, T. M. Randolph, popularized it in Virginia. Those who tried contour plowing found that it made deep plowing much easier and aided materially in retaining the manure and the soil during rains.

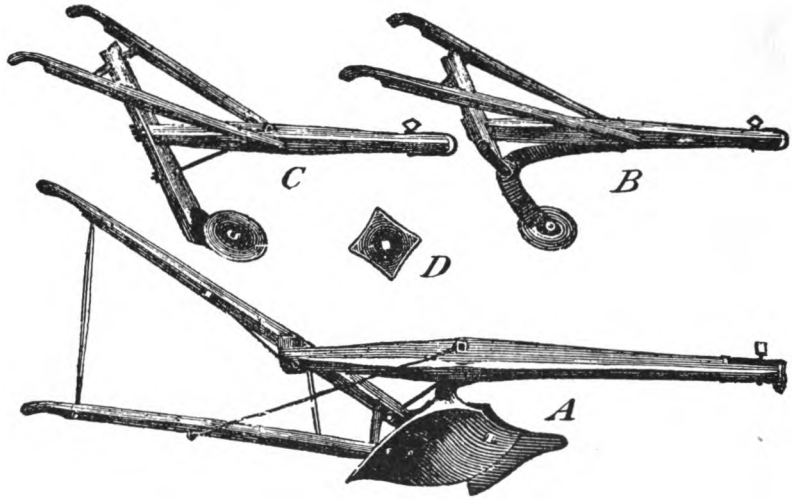

FIGURE 6.—Early plows; *A*, Bar-share plow; *B*, substratum or subsoil plow; *C*, shovel plow; *D*, square type shovel for plow.

A few devotees of the practice took care to lay their rows off exactly on the level, using the rafter level or "compass" for this purpose. This instrument was made of two rafters, or legs, fastened together at one end to form an angle and having a span of 12 to 16 feet between the other two ends. A crosspiece was fastened between the two legs about half way between apex and base, and a plumb line was suspended from the apex. As the instrument was "stepped" across the field, the contour was determined by keeping the plumb line exactly at a center mark on the crosspiece. The plow followed the course indicated by the rafter level in making a guide row, and other rows for 12 or 15 feet on either side were laid parallel to the guide row by the eye of the plowman (*75, pp. 388–389*).

Many farmers laid off their rows with great care, and swore by horizontal plowing as the chief means of erosion control. The opinion was by no means universal, however. If rows were run exactly on

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the contour, heavy rains were likely to fill the furrows to overflowing and cause breaks that would develop into gullies as the water swept downhill from one furrow to the next. In addition, on the comparatively short, steep slopes and narrow ridges of the Piedmont, accurate horizontal plowing at first was considered very difficult. For these reasons many men who had taken up the practice with enthusiasm later modified it or abandoned it altogether.

It seems that those who laid off rows accurately with an instrument composed only a minority of all who tried horizontal plowing in one form or another. To many horizontal plowing meant merely zigzag rows, on the theory that the more turns there were in a furrow, the more obstructions there would be to the descending water and the less erosion. Much supposedly horizontal plowing was inaccurate and ineffective because it was done with no other instrument than the plowman's eye.

A story illustrating it is that of the legendary "Horseshoe" Robinson [15] of Pickens District. After hearing a discussion among the members of the Pendleton Farmers' Society on the benefits of contouring, he determined to try it. It is said that he laid his entire crop out on the contour, or as near thereto "*as a plowman, at a lively pace, could come at it.*" Soon afterward he was asked if he had received any of the late heavy rains. He exclaimed, "'Yes, yes, and d—m your horrexantal plowin, I'm dun with it. Its ruined my ground wus than if you'd turned Savany river over it'" (*19, p. 154*).

