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THE TENNESSEE VALLEY PROJECT—FACTS  
AND FANCIES

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An enthusiastic President recommends, a willing Congress formulates, debates, and passes a bill, a President signs, and the problem of what to do with the great Muscle Shoals hydroelectric plant with its associated properties that has been a football in nearly every session of Congress for the last dozen or fifteen years, is settled. But the bill provides for something more, an all powerful board of directors. The Tennessee Valley Authority is established, not only to handle the Muscle Shoals property *as it thinks best*, but in addition to direct the economic, commercial, and social development and betterment of an area as large as an average American State and now occupied by some 2,000,000 people. An experiment is to be tried which, if successful, will be repeated in other sections of our country—an experiment in regional planning, encouraged, supervised, and backed financially by the Federal Government. Much depends on this venture.

No one has yet<sup>1</sup> formulated complete plans for the development, certainly not declared them, beyond the brief pronouncements in the message of the President, the statements in the bill itself and a few newspaper announcements. At any rate, it is to be a seven-phase venture:

(1) Power development, (2) Transportation improvement, (3) Agricultural rehabilitation, (4) Forest reclamation, (5) Flood control, (6) Industrial development, and (7) Social betterment.

The latter is the "end product," the creation of prosperous agricultural and industrial communities, peopled by contented, healthy, educated, law-abiding, progressive citizens. But all prosperous, progressive civilizations can evolve only in rich stimulating environments. The degree of attainment of the evolving civilization bears

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<sup>1</sup>This paper was written June 5, 1933.

a close relationship to the degree of economic development. Waterfalls and rapids must, therefore, be harnessed and coal mined to supply power for the numerous industries that will need to arise in many parts of the valley. Forests, fields, and mines will supply the raw materials. Thus will be laid the material basis of a rich human existence, the pabulum on which mind and soul may be nourished. This is a vision whose realization will take many a decade. It is not for our day alone.

#### MEETING PARTY PLEDGES

Why was the Tennessee Valley or Basin selected to be a great economic and social laboratory for this experiment? There are probably several reasons. First, there was a Democratic platform pledge that the Muscle Shoals problem would be settled, that is, that Congress would provide for the disposal of the Wilson Dam, the nearby steam plants, and the two nitrate plants and related properties. The bill creating the Tennessee Valley Authority provides that the President may within a year lease the nitrate plant or plants to responsible parties, if he sees fit. If he fails to find a suitable lessee, then the board of directors is authorized, *but not required*, to operate plant No. 2, which of course will necessitate the operation of either or both the hydroelectric and the steam-electric plants. The board of directors has a right to establish, maintain, and operate laboratories and experimental plants and to undertake experiments to discover new methods of producing nitrogen products of use in fertilizers or explosives. It may construct an additional dam, a steam plant and other facilities, and may issue and sell fifty-year serial bonds not to exceed \$50,000,000. Thus the party pledges have been met. The bill also settles the question of the right of state or nation to lease the Cove Creek dam site. This site is to be taken over by the Federal Government, a \$35,000,000 storage and power dam and hydroelectric plant constructed; and a \$6,000,000 transmission line is to be run to the Muscle Shoals plants if other arrangements for transmission of the power are not made. Cove Creek dam is to be made primarily an "assist" to the Muscle Shoals plant. Electricity, however, may be distributed from it or from stations along the transmission line. Its impounded waters will tend to regulate to some degree the flow of water through the Muscle Shoals power plant.

#### PLANS FOR WATER CONSERVATION

A second consideration for selecting the Tennessee Basin is that a scientific plan for the complete utilization of its water resources had been completed by the engineers of the War Department (in 1930), the investigation having been authorized by Congress during the Coolidge administration. President Roosevelt of course knew of this report and also of much of its contents. This report is the most complete survey of any river system ever undertaken unless it

