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V. 55. — Example of a reconnaissance soil map produced by the pedological analysis of aerial photographs, followed by the study of soils in the field

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Soil scientists in many countries use aerial photographs for the classification and mapping of soils (STEPHENS, 5, SOIL SURVEY STAFF, 4). Recently some new methods for the application of aerial photographs to soil survey have been developed in the Netherlands. These methods will be of great advantage when mapping soils of large areas. They have been published by BURINGH (1, 2).

In this article we will present an example of our work in Syria to which we applied the pedological analysis of aerial photographs and the pedological photo-interpretation according to the method of interpolation. Both methods are based on a thorough study of the photographs with the help of a stereoscope. Various elements, which are important to soil mapping, can be analyzed either separately or in groups. The result is a preliminary soil map, i. e. a map on which various soil boundaries are shown and on which soil associations, soil complexes and soil phases are indicated. In the next stage, this map is used for carrying out field work, which can then be executed in a very short time. The soil map is much more accurate than a map produced by the normal soil survey methods.

We studied the area of Khan Cheikhum east of the Ghab Valley in Syria. This area is about 12,000 ha and is covered by 30 aerial photographs of good quality on a scale of 1 : 20,000 (K.L.M. Aero-

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carto). The photo analysis has been carried out by the first author in two days. He never had visited Syria before. Later on the two authors studied the soils in the field. Soils in an area like this are well known to the second author, who already works for some years in Syria.

While travelling by car through this area we were able to study the soil and in about half a day we made enough observations to check the preliminary soil map and to transfer it to the definite reconnaissance soil map. It would have been possible to map more details in the same way, but then the field work would have taken about 2 days more. This extra work would have produced a semi-detailed soil map in a scale of 1 : 50,000. Due to the weather and soil conditions in the beginning of February 1954, it was impossible to cross the whole area by car. We therefore had to simplify the original map of the analysis.

In addition to the advantages of this working method for large areas, mentioned by BURINGH (1, 2), we found some other advantages which may be typical for a steppe area like this. There is hardly any vegetation so that the soil itself can be seen on the photographs. The white coloured subsoil in the limestone area and the soil thickness phases can be recognized very well. Many features, which may be overlooked in the field, are clearly visible on the photos. They can be mapped very easily and accurately too.

The result of our work is shown in figure 1. We shall limit ourselves to a general description of the soils in the legend of the map, because the purpose of this article is to show what can be achieved by the applied methods. Although it would be possible to produce a more detailed soil map of the same area in a few days, it will not be possible to map soils in detail, for instance on a scale 1 : 10,000. In detailed soil surveys all soil series and soil types must be mapped. These units can usually not be analyzed in aerial photographs. They can only be mapped by means of normal field mapping. This conclusion is in accordance with the results of an interesting study of POMERENING and CLINE (3).

It always takes much time to map soils of a large area on a scale 1 : 50,000 or 1 : 100,000. It is evident now that the method of photo analysis, whether in combination with the interpolation method or not, has greatly improved the working methods in soil survey.

