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Color Photography in Soil Studies

LINDSEY A. BROWN and MAURICE N. LANGLEY

Color Photography Gives the Correct Conception of Colors in Soil.

Colorado Experiment Station
Colorado State College
Fort Collins

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Color Photography in Soil Studies

LINDSEY A. BROWN and MAURICE N. LANGLEY[1]

FROM the beginning of soil survey work in the United States, agricultural technicians and photographers have taken innumerable pictures of soil profiles as an aid in describing and illustrating the characteristics of soil types. Many good pictures have been published in bulletins which accurately show such features as thickness of horizons, structure, spots of lime or iron accumulation, and fragments or ledges of consolidated material. However, with pictures in black and white it has never been possible satisfactorily to show slight or even marked differences in colors of various horizons or the color nature of mottlings within individual layers in soil profiles.

Even with the development of the chromatic type film, which emphasizes variations in color, the black and white pictures or projections have not been fully satisfactory because they do not give the correct conception of true colors.

It is the purpose of this discussion to call attention to added information obtained by taking pictures in natural colors, which is accomplished by the use of film made especially to reproduce color.

The differences in the information shown by black and white pictures and those in color are illustrated by figures 1 and 2. These two pictures show the same group of boxed monoliths of representative profiles of eastern Colorado soils.

It is sharply evident on first examination of the two pictures that a yellow color in the soil cannot be shown accurately in black and white photography because it results in quite dark colors. On the black and white plate the Terry soil appears fully as dark as the Keith soil, whereas the color plate correctly shows the Terry to be a grayish-brown soil developed on yellowish sandstone while the Keith soil is dark grayish brown. The surface layer of the Fort Collins soil also shows darker in the black and white print than it does on the color print. This is probably due to yellow coloring in the Fort Collins soil that is not noticeable to the eye. Comparative shadings of color show up fairly well on the Keith, Weld, Epping, and Rosebud soils

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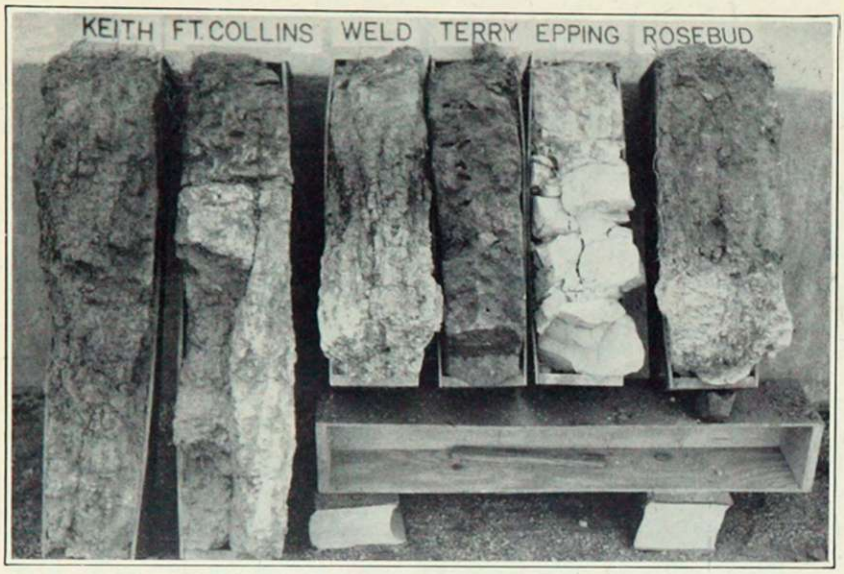

Figure 1.—Soil profiles reproduced in black and white.

Figure 2.—Same soil profiles as in figure 1, reproduced by means of color photography. The original color slide, when projected on a screen, shows the variation in color of profiles even more nearly as they actually occur than does this color illustration.

as they are to a large extent composed of brown, black, and white color constituents only. In regions where many soils have reddish-colored horizons, it is likely that the advantages of color photography will be more marked than in the illustrated example.