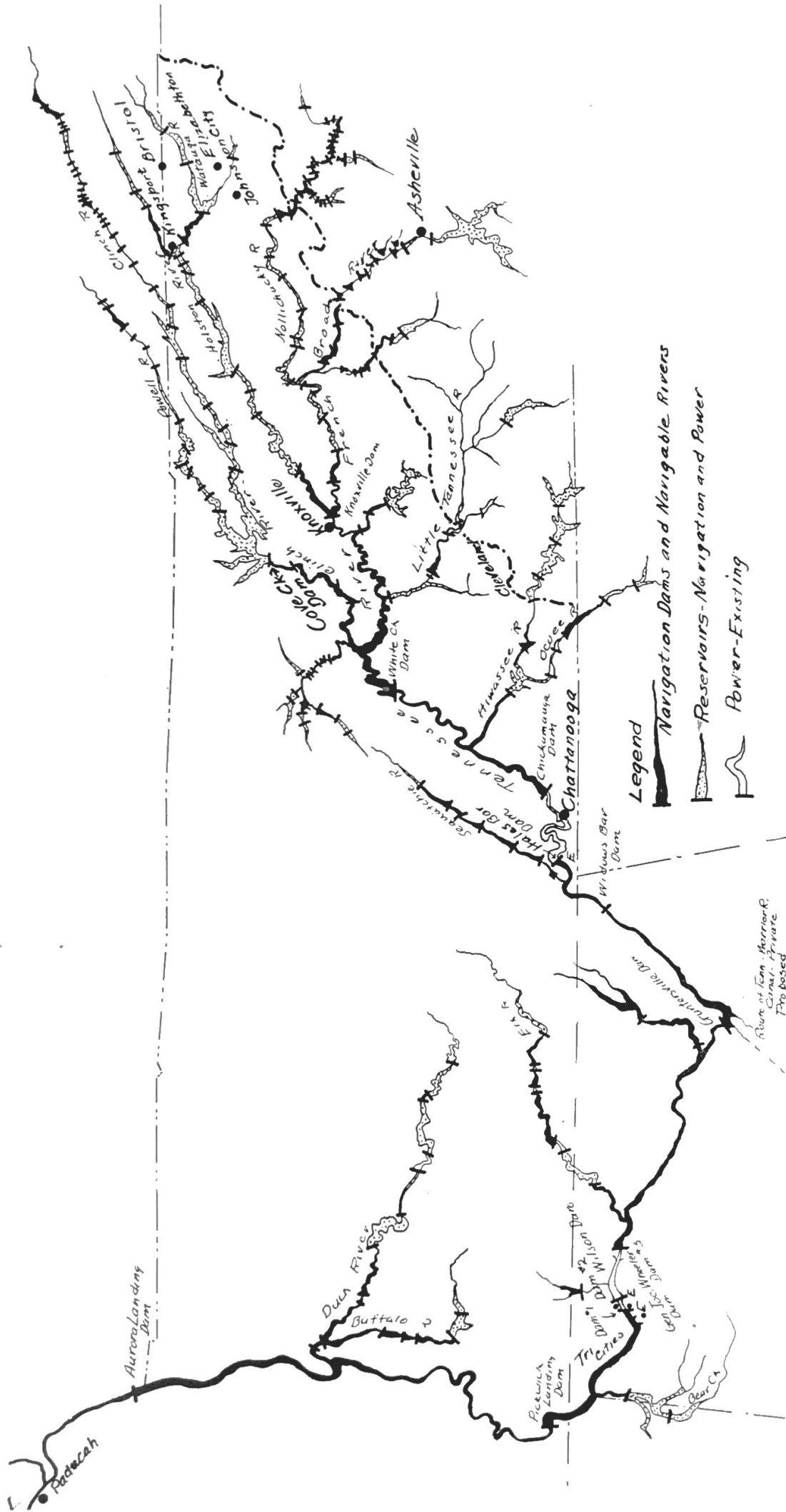


Fig. 1. The Tennessee River completely developed for navigation. Based on a map in report of U. S. Army Engineers, 1930.

be that by the British engineers on the Nile. There are complete data on power developments. The best locations for power dams, storage dams and reservoirs have been determined, the objective being to get the maximum horsepower available from the streams. All navigation locks and dams are also located, and for both detailed estimates are made of the cost of construction. There are in this report tables on stream flow; data on the areas of watersheds, rain-fall, evaporation, run-off; plans for the regulation of the flow of the rivers for navigation and power combined; and plans for operating the entire system as a unit. The report is in two parts. Part I, more than 700 pages, presents the descriptive material and some of the tables; Part II is a portfolio of maps and charts and tables, 194 in all. This report will be the guide, the bible, for all water utilization developments for many decades. Although the survey cost nearly \$791,000 (authorized in 1926), it was money well spent. It is the type of thing conservationists have been recommending for many years—comprehensive surveys before developments.

