ANNUAL REPORT

1942-1943

SOIL AND WATER CONSERVATION RESEARCH

(Bankhead Jones Fund Project)

Agricultural Engineering Department
Virginia Agricultural Experiment Station
Blacksburg, Virginia

in cooperation with

Research Division, Soil Conservation Service
U.S. Department of Agriculture

and

Agricultural Division, Tennessee Valley Authority

July 1, 1943

SOIL AND WATER CONSERVATION RESEARCH

1942-1943

1. Personnel:

C. E. Seitz, Head of Department (part time))
H.T.Rogers, Asst. Soil Tech. July 1, 1942 to Sept. 30, 1942) Va. Agri.
Jesse Elson, Asst. Soil Tech. Oct.1, 1942) Experiment
E. Azar, Acting Asst. Agric. Engr. July 1, 1942 to April 21,1943) Station

D.W. Cardwell, Assoc. Agric.Engr.(part time) July 1,1942 to Mar.31,1943)
J.Elson, Jr. Soil Surveyor,July 1,1942 to Sept.30,1942)
G.A.Crabb,Jr.,Asst. Agric. Engr. (part time) April 9,1943) S.C.S.
J.R.Price, Jr. Agric. Aide,April, 15,1943)

W. H. Dickerson, Asst. Agri. Engr.(part time) Tenn.Valley Authority

Jesse Elson was appointed Asst. Soil Technologist on Oct.1, 1942 to fill the position vacated by H. T. Rogers, who resigned from the Virginia Agricultural Experiment Station. G. A. Crabb, Jr. was appointed as Asst. Agric. Engr. on April 9, 1943 to fill the position of D. W. Cardwell who resigned from the Soil Conservation Service. J.R.Price was appointed Jr. Agric. Aide on April 15, 1943. E. Azar was granted leave from the Virginia Agricultural Experiment Station on April 21, 1943 as he was inducted into the Army of the United States.

2. Progress and Results of Research:

(A) Soil and water losses from cropland: Operation of the system of runoff plots to study the effects of slope , character of soil, rainfall, and cropping treatments on erosion losses were continued.

In previous years the high-intensity thunderstorms which caused practically all the erosion from these plots came during the summer months. However, in 1942 and 1943 there was considerable erosion in the spring months. During the night of June 6, 1943 there were two storms that caused the largest amount of erosion that has been experienced during the life of the experiment from the corn plots. The rainfall intensity of the first storm was 5.25 inches per hour and continued for 15 minutes during which time 1.30 inches of rain fell; the expectancy of occurrence of a storm of this type was once in 17 years. The second storm was less intense and came three hours later during which 0.60 inches of water fell.

The erosion losses from the corn plots for these storms were as follows:

Percent slope of plot;	Soil loss in tons per acre.
5	7
10	22
15	25
20	27
25	34

Since an acre of topsoil (7 inches deep) weighs 1000 tons it would appear that these losses were of little significance from the standpoint of the quantity of soil material removed. However, the soil nutrients and organic matter are concentrated in the topsoil and it is expensive for the farmer to replace these materials after losing them by soil erosion. Wheat and grass plots on these same slopes lost practically no soil during these storms indicating the effectiveness of a close-growing crop in controlling erosion from sloping land.

Analyses of past records of erosion and runoff from the runoff plots has continued and is providing information that is used in making recommendations for controlling soil erosion in the Limestone Valley Region of Virginia.

A study of the effect of cropping and fertilizing treatments on the physical properties of the soil as they effect its erodibility led to an investigation of the relationship of different fractions of soil organic matter to the whole soil and five aggregate-size groups. Soil samples from 96 plots of a 33-year fertility experiment (conducted by the Department of Agronomy) were used in this investigation. During the year, 576 samples representing the whole soil and the five aggregate-size groups (2-5-, 1-2-, 0.5-1-, 0.25-0.5-, and 0.1-0.25-mm.) were analyzed for both total and alkali-soluble organic matter for a total of 1152 determinations. It was found that on the basis of alkali-soluble organic matter the five-aggregate-size groups could be separated into two classes: (a) aggregate larger than 1mm, and (b) aggregates smaller than 1mm. It was previously reported that 6 and 18 months after liming the aggregates of class a contained more alkali-soluble organic matter than those in class b. However, after 30 months the smaller-size group contained more than the larger-size group which indicated that the effect of liming was short-lived. Investigations are now continuing to determine whether the alkali-soluble organic matter is the active cementing agent that binds the soil units into large water-stable aggregates.

