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TESTING AND IMPROVEMENT OF A QUESTIONNAIRE TO USERS OF SOIL MAPS

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ABSTRACT

Ninety-four people from 35 countries responded to a questionnaire on the use of soil maps. Most respondents had used soil maps in the fields of agriculture, of forestry, soil conservation, environmental pollution and protection. 98% of the respondents had used soil maps for locating suitable areas for their professional work, 15% for teaching and research and 13% had also used soil maps to help get financial assistance. Less than half of the respondents had used interpretation maps derived from soil maps. Most maps were produced by government soil survey institutes, but 51% had also used soil maps produced by other government institutions including universities and research stations. Only 19% had used soil maps made by private soil survey organizations. Major problems encountered in using soil maps include poor legibility, problems of location on the maps, vague and complicated terminology. Most respondents felt that soil maps are essential for their projects. Only a few found soil maps completely useless. Based on the problems encountered while using soil maps, recommendations have been made to those involved in soil resource inventories. A revised questionnaire has also been proposed following comments made by the respondents of the previous one.

INTRODUCTION

As stated in the USDA Soil Survey Manual (Soil Survey Staff, 1951), the objective of soil surveys is to study soil properties, to describe soils and classify them, and to map their distribution so that predictions can be made about their use and their response to various management practices. Soil surveyors are charged with the responsibility of organizing data into classes for presentation in both soil maps and soil reports. The utility of a soil map is a function of the surveyor's ability and the effort he invests in trying to satisfy users' demands and expectations (inasmuch as these are known).

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While there is a general agreement about the stated objectives of soil surveys, there is doubt if sufficient use is made of soil survey work (Dudal, 1978). It is often observed that soil data that are potentially important as a basis for decision making in land use are not utilized. This may be due to various reasons including poor presentation of results, lack of communication between soil scientists and agriculturists, difficulties arising from specialized terminology, inadequate interpretation on the surveyor's side or lack of interest on the side of the decision-makers.

It has also been noted (Cline, 1981; Valentine et al., 1981) that soil inventories are being used more and more by people who are not soil scientists. Planners, foresters or consulting engineers usually have to include an evaluation of soil information in their land use reports or plans, yet only rarely have such people helped in making the maps (Valentine et al., 1981). Moreover, whether users of maps can use them properly or whether maps offer the needed information needs to be verified. The objective of the present study is to get a feedback from users of soil maps, to identify existing bottlenecks in their use and, eventually, send a message to soil surveyors for improvement of soil inventories.

MATERIALS AND METHODS

A questionnaire (Appendix 1) was used in this study to get information from users of soil maps. Questions were set to find out to what extent soil maps have been used and to identify the problems encountered while using them. Copies of the questionnaire were mailed to 274 possible users in different countries whose addresses were sought from professional association membership lists. They included agronomists, foresters, university lecturers, engineers and private farmers.

After about 10 months, the number of completed questionnaires was 94, from 35 countries. All these have been used in the present study. Table 1 shows the countries from which replies were received and table 2 gives a distribution of their fields of specialization. The different institutions in which the respondents were working is given in table 3.

RESULTS AND DISCUSSION

Use of soil maps

96% of the respondents had used soil maps in their professions in one way or another. Those who had not used such documents attributed this to the fact that (a) the use of soil maps was not part of their professions and (b) suitable soil maps specific to some professions were not available. As for those who did not respond to the questionnaire, there is no way to ascertain that they had not used soil maps as the questionnaire was open both for those who had used soil maps and those who had not.

Objectives of using soil maps

The present study indicates that soil maps have been used with many different objectives and motives (table 4). More than 97% of the respondents had been using soil maps for locating suitable areas for their professional work.

Table 1. Countries in which questionnaire was answered*

Country	% of respondents	Country	% of respondents
Australia	7	Jamaica	2
Bangladesh	1	Japan	2
Belgium	6	Kenya	2
Botswana	2	Netherlands	9
Brazil	1	New Zealand	4
Britain	9	Nigeria	1
Burundi	1	Philippines	1
Canada	6	Poland	2
Chile	2	Sudan	1
Ciskei	1	Syria	1
Czechoslovakia	1	Taiwan	2
Denmark	1	Tanzania	1
Ethiopia	2	Thailand	1
France	3	Turkey	2
Greece	1	Uruguay	1
India	5	USA	10
Indonesia	2	West Germany	4
Ireland	1		

*Total no. of countries = 35, no of respondents = 94

These included agricultural and forest production, soil conservation and studies on environmental pollution and protection. About 14% had used soil maps for teaching and research while 13% had used them for getting loans and financial assistance to support their projects. Very few had used soil maps with other motives such as soil correlation preparation of scientific papers, geographical research for national atlases and for preparation of new soil maps (in each case only one or two respondents).