#### STATE SURVEYS

In addition to this most excellent comprehensive report of the army engineers, the states of Alabama, Tennessee, North Carolina, and Virginia have for decades, through their state geological surveys, forestry bureaus, and other state offices, carried on extensive studies of the resources of the area included in the Tennessee Valley, and the United States Geological Survey has cooperated in many of these investigations. The Federal Bureau of Chemistry and Soils moreover has completed many studies. In our own state of Tennessee there are published reports, very complete, on forest and coal resources, iron ore deposits, copper, zinc, and bauxite, mineral waters, sands, gravel, building stone and surface and underground waters. Geographical studies covering the environmental factors in totality to which man has adjusted his industries, agriculture, mining, manufacturing have been completed for Eastern, Central, and Western Tennessee. All in all of no other section in our country is there more known about minerals, soils, waters, forests, and weather and climate, and thus about the potentialities.

#### THE DIVISIONS OF THE TENNESSEE VALLEY

The third fact—we cannot label this a consideration, for possibly the President was not aware of it when he made his recommendation to Congress—this valley, all natural environmental considerations being considered, is certainly one of the richest in resources and potentialities of any in our country of comparable area. Some of these potentialities are discussed in the army engineers' report. These resources are far from being evenly distributed. The Tennessee basin may be divided into five distinct divisions.



## THE MOUNTAIN SECTION

First, there is the mountain section with vast areas of forests mostly locked up from destructive exploitation in National Forests or preserved from molestation in the Great Smoky Mountain Park. These forests serve to regulate the flow of the numerous eastern tributaries of the Tennessee and thus benefit both the water power developments and navigation. Most of the developed power of the basin is in this section. The actual kilowatt-hour output of the plants is far greater than that of the much discussed Muscle Shoals plant. Copper, feldspar, mica, clays, sands, and gravel are the economically exploitable mineral resources. Though mountainous, this section is not without most excellent agricultural lands in the valleys and mountain basins. With hundreds of miles of excellent hard-surfaced roads and several lines of railroads, the farmer is no longer cut off from markets as he once was. Although the army engineers have indicated feasible sites for navigation dams on some of the mountain streams, the improvement of these rivers for commerce would never pay. Here are, however, suitable sites for numerous reservoirs for the regulation of stream flow, and at which hydroelectric power may be developed, unless they are used exclusively for flood control, in which case they will need be kept empty when possible. Mountain, sky, forest, stream, and lake combined produce landscapes and recreation resources that will attract thousands of tourists and resorters.

## THE VALLEY OF EAST TENNESSEE

The second section is the Valley of East Tennessee, a portion of the Great Appalachian Valley that extends from the St. Lawrence to Central Alabama. The Valley of East Tennessee, and to this may be added southwestern Virginia, is by far the most important of the sections of the Tennessee Valley or Basin. Here is much undeveloped water power and its plants, when they come to be constructed, may easily be tied up by transmission lines to the power plants in the mountain section. On the western border is the Cumberland Escarpment on whose face high grade coal outcrops in almost continuous strata from Chattanooga far into Virginia. These coal outcrops have been mined at several places for decades, and are the eastern edge of great seams that underlie the entire Cumberland Plateau. The area of coal lands in Tennessee in this plateau is 4,400 square miles, and the estimated available supply 25 billion tons. This coal is easily reached on the slopes of all the valleys cutting the Plateau or by shallow shafts from the top. The power units of the Valley are within reach of a large part of the Eastern Kentucky coal fields of more than 10,000 square miles and its 70 billion tons. With approximately 3,000,000 horsepower available in its streams and those of the nearby mountain section, developed and undeveloped, and a reserve of 40 to 50 billion tons of coal within easy reach, the Valley of East Tennessee is by far the greatest power region of the

South and ranks at or near the head of the power regions of our country. It is coal alone that nourishes the great industrial development of Glasgow, Birmingham, Sheffield, Leeds, Manchester, and other centers of England, and the prosperous Ruhr in Germany. In our own country coal is the environmental basis for most of our manufactures. With both cheap coal and cheap water power both abundant, the Valley of East Tennessee therefore should in time become one of the great industrial centers of the United States in light manufactures. It may some day become active again in the production of iron and steel, but not until the ores in the Birmingham region approach exhaustion. The rise of Birmingham as an iron and steel center has meant the demise of the smaller blast furnaces in the Valley at Dayton, Lafollette, and Rockwood; just as the decline of the smaller forges, bloomeries, and furnaces that had been in operation since white occupancy of the Valley. In the census report for 1870 it is stated that there were at that time from one to five works in every county in the Valley. Swank in the census report for 1880 informs us that iron making began shortly after the arrival of the first settlers. Of the early iron makers he wrote, "they appear to have been born with an instinct for iron making." The ore used in the early furnaces was largely brown limonite. Charcoal was the fuel. The larger Rockwood, Lafollette, and Dayton furnaces, just noted, used red hematite, the ore that outcrops near Clinton, New York, and is used in Birmingham today. It outcrops here and there the entire length of the Great Appalachian Valley and has in the past been exploited in Pennsylvania, Maryland, and Virginia.