Modifications introduced in the practice by careful farmers included giving the rows a slight fall from the horizontal so that water would drain off instead of standing in the furrows, opening the furrows into small gullies or other drainageways in the field in order to carry off excessive water, and leaving strips of uncultivated land across the hillside field. The small gullies into which rows were emptied were occasionally paved with rock as a precaution against further scouring (*38, p. 181*). The unplowed strips crossing the field on the contour were from 6 to 10 feet wide and were allowed to remain in grass or underbrush or were used for stacking logs and brush from the cleared parts of the field. Anything was left here that would retard the water or spread it out before it overflowed into the next lower "cut," or cultivated strip (*2, p. 235*). One farmer suggested planting strips of grass across the hillside between the crop rows.

By 1835, there was a fairly widespread conviction that deep, horizontal plowing, even when aided by the devices mentioned above, was not sufficient to prevent erosion on clean-tilled land. As a substitute or supplement, hillside ditching was coming into increasing favor.

Hillside Ditching

The southern farmer's hillside ditch was the ancestor of his modern terrace. Although terracing is an ancient practice in some parts of the world, the southern farmer appears to have relied on his own experience rather than foreign example in developing the practice. When horizontal plowing in the upper part of South Carolina was

[15] Hero of the novel, Horseshoe Robinson, by John Pendleton Kennedy.

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first called to the attention of James Gregorie (*75, pp. 385–387*), an editor of the Southern Agriculturist of Charleston in 1829, he remarked that without doubt farmers would eventually adopt a system of terracing similar to that practiced in the hilly parts of Tuscany. Although not familiar at first hand with conditions in the Piedmont, he realized that in the climate of South Carolina contour plowing would not be sufficient to prevent washing resulting from the heavier storms, and that the farmers could not "do without regular drains leading down the hills."

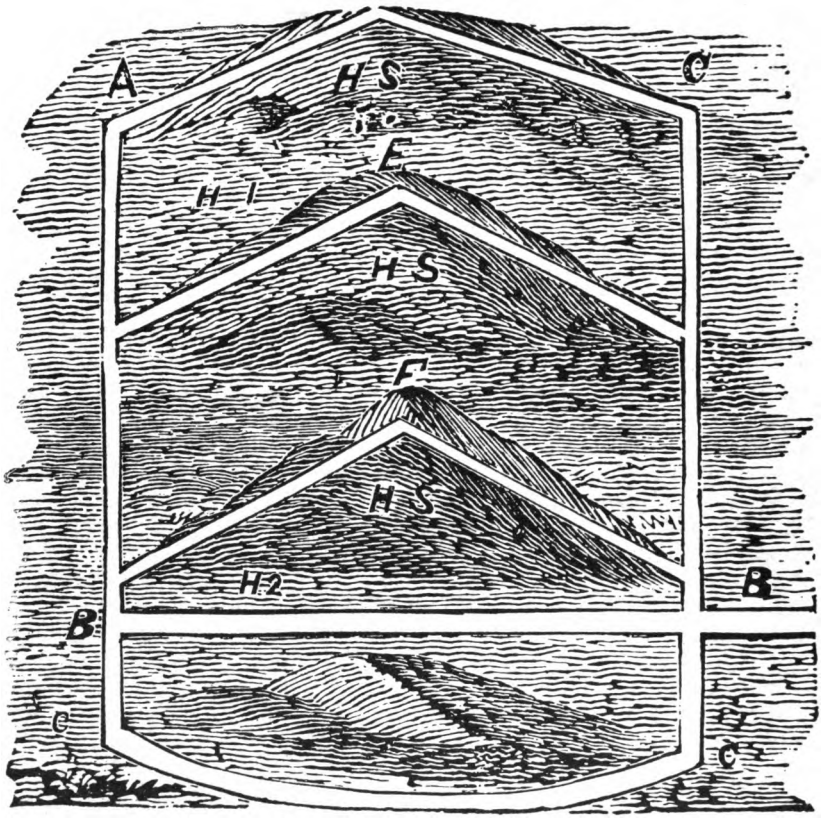

FIGURE 7.—Diagram accompanying instructions for making hillside ditches, 1836. It represents a 10-acre field containing three knolls, each marked HS, and three depressions. Water from the three knolls is carried off by hill ditches to outlet ditches AB and CB situated in low grounds on either side of the field. Water from these two outlets is in turn received by the larger ditch BB. The author of the instructions claimed that this system of ditches would protect the knolls from erosion and the depressions and lowlands from being inundated (*28*).