Table 2. Fields of specialization of respondents of questionnaire*

Specializations	no of respondents
Agricultural Engineering	1
Agronomy	4
Forestry	2
Geography	2
Soil Science	39
Agronomy + Soil Science	27
Forestry + Soil Science	12
Soil Science + Environmental Sciences, Geography	5
Soil Science + Land Use Planning	3
Soil Science + Horticulture	1
Soil Science + Agricultural Engineering	1

*Based on 94 questionnaires

Table 3. Institutions in which respondents of questionnaire are working*

Institutions	% of respondents
1. Ministries of Agriculture	43
2. Ministries of Natural Resources including Forestry	9
3. Ministries of Public Works	1
4. Universities	35
5. Agricultural Research Institutes	7
6. Forest Research Institutes	1
7. Private Agricultural Consultancy Firms	4

*Based on 94 respondents

Table 4. Motives for using soil maps

Objectives	% frequency based on 90 respondents who had used soil maps				
	A	F	C	O	N*
1. Location of suitable areas for professional work/production	37	41	12	8	2
2. Teaching and research in colleges, universities and in research institutes	3	3	4	3	86
3. For the sake of securing loans and financial aid from banks and governments	1	3	4	4	87
4. For soil correlation	0	2	0	0	98
5. Preparation of scientific papers	0	0	1	0	99
6. Geographical research for national atlases	1	0	0	0	99
7. Preparation of new soil maps	0	1	0	0	99

*A = always, F = frequently, C = commonly, O = occasionally, N = never

Use of interpretive information

The aim of soil survey is to supply information about soils. However, users who are not specialists in soil science may not be able to use directly the information registered on a soil map. This implies that interpretative data for land use would be of more direct use to users. Yet about 45% of respondents had never used interpretative maps (table 5). This observation may possibly be due to the fact that most of the respondents have a background in soil science and do not necessarily need interpretation or it may be a reflection of unavailability of such maps.

Institutions producing soil maps

In most countries, soil surveys are done by specialized government soil survey institutes (table 6). About 95% of the respondents had used soil maps made by the conventional government soil survey institutes, while about 50% had also used soil maps from other government institutions including universities and research institutes. Only slightly less than 20% had used soil maps made by private soil surveys probably because these are the fewest and that normally documents produced by such institutions are not easily accessible to the public.

Table 5. Use of interpretative maps, based on 90 respondents

Nature of interpretation maps	% frequency				
	A	F	C	O	N*
1. Completely derived from soil maps	10	23	10	11	45
2. Partly derived from soil maps	4	12	16	21	47

Characteristics of soil maps used by respondents

The frequency distribution of the responses on the nature of soil maps that had been used is presented in table 7. It is apparent that most respondents had been using general purpose soil maps. About 40% of respondents had also used soil maps specific for their own needs, and about the same percentage had used soil maps with specific objectives different from theirs.

Table 6. The different institutions making soil maps

Type of institution	% frequency based on 90 respondents				
	A	F	C	O	N*
1. Conventional government soil survey institutes and affiliated organizations	48	26	13	8	6
2. Other government institutions and universities	7	20	9	16	49
3. Private soil survey organisations including consultancy firms	1	1	4	12	82

Table 7. Type of soil maps that have been used

Type of soils maps	% frequency based on 90 respondents				
	A	F	C	O	N*
1. General purpose soil maps	44	32	8	4	11
2. Maps specific to users' objectives	4	17	7	11	61
3. Maps with specific objectives different from users'	1	4	9	24	61

*A = always, F = frequently, C = commonly, O = occasionally, N = never

Users' experience when using soil maps made by institutions other than their own is recorded in table 8. Quite a big portion of the respondents (about 66%) indicate that there were deficiencies in at least some of these documents.

Knowledge about the existence of soil maps

Table 9 gives information on how knowledge about the existence of soil maps was obtained. Most respondents got that knowledge through education at college/university, through colleagues and through extension services. Other sources of this knowledge include professional contacts directly with producers and related institutions and through libraries. It is well known that television, radio and newspapers are effective means of communication, yet only about 5%. of the respondents learned of the existence of soil maps through these media.