*Present-Day Industrial Development.*—Already East Tennessee has made excellent progress in its industrial development. Chattanooga, Knoxville, Kingsport, Johnson City, Elizabethton, and Cleveland have a variety of industries, though small in output. Knitting, spinning, and weaving mills are numerous, some 35 in these and smaller towns. The rayon plants near Elizabethton are among the largest in the South.

There are hardwood lumber mills, wood working and extract plants in several towns. A hardwood distillation plant at Kingsport produces wood alcohol, wood oils, acetone, acetate of lime, and charcoal. A huge paper mill at Canton, North Carolina, and the copper smelters and sulphuric acid plants at Ducktown and Copper Hill, Tennessee, though in the mountain section, are closely related to the industries of the Valley. The aluminum plant at Maryville is one of the largest in America, drawn to the Valley by cheap abundant water power. There is bauxite in the Valley but not rich enough to be mined in competition with ores elsewhere. The aluminum smelted in the valley is largely from South American ores that are first carried to St. Louis for reduction to aluminum oxide. The zinc deposits, while not so rich as those of Missouri, have long been worked, and at Mascot, a dozen or so miles from Knoxville, is one

of the largest mines in our country producing zinc ore for zinc paint. Lead and barite are other minerals that have been mined in the past and may be again in the future when other higher grade deposits reach exhaustion.

The marble, outcropping for miles and miles, almost the entire length of the Valley, even two or three parallel outcrops for long distances, huge in extent and excellent in quality, has already won a high rank among the more elegant building stones of both South and North. The leading quarries are near Knoxville. The abundance of limestone in the lower strata of the Cumberland Plateau and the marbles of the Valley and clays or shales widely distributed supply the raw material for cement.

#### THE GORGE

Westward from Chattanooga for some thirty-five miles by the river, the Tennessee Valley is constricted to a narrow gorge cut through the Cumberland Plateau. This is the third section or division of the Tennessee Valley. The flood plain in the gorge is almost too narrow for extensive agriculture and so the agricultural population is small. Coal and limestone outcrop in the bluffs of the gorge, and iron ore near the western end of the gorge can be reached above the water level. Here then are excellent reserves of useful minerals.

#### THE NORTH ALABAMA VALLEY

From the western end of the gorge near Jasper, to the northeastern corner of the State of Mississippi, the Tennessee River flows through an agricultural area. By some this is known as the North Alabama Valley. Huntsville, Decatur, and the Tri-Cities are the urban centers. Huntsville has been an active textile center since early in the last century. Only a beginning in manufactures has been made at the other two centers. There are coal outcrops in the bluffs of the Valley southward from Jasper for some distance and there are brown ore deposits to the north of the Tri-cities. The effective utilization of these iron ore deposits in the face of competition from Birmingham, however, is problematic and increasingly impossible. They, too, are reserves to be called upon when the price of iron is high. Limestone is to be found everywhere in this portion of the Valley. An excellent oolitic limestone is quarried near Tusculumbia. Except for power at Muscle Shoals, there is little to attract industry; and power, since the development of efficient transmission lines, is practically as available and as cheap a hundred or even three hundred miles from the plant as one hundred rods. There is therefore little geographic basis for the faith that some people are displaying in the future of the Tri-cities. The only resource that can meet competition from other areas is power, and we have just shown that it is of no great moment in localizing industry here. Back in the days before electrical transmission attained its present stage of development, factories had to crowd the river banks at rapids and falls, but the



steam engine freed them from such restrictions and the new advantage, electrical transmission, has in no way lessened their freedom.