The terrace was indeed the eventual device used, but the "drain leading down the hill," rather than the more elaborate Old World terrace structure was tried first. The hillside ditch developed from haphazard attempts to stop washing by throwing logs and

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brush across rills or running small furrows across horizontal rows to the nearest depression so that excess water could be discharged. It was constructed obliquely down the hillside with a bank paralleling the lower side to prevent overflow. At the lower end it usually emptied into a convenient natural draw, creek, or wooded area at the edge of the field.

Specifications as to width of the ditch, grade, and distance between ditches varied with the supposed requirements of the climate and soil or the fancy of the individual farmer. The average width was about 3 feet or less, and the grades ranged from 8 to 35 inches per 100 feet (fig. 7).[16]

Hillside ditches were usually laid off with the rafter level. One point about which there was considerable difference of opinion was whether the crop rows should be inclined at an angle from the horizontal, thus paralleling the ditch, or whether they should be made exactly horizontal, thus intersecting the ditch and emptying their water into it (*20, pp. 7–8; 28; 34, pp. 10–11*). Frequently the water channels and banks of the ditches were covered with grass to prevent abrasion. In 1835, Robert Watts of Edgefield District constructed hillside ditches along the lower edges of his horizontal uncultivated strips to protect the lower tilled strips. This system bore some similarity to the combination of terracing and strip cropping practiced today (*88, p. 456*). Bottom lands subject to overflow and silting from adjacent hillsides were occasionally protected by drainage ditches within the bottom itself and by a ditch parallel with the foot of the hill to catch water and silt from above (*7*).

The wide variety of opinions regarding the details of hill ditching made it difficult to evolve uniform rules based on scientific principles. Because the subject was of sufficient importance, however, some attempts at synthesis were made. In 1859, a paper on the subject by D. Wyatt Aiken (*17*) of Abbeville District received the stamp of approval of the State Agricultural Society of South Carolina. About the same time Nicholas T. Sorsby (*79*) of North Carolina and Alabama wrote the most detailed and scientific study of mechanical erosion control to appear before the Civil War. These men recognized that the specifications for ditches should vary with soil texture, slope of the land, and the rainfall.

John C. Calhoun was among the first in upper South Carolina to install a regular system of hillside ditches covering the whole plantation. All of the bottom lands at Fort Hill (fig. 8) were planted to corn and peas, while most of the upland was devoted to cotton and small grain. On these uplands, in the 1840's, one could see hillside ditches, or "guard drains" as they were called in this locality, spaced and graded according to the slope. The grade was generally about 3 to 5 feet per 100 yards. One interesting feature of the system was that the ditches discharged onto galled spots in the fields or wet places in the low grounds so that these would be built up by the sediment. Plantation roads were laid out around the hills on a grade and served as hillside ditches as well as thoroughfares. As a result of his care,

[16] It will be observed that these early hillside ditches were much narrower and had a greater fall than the modern broad-base terrace (*43*).

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Calhoun's plantation is said to have shown few signs of erosion (*19; 21, pp. 212–215*).

Calhoun's neighbors also practiced hillside ditching, although not to the extent or with the care shown by him. In 1848, Michael Tuomey found that the practice was used increasingly in the vicinity of Pendleton and in Fairfield District. By 1860, it was fairly widespread throughout the Piedmont and all the Southeastern States.