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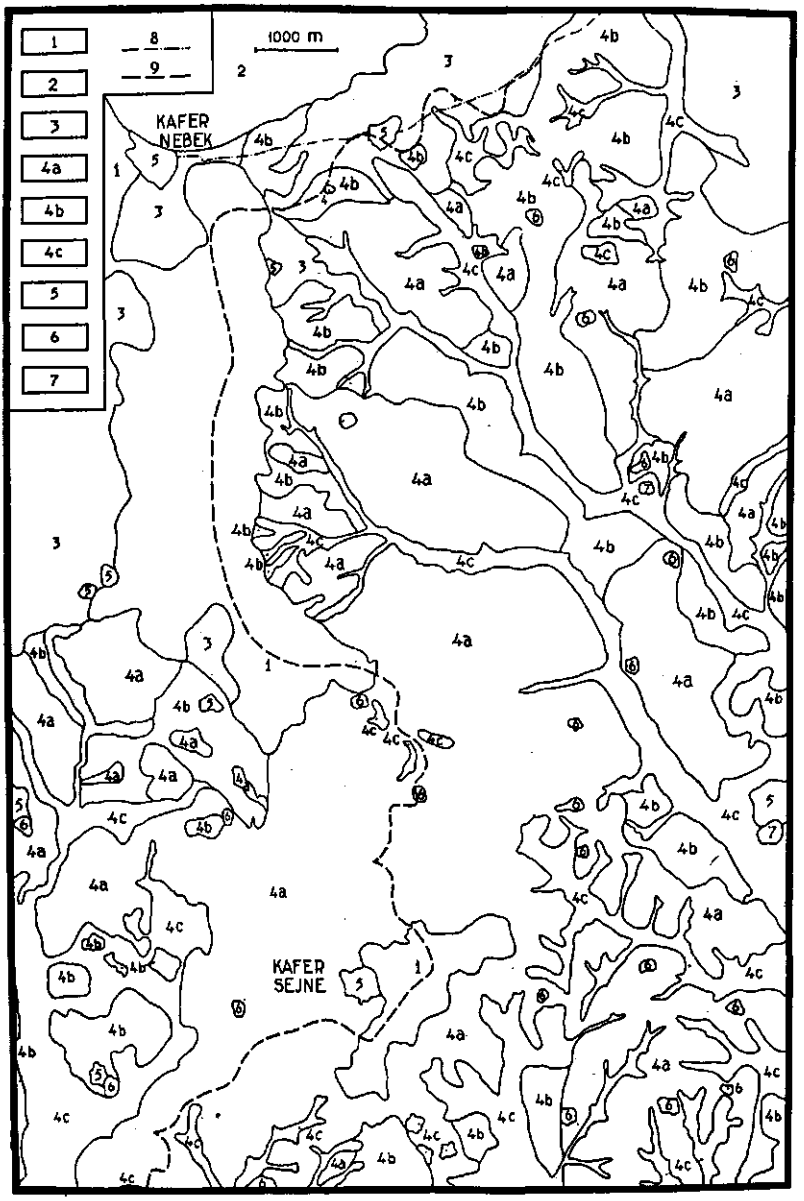
Figure 1.



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SUMMARY. — *Some new methods for the applications of aerial photography are described, which are of great advantage for soil classification and mapping of large areas.*

An example is given of pedological analysis of aerial photographs and the pedological photo-interpretation according to the method of interpolation of an area of some 30,000 acres in Syria.

Figure 1. — Reconnaissance soil map of Khan Cheikhum in Syria.

1. Dark brown basalt soils, medium deep to deep, generally boulder-strewn profiles on plateaus. Fields mostly cleared and partly used for olives.
2. Lithosols and shallow red soils on hard lime stone (« nummulitique »). At present grazing land, but traces of antique vineyards are clearly shown.
3. Eroded chalks (Miocene marine), white, highly calcareous profiles, mostly used for olives and grapes.
4. Red soils with encrusted subsoil (Cca)
   (upper Cretaceous; Senonian)
   a) shallow phase; thick crust at many phases at the surface; soil accumulated in pockets and lower places. Mostly grazing land, but every better patch is cultivated by the wooden plough and planted with wheat and barley. Gullied land.
   b) medium deep phase; as above, but all planted; crust only sporadic at the surface.
   c) deep phase; dark purple heavy clay soils in valleys, transported from the nearby higher places. Very good wheat land. At some places the hardened crust may be absent in the valleys.
5. Villages.
6. Ruins.
7. Tells.
8. Roads.
9. Watershed.

The photographs are studied with the help of a stereoscope; a preliminary soil map is thus drawn; this map is then used for carrying out the field work, which furnishes the necessary data for the definite reconnaissance soil map. In the aforementioned example, the area of 30,000 acres was covered by 30 photographs; the photo analysis, by one of the authors, took 2 days; work on the field, by car, was done in half a day. A more detailed study would necessitate some two days more. For detailed soil surveys, however, wherein units must be mapped which cannot be analyzed by aerial photography, normal field mapping methods are required.

RÉSUMÉ. — *La photographie aérienne est actuellement d'un grand secours pour la classification et la cartographie des sols de contrées très étendues.*

Pour en démontrer les énormes ressources, les AA. présentent ici, en grandes lignes, un travail réalisé sur 12.000 ha en Syrie par l'analyse pédologique de photographies aériennes et la photo-interprétation pédologique suivant la méthode d'interpolation.

Les résultats de cette étude permettent de tracer une carte préliminaire qui servira au travail sur le terrain et ce en quelques jours seulement : étude des photographies (deux jours) et travail sur le terrain (en voiture, une demi-journée). Pour une étude plus poussée, il faut compter deux jours supplémentaires. Pour des cartes détaillées, la simple étude des photographies doit se juxtaposer à une étude approfondie sur le terrain suivant les méthodes ordinaires de cartographie.