#### THE FIFTH SECTION

The fifth section of the Valley, from the corner of Mississippi to the Ohio River, is carved in both the Highland Rim Plain and the Coastal Plain. The deposits of bauxite, white phosphate, limonite, clay, sand, and gravel on the borders of the Valley offer no great inducement for their exploitation at present and few are now worked except the ball clays near Paris, Tennessee. This at present is an area of forests and farms. The great extent of hill lands, that erode dangerously, should remain in forest, or if already cleared, should be reforested.

#### THE SECTION OF GREATEST PROMISE

It should be plain from the discussion of these five sections that the most promising part of the Tennessee Valley is the Valley of East Tennessee. In this section manufacturing is already varied and advanced. It has long been one of the active manufacturing centers of the South. It has adequate transportation facilities by rail to the Gulf Coast, the South Atlantic Coast, the Chesapeake Bay ports and the Northeast, and to the Ohio River cities. Railroads have made its shortest and quickest means of communication with the outside world. Here may be assembled abundance of power and a wide variety of raw products, timber, cotton, limestone, aluminum oxide, marble, and others. Its strategic location gives it close contact with markets north, east, south, and west. That it is the most active section of the Tennessee Valley is well shown by the freight movement by rail to and from the area in comparison with other sections. Freight originating in or destined for the Valley of East Tennessee in 1926 (data from report of Army engineers) amounted to 8,500,000 tons; for the middle section of the Valley with Huntsville, Decatur, and the Tri-cities as major center the movement was 2,609,000; and for the lower section, only 857,000.

#### THE VISION OF REGIONAL PLANNERS

Regional planners in thinking of the Tennessee Valley development have visions of landscapes dominated by small industrial centers each with well-kept factories, neat clean homes, schools, churches, and community houses; and surrounded by garden, poultry, fruit, and dairy farms on which the majority of the factory workers would live. There is nothing new in this conception. Landscapes such as these are now to be met with in many parts of Belgium, in England, and about the textile manufacturing centers of the Carolinas, Georgia, and Alabama, and in many irrigation districts of the West. A few have already begun their evolution in the Valley of East Tennessee. Huntsville, Alabama, surrounded by satellite mill villages, will illus-

trate the type. Low taxes, low rents, home-grown food, wholesome home and community life, modest but sufficient incomes, ought to fit the Valley population to weather future depressions and adversities such as frequently befall human beings.

#### ECONOMIC DEVELOPMENT BASAL

Agricultural rehabilitation, or further agricultural development, as indicated in our opening paragraphs, must be tied intimately with industrial development; and the utilization of the power resources is basal to the latter. They are reciprocal concomitants. With the construction of Cove Creek dam and power plant, the extension of public owned transmission lines, and the coordination of the government owned plants with the numerous privately owned plants the whole Valley will have sufficient hydroelectric power to meet the increasing needs of industries for a few decades at least. The problem of flood control is considered by the army engineers as secondary to power and navigation development. It is to be hoped that the Authority will study well and long the possibilities of water transportation in the Tennessee Valley. More than \$20,000,000 have already been "invested" with no appreciable benefits to the people.

#### FURTHER SURVEYS NEEDED

There has been much speculation as to what can be done in forest reclamation as one of the phases of land utilization. Wild ideas as to the government's function are afloat. Some who are familiar with the struggle of the Kulaks of Russia to retain their lands have visions of wholesale farm and home eviction that the land may be planted to forests. Others take a saner view and see very detailed surveys of the lands being made by experts that will suggest to the land holders the best type of utilization of their land—crop, pasture, woodlot. There are vast areas in the Valley now under the plow that should be in forest to check their ultimate destruction by soil washing and gullyng.

Careful consideration will need to be given to the relative cost of generating electricity by water and steam power. In recent years engineers have so greatly improved steam boilers and engines that at only the "best" water power sites may the electric "juice" be generated as cheaply as at steam plants near deposits of good streams of cool and clear water. In the Annual Report of the Federal Power Commission for 1930, we read, ". . . even in the regions of water power resources the steam-electric plant is assuming a position of rapidly increasing importance and is demonstrating its capacity to compete on even terms with hydro-power."