Table 8. Adequacy of soil maps made by institutions other than users'

Adequacy of soil maps	% frequency based on 90 respondents				
	A	F	C	O	N*
1. With such maps, one still has to make complementary investigation	20	19	10	17	34
2. All the necessary information can be found in the soil maps	7	9	20	16	49

*A = always, F = frequently, C = commonly, O = occasionally, N = Never

Table 9. Source of knowledge on existence of soil maps

Source of knowledge	% frequency based on 90 respondents				
	A	F	C	O	N*
1. Through education at college/university	28	14	9	12	37
2. Through extension services	4	6	8	10	72
3. Through libraries	6	2	1	1	90
4. Through professional contact with producers	6	8	0	1	86
5. Through colleagues	9	18	9	14	50
6. Through radio, television, newspapers	0	1	1	2	95

*A = always, F = frequently, C = commonly, O = occasionally, N = never

Almost 50% of the respondents invariably had difficulties in getting information about the existence of relevant soil maps.

Competence in using soil maps

The present survey indicates that about one third of the respondents felt that they only occasionally needed help from soil surveyors or other soil scientists when using soil maps, and slightly more than half, could use maps without the help of other soil scientists. This is a good score and could be a reflection of the fact that most respondents had background knowledge in soil science (table 2).

Problems encountered by users of soil maps

Table 10 reveals the problems that users encountered while using soil maps. It is apparent that the major problems are related to location (32% of the respondents), low map legibility (33%), complicated terminology (19%) and vague terminology (34%). Other minor problems perceived include incomplete definition of mapping units, incomplete analytical data and mapping errors (as indicated by less than 5% of the respondents in all cases).

Table 10. Problems perceived while using soil maps

	% frequency based on 90 respondents				
	A	F	C	O	N*
Problems of location	1	12	7	12	68
Problems related to legibility	1	2	12	18	67
Problems of complicated terminology	2	6	4	7	81
Problems of vague terminology	2	3	12	17	66
Problems of incomplete definition of mapping units	0	0	1	2	97
Problems of incomplete analytical data	0	0	1	1	98
Problems of mapping errors	0	0	0	1	99

*A = always, F = frequently, C = commonly, O = occasionally, N = never

The significance of soil maps in projects

Table 11 summarizes the feelings of respondents about the significance of soil maps. More than 85% of the respondents indicated that soil maps are

essential in their projects. About 23% feel that soil maps are only good when there are soil experts to interpret them, and about 7% feel that they are only a valuable addition to other information. About 9% of the respondents (foresters) found soil maps completely useless in their projects.

Table 11. Significance of soil maps

Users' feelings	% frequency based on 90 respondents				
	A	F	C	O	N*
1. Soil maps are an absolute necessity	51	22	11	2	13
2. Soil maps are only good when there are experts to interpret	7	4	2	10	77
3. Soil maps are a valuable addition to other information	2	1	2	1	93
4. Soil maps are completely useless	1	1	0	7	91

*A = always, F = frequently, C = commonly, O = occasionally, N = never

RECOMMENDATIONS

1. In relation to the problems encountered while using soil maps

Based on the problems encountered, the following recommendations are put forward to those involved in making soil resource inventories:

- to improve their legibility, (i) soil survey reports should contain a section on 'how to use the report and the maps' to enable the non-specialists to understand the information. A number of organisations in the USA and Australia already do this; (ii) Construction of clear and if possible, simple legends will be essential;

- as for problems of location, careful selection or elaboration of base maps is needed;

-provision in the soil report of a clear and concise glossary may help to alleviate the problems of specialized terminology;

-last but not least, much more publicity about the existence and usefulness of soil resource inventories should be made, and there should be at least one centre in each country, state or province where the documents can be kept for consultation and use. In order to guarantee the permanence of such centres, their organization should depend on a national institution.

2. In relation to the questionnaire

Based on the comments made by some respondents some changes are deemed necessary to make such a questionnaire more useful. The ideas of Valentine et al. (1981) have also been incorporated. The changes include:

(a) additional questions to cover more aspects of design and content of soil maps and reports;

(b) removal of frequency classes from some of the questions where they may not increase the value of the answers;

(c) simplification of some of the questions for better and easier comprehension;

(d) removal of questions which appeared ambiguous.

A copy of the revised version of the questionnaire to users of soil maps and reports is included in this paper (Appendix 2).

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