(B) Moisture conservation and erosion control on permanent pastures:
The study of the practicability of contour furrows for pasture improvements was continued. It was found that the contour furrowing of pasture land materially decreased water losses by runoff. During the 1942 season there

were 16 rains, totaling 16 inches of water, that gave some runoff from the pasture plots. The non-furrowed plots lost 9.1 per cent of this rainfall while the contour-furrowed plots lost 1.3 per cent. The retention of water by the furrowed plots resulted in increased herbage. It was found that while the use of 500 lbs. per acre of a 4-12-4 fertilizer gave an 18 per cent increase in dry herbage over the untreated plots, the combination of the same amount of fertilizer with contour furrowing gave a 32 per cent increase. The large increase in herbage resulting from contour furrowing was realized the first year after the furrows were constructed and reseeded. The indications are that the benefits to be derived from furrowing will increase after the vegetation has completely reestablished itself on the furrows. The attached photographs show comparisions of the various treatments on the pasture experiment.

The application of simulated rainfall in the amount and intensity which is likely to occur in the Limestone Valley Region at least once in two years resulted in 20 per cent of the rainfall being lost as surface runoff from excellent pastures. This runoff removed nine per cent of a 200 pound per acre surface treatment of triple superphosphate applied on the dry pasture. This was an average of tests on 25 plots.

Application of superphosphate and limestone together had no effect on phosphate losses. Loss of limestone in runoff was small amounting to 2 per cent of a 2 ton per acre application.

(C). Rates and amounts of runoff from small agricultural watersheds:

Records of rainfall and runoff, as well as soil moisture and cover conditions have been collected during the period of this report from watersheds II and III at Blacksburg. All runoff data from these areas have been computed through the 1942 season and tabulation of the 1943 data is progressing. Rainfall intensity data for these watersheds including most of the 1942 season has been computed.

In the fall of 1942 a complete system of contour strip cropping was laid off on the College Farm field that includes Blacksburg watersheds II and III. Records of rates of water discharged from these watersheds are being compared with previous years results when "straight-row" cultivation was employed on the field. A noticeable decrease in soil erosion is already noticeable on the strip planted to corn. The attached photographs show views of the field taken after a heavy runoff in the spring

of 1942 compared with the spring of 1943 when the field was contour strip cropped.

Records of rainfall and runoff have been collected from Danville, Va. watersheds I, II, and III, and data has been compiled and computed. Hydrologic bulletins covering runoff studies at Danville and Blacksburg have been completed and are in process of being published.

3. Publications:

A. Publications issued:

1. Addy, E. C., Dela Barre, C. F., and Cardwell, D. W. Farm Fish Ponds, Suggestions for the Building and Management. Bulletin of the Virginia Polytechnic Institute, June 1942.

2. Elson, J. and Azar, E, Total and Alkali-soluble Organic Matter in the Whole Soil and in Soil Aggregates at 6 and 18 Month Periods after Liming, Soil Science, Society America, Proc. 7:56-57. 1943

3. Elson, J. and Azar, E., Distribution of Total and Alkali-soluble Organic Matter Between the Whole Soil and Soil Aggregates of Dunmore Silt Loam: I. Influence of Fertility Treatments 6 and 18 months After Liming. Soil Science. 55:177-183. 1943

4. Rogers, H.T. Losses of Surface-Applied Phosphate and Limestone Through Runoff From Pasture Land. Soil Science Society America Proc. 7:69-76, 1943.

B. Publications prepared:

1. Azar, E. and Cardwell, D. W., Runoff From Small Agricultural Areas in the Limestone Valley Section of Virginia. To be published as Technical Bulletin by the Virginia Agricultural Experiment Station in cooperation with the Soil Conservation Service.

2. Cardwell, D. W. Description of Runoff Studies at Blacksburg, Va. To be published by Hydrologic Division, Office of Research, Soil Conservation Service in cooperation with the Virginia Agricultural Experiment Station.

3. Cardwell, D. W. Description of Runoff Studies at Danville, Va. To be published by the Hydrologic Division, Office of Research, Soil Conservation Service in cooperation with the Virginia Agricultural Experiment Station.

4. Elson, J. Efficiency of Randomized Block arrangement for a Contour Furrow Experiment . Presented before the Section of Statistical Methods. Virginia Academy of Science. Richmond, Va. May 12, 1943.

5. Elson, J., Distribution of Total and Alkali-soluble Organic Matter Betwe n the Whole Soil and Soil Aggregates of Dunmore Silt Loam:II Comparison of 5 Aggregate-Size Groups 30 months after Liming. Soil Science in press.