#### THE PROBLEM OF CHEAP FERTILIZER

Vote-solicitating politicians have certainly overestimated the future of the Muscle Shoals section, and vote-getting politicians have over-



estimated the ability of the federal plants to produce cheap fertilizers—*if fertilizers are produced and sold at cost*—and of commercial fertilizers as a factor in agricultural rehabilitation. What the farmers of the Valley most need are markets near home, such as will be supplied by the industrial centers in the Valley and elsewhere, for the products of their lands; and they need lessons, that county agents can well teach them, if they but heed, on soil reclamation by proper rotation and the use of barnyard and green manures, and soil preservation from washing and erosion. Fertilizers will increase production, but the best results will come only if soil conservation is practiced. Constant surface wash and erosion and leaching and soil mining will eventually kill any soil. As for the cost of production of fertilizers, it must be remembered that, if the present equipment is used, the operator of the plant, government or private, must use machinery that was probably antiquated by the time it was completely installed; and the power needed will be taken from either of two exceedingly expensive power plants—hydro (which with the navigation lock costs \$48,000,000) or steam (or both)—constructed when building costs were high and many experiments were being tried out at government expense. Moreover, the actual output of the turbines or the hydro-plant are far short of the installation because of low water for most of the year; and it will be many years before storage basins and reservoirs can be provided that will reduce the maximum and increase the normal dry season flow at the dam. Under present conditions of stream flow the minimum potential output of the turbines (firm power) is about 60,000; although the eight generating units have a combined capacity of 264,000 horsepower.

#### SHOULD THE NITRATE PLANT BE JUNKED?

The nitrate of plant No. 2 is not the nitrate farmers are accustomed to. There undoubtedly will need be much experimenting in the production of new fertilizers. It may be necessary to junk the present plant and construct an entirely new one. The Congressman who formulated the Tennessee Valley bill apparently did not know that an ever-efficient bureau in the Department of Agriculture at Washington, known as the Bureau of Chemistry and Soils, has been working on nitrogen fixation problems and are assuring us that it has perfected methods that will give the farmers "a dependable supply of nitrogenous fertilizer" at greatly reduced cost, the saving amounting to \$113,000,000 during the period between 1924-30. The Bureau has "worked out fundamentals for the use of industry" but it is unlikely that the government plant at Muscle Shoals can be adjusted to take advantage of the recent discoveries. The nitrate plant may never be used nor another built. What is wanted is cheap fertilizer, and this private corporations can furnish probably cheaper than the Government. Fortunately, to the Authority is left full decision. At the present state of information we may be certain of one thing, possibly little more: the farmers of the South will not use govern-

ment-produced nitrate for this year's planting. The board of directors has an Herculean task, and all must be patient. Still another thing is certain: a large part of the cost of the present government property at Muscle Shoals must be absorbed as World War expenses or the farmers who purchase government nitrate will pay more for it than if obtained from the so-called "greedy" fertilizer corporations.

### THE COST

Many a taxpayer is undoubtedly wondering about the cost of the Tennessee River development. Are all projects to be self liquidating? Chairman Morgan in a recent informal address gave it as his personal opinion (the other members of the board had not then been selected) that the function of his board (and probably the Government) should be as that of a catalyzer in a chemical reaction, to assist in bringing about the change, yet not be changed itself. It is to be hoped that federal funds will come through the reaction without diminution in mass. But such would be a miracle, a thing never yet experienced when government has gone into business. Let us take, for example, the result of federal assistance to irrigation in the West.

### GOVERNMENT AID TO IRRIGATION

Most of us believe that the Tennessee Valley project is the first venture of the Federal Government in economic and social uplift work. But we are mistaken. We have overlooked the fact that about 7.5 per cent of the irrigated lands of our country is the work of the Federal Government. It has provided dams, canals, and other works to irrigate nearly 2,000,000 acres, an area more than two-thirds that of the Tennessee Valley, has made "the desert blossom as a rose" and peopled this land with a prosperous farmer folk; *but* at a tremendous cost to the taxpayers of the United States.

The Reclamation Act which established the Reclamation Service which has supervised these developments was passed in 1902. The act established a reclamation fund, the money to be derived from the sale of public lands in the West. These moneys were to constitute a revolving fund for the construction of irrigation works, the cost, *without interest*, to be repaid in ten annual installments by the farmers who took up the land. Within ten years it was found that the cost of developments exceeded the income from the sale of public lands and the repayment of the farmers. In Taft's administration Congress loaned \$20,000,000 to the Reclamation Fund.