The comments of Tuomey and Edmund Ruffin on hillside ditching are significant because they pointed out difficulties that have, from that day to this, remained the principal objections to all types of mechanical erosion control. Tuomey (*83, p. 250*) said that hillside ditches were not, like other practices, good so far as they went; but

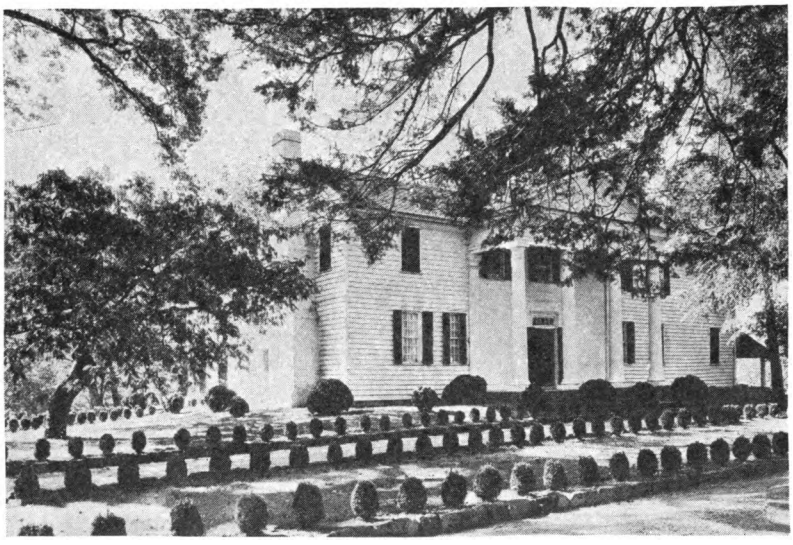

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FIGURE 8.—Fort Hill on the campus of Clemson Agriculture College, Clemson, S. C., the home of John C. Calhoun.

that unless they were properly constructed the increased concentration of water in ditches would break over and cause greater washing than before. Ruffin (*70, p. 98*) admitted that better plowing and guard ditches had checked erosion, but remarked that the means of prevention would not be complete unless rotations, including cover crops of weeds, grass, small grains, and peas, were introduced in place of the almost continuous succession of cotton and corn.

During the 40 years from 1880 to 1920, hillside ditching and its outgrowth, terracing, became almost universal in the hilly sections of the Southeast. It must be said that in a region where climate, topography, and soil composition all combine to make tillage a hazardous undertaking at best, terracing alone has preserved the soil after a fashion. Terracing became the South's major contribution to the techniques of erosion control in the United States. Yet it is a sad

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commentary upon the agricultural system that the section that developed terracing is today one of the major problem areas of the country from the standpoint of soil erosion. As Ruffin and Tuomey predicted, faulty construction and maintenance, and above all, the continuance of clean tillage have nullified the good results that were to be expected from the practice.

ECONOMIC BARRIERS TO AGRICULTURAL REFORM

The early agricultural magazines and the reports of the agricultural societies are replete with accounts of successful attempts to improve farming practices and conserve the soil. An examination of this literature alone might lead one to think that most farmers were engaged in such attempts. However, there are enough discordant notes sounded to indicate that complete harmony was wanting.

The complaints about erosion increased rather than decreased as the century progressed. The evils predicted for South Carolina by Davie in 1818 did not literally come about within the 50-year time limit set by him, but 35 years after he spoke a writer observed gloomily that (*10*):

> We think none will have the temerity to deny the destruction that has and is now going on in the middle and upper portion of our State. Tens of thousands of acres of once productive lands, are now reduced to the maximum of sterility. The forest has been levelled, almost with wanton prodigality, and a thoughtless and * * * senseless tillage has done its worst. The one idea planting system has told most fearfully on the once fertile and beautiful faced country of Carolina. Water-worn, gullied old fields everywhere meet the eye, and mocks our boasted improvements and progress.

The vicinity of Pendleton, with its agricultural society, was far-famed because of its progressive farming, yet even it had not escaped the general deterioration. The society had been founded, with high hopes, yet in 1855 A. P. Calhoun (*23*, *pp. 266–267*) spoke to the members as follows:

> * * * of all the projects suggested, it is curious to note that none have succeeded, and that we, at this moment, are making anxious enquiry whether the very experiments then proposed are practicable. Look at the blue book of 1815, and on the subject of grasses, how anxious were the practical men of those days to test every variety, and find some suitable to this locality. Where are the results? Again, in every department we find we are but repeating what was then done, and yet, after the lapse of nearly forty years, the eye wanders over agricultural desolation * * * a country that might be an Eden, repels the vision with its sedge fields, rotten fences, gullied hillsides, and undrained flats.