As previously stated, color film (daylight type) was used to obtain the picture in natural colors.

The ideal condition for taking color pictures is a bright, cloudy day, when the sun is shaded just enough to prevent shadows. Like all types of picture work, the use of color film requires practice to obtain the best results.

For the first one or two rolls of color film that an amateur photographer takes, it is recommended that he vary a couple of exposures each way from the light meter's recommended exposure. For example, if the exposure meter shows that you should use one-fiftieth second at f. 11, take one picture at this exposure, another at one-fortieth second, f. 11, and another at one-sixtieth second, f. 11. It is best to record each picture as to series, location, time of day, distance from profile, and lens setting. It is beneficial to place a spade, yard stick, or some other familiar object beside the profile so as to have a unit of measurement to which the depths of horizons can be compared. After experience with the first few rolls of film one will be familiar enough with the exposure meter, camera, and films to get a very large percentage of good transparencies.

Color film still has some disadvantages. First, it is difficult to obtain except in the 35 millimeter size. This is small and often does not give as much detail as the larger negative would. Second, it is expensive to reproduce, and therefore is generally used only for projection.

A nationally-known company makes color prints in one size, 6 inches by 8 inches, from the 35 millimeter transparencies. The prices for the prints, suitably mounted, are $10 for the first print and $2.50 each for subsequent prints of the same subject.

Equipment

Equipment needed for the satisfactory taking and projecting of color pictures includes the following: A camera, tripod, light meter, projector, and screen. These will vary according to the quantity and quality of pictures one desires.

Several companies make cameras which are satisfactory in soils work. Seldom does one need a camera with faster lens

than f. 6.3 for soils work. However, the cameras with the faster lens usually have other desirable features such as: Range finder, greater variability of shutter speeds, compur type shutter, etc. Prices of cameras will usually be in a fairly direct proportion to the lens speed, varying from one with an f. 3.5 lens at $25 to others with faster lenses at prices generally above $100.

A light meter of the photoelectric cell type is an absolute necessity since soil and vegetation colors vary greatly, and the light intensity has such large changes with the seasons and time of day. It is essential that all color film be exposed uniformly because the range of exposure is narrow, and in the development all pictures receive identical treatment.

Although a tripod is not an absolute necessity, it will enable one to get many pictures requiring long exposures, where one would be unable to hold the camera steady otherwise.

The projector used by Colorado State College Agronomy Department is made for projection of 2-inch-square slides or projection of 35 millimeter film in the roll.

A white or aluminum-colored screen should always be used to give a true comparison of colors.

All equipment should have a tight fitting leather case to protect both the equipment and film, since one is certain to encounter a great deal of dust that would tend to ruin the lens and delicate mechanism of the camera, as well as causing small pin-like holes and scratches in the film. Cases also greatly aid in the convenience with which equipment may be carried.

Costs

The investment in equipment may vary a great deal, as previously indicated. However, the following may be used as a guide to the cost of satisfactory equipment:

Camera—35 mm., f. 3.5	$ 25.00
Case	5.00
Lens shade	1.00
Light meter	22.50
Case	5.00
Tripod	4.50
Case	2.00
Projector	32.50
Screen	8.00
Total	$105.50

Cost of materials used is chiefly for color film, which is $2.50 for an 18-exposure roll. This cost includes developing the film and making each exposure into a 2-inch-square slide.

If one obtains about 12 good slides per 18 exposures, the cost for each good slide is about 21 cents. (If one wishes transparencies mounted in glass slides rather than the free mount, 12 cents per slide should be added to the cost.)

In taking pictures of soil profiles for preparation of a color record of each series, it has been an economical practice to take three pictures of each profile and three pictures showing the type of topography and native vegetation associated with the series. In this manner three complete sets of slides can be made up, showing all soils. This practice will allow the loaning or exchange of two sets of slides. The cost of six slides at 21 cents is, of course, $1.26.

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