### THE BALANCE SHEET

Let us look at the balance sheet to date. In its aid to irrigation in the West the total "disbursements" of the Government (through the Reclamation Service) to June 30, 1928 (the year before the depression, selected advisedly) were \$230,213,082 and its collection \$78,-

621,920, leaving a "net investment" of \$151,591,162 (Statistical Abstract, 1929, p. 602). A large percentage of the farmers who contracted to repay the government investment in ten annual payments had been on their lands for at least twenty years and all or nearly all for more than ten years, yet only 34 per cent of the expenditures had been met.

In the year closing June 30, 1928, the disbursements were \$8,637,000 and the collections \$6,182,000. In other words, the Government sank nearly \$2,500,000 in its *self-liquidating irrigation venture* in this one year. In 1930 the expenditures were nearly \$5,000,000 more than the collections. More than one Secretary of the Interior has resolved to put irrigation on a business basis, but the net investment grows larger each year. In 1928 it was \$151,591,000, as stated; in 1930, \$158,875,000. What has been the taxpayers' contribution, the West, in deferred interest on the funds invested and the principal? It will be remembered that the irrigation farmer pays no interest. For simplicity, let us consider our contribution to the success of an average irrigation farmer on the Salt River project, one of the most prosperous in the West, who contracted in 1910 to pay the Government \$60 per acre for his water rights. Most of the lands were homesteaded. In 1933, at a moderate rate of 4 per cent. annually, would have become \$156.00. Up to June 30, 1930, the Salt River farmer had paid to the Government (all disbursements and collections considered) about two-thirds of the \$60 or \$40 on each acre of land he contracted to purchase. To summarize, the average Salt River farmer had invested \$40 per acre in his land, the American citizens had invested (principal and deferred interest to 1933) \$156.00. The value of the crop in 1930 was more than \$275.

### THE OLD PORK BARREL

Is the Federal Government to be as inefficient and lavish with its money in its Tennessee Valley venture as in the West? This lavishness and inefficiency in an indirect way is to be laid largely on the head and shoulders of our Congressmen. They vote the money. They are supposed to look after the country's general welfare, but they think more of the votes they can win in their own local districts than in the general welfare of the country. General welfare to them is the welfare of their district.

It is said of Vice President Garner, the sly old coyote of Uvalde, that he has made it a cardinal practice for many years that if a Northern Republican got a ham from the Federal "pork barrel" for his district, he went after a whole hog for his. Most of the donations to government irrigation in the West have been during Republican administrations. The Democrats now have a mandate over the Federal pork barrel.



PRIVATE INITIATIVE SHOULD NOT BE DESTROYED

But for the sake of unborn generations who must be called upon to pay the debts now being contracted, let us hope that the "new deal," when "the recovery" is well on its way, will endeavor to put our Government on a business basis; that the Tennessee Valley Authority will sponsor only those projects that are self-liquidating, and self-liquidating as judged on the best business principles. The preservation of the spirit that made America great, the leader among all the nations of the world today, demands that. The giving of alms, whether as soldiers' bonuses, gifts to irrigation and navigation, or loans to cities or states whose credit has been impaired through misgovernment, is debasing. Unless America retains the spirit of independence, self initiative, and enterprise, the "rugged individualism" of our forebears, we are not going to hold the rank we now have among the world nations. In the Tennessee Valley, if the Government enters the field of business in the production of power and fertilizers, it should run its plants on a business basis. The selling price of its product should be based on the cost of production. Irreparable harm will be done private initiative if it deviates from this sound principle. America and Americans have not sunk so low that we need a central government to manage the affairs of private business in which competition still has full play.

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ANNOUNCEMENT OF THE ANNUAL MEETING  
OF THE TENNESSEE ACADEMY  
OF SCIENCE

The regular annual meeting of the Tennessee Academy of Science will be held Friday and Saturday, December 1-2, 1933, at George Peabody College for Teachers.

All members are earnestly requested to attend this meeting and are invited to contribute papers. Since the committee is desirous of mailing copies of the final program to all members on November 20 it sincerely requests that the following information be in their hands not later than November 17: (1) title of paper, (2) brief abstract of paper, (3) statement of time necessary for presentation, (4) preferred time on program, (5) whether lantern slides will be shown. Papers may be submitted for presentation by title in case the author cannot be present (please so state). Authors will be notified at the earliest possible date of acceptance and time of appearance on the program. Please notify the Chairman of the Program Committee, Dr. C. R. Fountain, George Peabody College for Teachers, Nashville, Tennessee.

Attention is called and notice hereby given of the proposed amendments to the Constitution of the Tennessee Academy of Science to

(Continued on page 375)