The attempts to improve agriculture did not succeed in checking the westward movement of white farmers. In 1830, 66,520 more white persons were living in the Piedmont districts of South Carolina than in 1790, but, there were 4,548 fewer whites in 1860 than in 1830. Conversely, the slave population increased steadily from 1790 to 1860. It was greater by 136,418 in the latter year than in the former.

Migration of the surplus white population after 1830 was accompanied by enlargements of land and slave holdings (fig. 9). It would seem that those who migrated were, in the main, small farmers.

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At home, as wealthy planters became wealthier or as their original plantations became poorer, they expanded their holdings.[17]

The agricultural reform movement failed in its larger objectives because it was dominated by the wealthy landholder, and because cotton continued to offer enough prospects of remuneration to insure its supremacy in the farming system. This dominance of the large landholder or gentleman farmer is illustrated in the membership of the Pendleton Farmers' Society. In 1860, the farm owners who were active members of the organization were 25 in number. The average hold-

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FIGURE 9.—Valencia, the home of the Palmer family, a plantation that grew in size and number of slaves with the passing years.

ing of each was 809 acres, whereas the average holding for the vicinity of Pendleton as a whole (comprising the southern part of Pickens District and the northern part of Anderson District) was 426 acres. Only 28 percent of the society members owned 250 acres or less, while

[17] For example, the first E. G. Palmer, a native of the coastal region of South Carolina, came to Fairfield District with approximately 100 slaves in 1824. Two years later he had acquired a plantation of 1,742 acres. By 1858–60 Palmer's holdings in the district totaled 2,972 acres and he owned 176 slaves. Although he was a progressive farmer, who experimented with cottonseed manure, sugarcane, and rice, he was not able to cope with soil erosion. Palmer noted in his diary that in the spring of 1827 prolonged rains washed the land to an "unprecedented degree." Apparently his erosion problem became increasingly urgent as time passed. In the years immediately preceding the Civil War, Palmer realized that the worn plantation soon would no longer support him and his family, and he considered sending one of his sons and some of the slaves to Mississippi to establish another plantation. These plans were not carried out because of the War. (Plantation Account Book of E. G. Palmer, 1824–1862; and information furnished through the courtesy of Mrs. E. G. Palmer (the third) and family, Ridgeway, S. C.)

One of the largest, if not the largest, of the landholdings in the South Carolina Piedmont in the ante bellum period was that of Nicholas A. Peay of Fairfield District. In 1860, it consisted of 19,000 acres divided into six separate plantations. Sometimes there were as many as four overseers. In 1857, there were 340 slaves connected with the estate, and the personal property was appraised at $288,168. (Inventory of the estate of N. A. Peay, May 1857, manuscript in office of the Judge of Probate, Winnsboro, S. C.; and manuscript schedules of the Eighth Census of the United States for Fairfield District, deposited in the South Carolina State Library at Columbia, S. C.)

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43 percent of all the landholders of the vicinity owned 250 acres or less.[18]

Most of the men belonging to the agricultural societies, or writing for the agricultural press, or furnishing information to and receiving advice from the agricultural surveyors were gentlemen farmers. Many of them had incomes independent of agricultural sources. They could buy the more expensive plows and other equipment. With their large supply of slave labor, they achieved leisure and could keep abreast of the latest developments in agricultural science and experiment with new crops and new practices. These things the small farmer, intent upon making a bare living, could not do.

A. P. Calhoun, in the address quoted, declared that the agricultural surveys, the teachings of agricultural chemistry, and even the agricultural societies were beyond the reach of the ordinary farmer. Most of the farmers remained in ignorance of the fundamentals of their occupation and were suspicious of book farming. They distrusted all attempts at cooperative action.