4. Accomplishments:

Many of the findings of the research studies have been summarized and reported in station bulletins and technical journals. Some of the investigations have been carried along far enough to make recommendations for proper land use under the increased food production program. These results have been used by the Agricultural Adjustment Administration, Soil Conservation Service, and Virginia Agricultural Extension Division in planning Virginia farms for soil and water conservation. Members of the research staff have worked with extension men in the field in planning farms for proper land utilization.

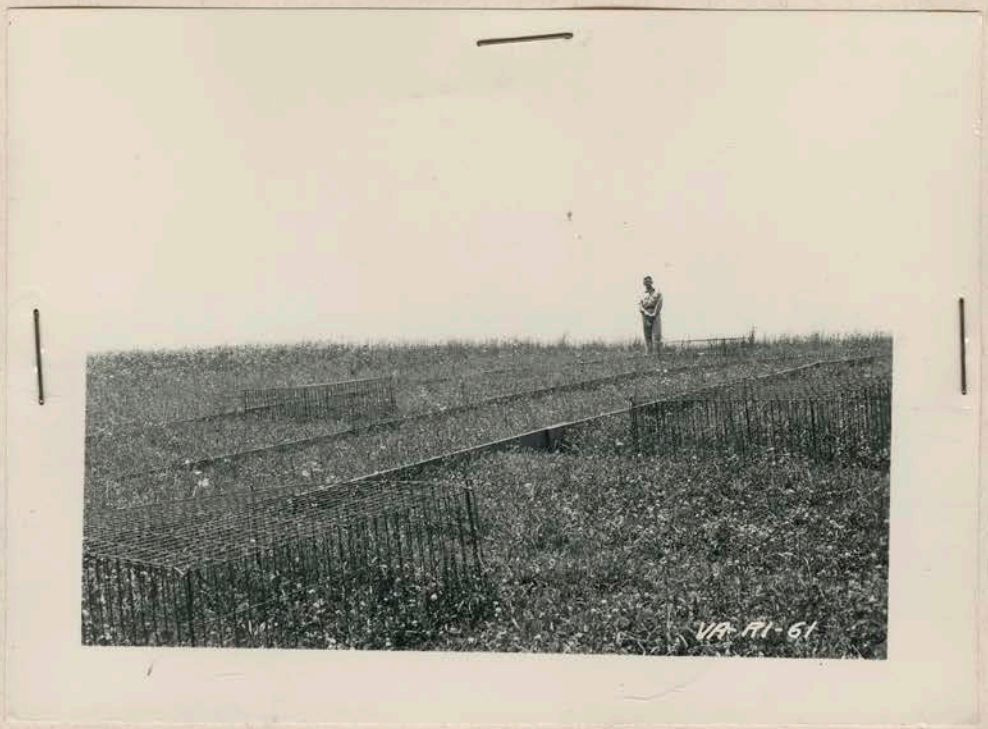
During the period of this report Giles, Montgomery and Pulaski counties were incorporated into the Skyline Soil Conservation District. To demonstrate improved soil and water conservation practices to be used in the District, the contour-strip cropping was installed on the Virginia Agricultural Experiment Station farm which is used as a demonstration area for recommended practices.

5. Work to be Completed during 1943-1944

An effort will be made to put research findings into field use by technical publications and by contacting extension men in the field.

It is expected that reports will be made on the following investigations:

1. Hydrologic Data-runoff studies near Blacksburg, Virginia
2. A four-year study of the effects of cropping , fertilizing, and manuring practices on soil structure.



Contour furrowed and fertilized pasture plot in foreground. Contour furrowed plot in background. Note heavy growth of grass under clipping cage of fertilized plot.

Contour furrowed plot without fertilizer. Note poor growth of vegetation under cage indicating need for fertilizer on furrowed plot.

Measuring run-off and erosion from corn plot with "straight row" cultivation on 20 per cent slope. After rain of June 17, 1943. Research results from this study are used in making recommendations for better land use practices. Note recommended practice of corn grown on contour in alternate strips with small grain, in field across road.

View of serious rilling following path of cultivator wheels in corn rows on Blacksburg watershed II following run-off of May 15, 1942.

Same watershed as above after heavy rains of June 1943. Oats(foreground) planted in alternate contour strips with corn to prevent soil washing.

Looking up Blacksburg watershed III after big run-off on May 15, 1942. Note serious erosion across and down corn rows as well as heavy silt deposit.

Same view as above photograph after heavy rains in June 1943. Note oat strip (foreground) alternating with corn strip planted on contour to prevent soil washing.