In time, perhaps, the example set by the upper class of agriculturists would have influenced favorably the entire community, but this had not happened by 1860. The facts that the upper class was impoverished by the Civil War, and that an entirely new class of semi-independent but even more impoverished small farmers, the Negro tenants, came to share control of the land, were to a considerable extent responsible for the delay in improvement that followed the war.

The ante bellum agricultural reform movement that took place contemporaneously with that of the South Carolina Piedmont was highly successful in parts of Maryland and Virginia because the staple crops of tobacco or wheat had become unprofitable by the early part of the nineteenth century and because the necessity for migration or improvement had become even more imperative than in South Carolina. By the time of the Civil War, general farming was established in these areas and some degree of prosperity had been restored.

In contrast, cotton continued to be the only large-scale source of income for South Carolina farmers. Unlike Maryland and Virginia farmers, they were not forced to abandon their staple crop. Cotton would always bring some cash, even in times of lowest prices; on the other hand, there was little market demand for provision crops, since nearly every farmer raised some. A few farmers experimented with such exotic staples as vines, rice, and silk, but these proved unsuccessful.

After 1840, however, the profits from cotton cultivation were more apparent than real for the Piedmont farmer of small or moderate means. It was difficult for him to compete with his country-gentlemen neighbors, just as it was difficult for him to adopt the practices that some of them advocated. It was difficult, too, for the region as a whole, with its worn soils, to compete with new cotton

[18] Minute Book of the Pendleton Farmers' Society, 1859 and 1860, manuscript copy in University of South Carolina Library, Columbia, S. C.; and manuscript schedules of the Eighth Census of the United States for Pickens and Anderson Districts, deposited in the South Carolina State Library at Columbia.

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lands in the West. As a result, the small farmer either intensified his cotton production, in a desperate effort to make a living, or moved West where the prospects seemed brighter.

RETROSPECT AND PROSPECT

The objectives of the movement for agricultural reform that commenced in South Carolina shortly after the beginning of the nineteenth century were: To conserve the soil from erosion and other forms of depletion and to stem the tide of westward emigration from the region.

In all ages and all communities, the problem of soil conservation has resolved itself into the problem of maintaining a well-balanced farm economy. Undue emphasis upon one crop or one group of crops has generally been disastrous in the end. In the South Carolina Piedmont, changes directed toward a more diversified farming and toward erosion control were attempted by the more progressive plantation owners. Grass culture and improved livestock were introduced; more manuring and better rotation of crops were practiced; even a few attempts were made to conserve and restore the forests. In addition, deep and horizontal plowing and hillside ditching came into rather common use. Withal, cotton continued to dominate the agricultural economy, the soil continued to erode and to lose its fertility, and farmers continued to migrate from the region.

The efforts to introduce soil conservation practices on a wide scale in the South Carolina Piedmont depended mainly upon the individual action of the large landowners. This individual effort was unavailing because the large landowners represented only a fraction of the total population and because the changes they recommended were not economically practicable for the unorganized small farmers.

Today, the situation is reversed, and the small farmers, realizing that their future prosperity depends in a large measure upon the conservation of the soil, have taken the initiative. Under a State districts law, the farmers of the South Carolina Piedmont have, through democratic processes, joined cooperatively in the establishment of 10 soil conservation districts, and 6 of these districts have entered into memoranda of understanding with the Federal Government. On December 15, 1939, these soil conservation districts embraced a total area of 9,265,360 acres.

The farmers within these districts, assisted by an interested Government, are carrying forward the conservation work of the large landowners of the past. Methods of farming that are not possible for single small landowners, have become economically practicable to organized groups of farmers. The program of soil conservation is no longer limited in action to individual farms, but is extended to cover all the land within a district. Without question, the struggle to save the land will require continuing effort on the part of the farmers, but, since many are cooperating toward a single goal, the prospects for attaining a permanent agriculture embodying the elements of soil conservation are encouraging.

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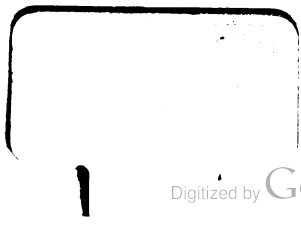
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