

CADASTRAL PHOTOMAP, A BASE FOR 1:5000 NATIONAL  
MAPPING IN FINLAND

Matti Jaakkola  
Pirkko Noukka  
National Board of Survey  
Finland

Commission IV

## Introduction

Depending on the value of land the cadastral surveys in Finland can roughly be divided into two categories namely,

- Towns or other densely populated areas where the scales of the cadastral maps vary between 1:500 - 1:2000. The maps have been combined mainly both for town planning and for carrying out of cadastral surveys. The map coverage usually is complete over this kind of areas. The boundary mark measurements have been carried out within accuracy of few centimetres. The maps of 1:500 - 1:2000 cover less than 10 % of the total area of the country.
- Rural areas where the scales of the cadastral maps vary between 1:4000 - 1:10000. The maps are so called "island" maps which do not form a homogeneous map system. The measurements of the boundary marks have been usually carried out within accuracy of about one metre. The material, however, is very unhomogeneous depending on age and method of survey.

In addition to the official maps mentioned above there exists cadastral index map 1:10000 which has been prepared in connection with the national basic mapping 1:10000/ 1:20000. This map covers the whole country. It, however, is an index of real estates and boundaries and has not been meant to be a base for technical use. The location of the boundary mark on the map bases on photointerpretation and on fitting together of the old cadastral maps.

The basic mapping of the country was near to the end in the half of 1970's. In order to plan the future activity the National Board of Survey organized an investigation about the need and use of the maps. The results of this investigation were published in 1977 /1/. Over 80 % of all replies indicated that the boundaries were considered the most important element of the map at the present situation when 1:20000 topographic map is ready all over the country.

## Products

As a result of this investigation the National Board of Survey organized some test works. These resulted to a proposal to start development work for a new map type at a scale of 1:5000 which includes two elements namely,

- orthophoto base map
- boundary element

The boundary element is always presented in two ways namely as a numerical boundary element, which is the primary output of the process and as a graphical map.

#### Production method

The outlines of the production technics and some of the technical details have been presented in the appendix I. However, some aspects may need a more close inspection.

In order to achieve for the boundary marks the same accuracy which corresponds the graphical accuracy of 1:5000 map the coordinates of the boundary marks have to be determined by means of geodetic or photogrammetric method. Photointerpretation or combining of the old cadastral maps alone were not seen reliable enough in this regard. The selected primary method for collecting co-ordinate data was then `photogrammetric triangulation`.

The base of the aerial triangulation consists of the national horizontal control survey and of the signalized boundary marks. The premarking is carried out by the landowners voluntarily. With this way we are able to have photogrammetric co-ordinates for about 50 % of all boundary marks only. The rest have been computed by means of old cadastral boundary measurements or have been placed on the map with photointerpretation. The photogrammetrically measured coordinates are intended to be used as fixed values in carrying out cadastral surveys later on. In same connection we would be able to check the co-ordinates of those boundary marks which have not been signalized and measured directly.

A fully computerized or automated system has been selected in data handling of the boundary element compilation. This has been done not only due to the economical reasons but merely because of the future use and revision of the boundary information. This also fits well with our land register reform where the manual register will be changed into a computer based real estate register. By means of 1:5000 base map we approximately at same time try to improve also the quality of the register information especially in the case of areas and other physical measures of the real estates. So the 1:5000 base map is a start for computer based `co-ordinate cadastre`. The first round of the mapping will of course not provide us with a complete content of such a cadastre. The completion work will later on happen in connection of every day real estate surveys when the surveyors will be obliged to tie their new measurements into the existing co-ordinates of the boundary monuments if they are close enough.

That is why the main attention in the first round has been paid to the fact that we have the photogrammetric co-ordinates for as many boundary marks as possible. This is a basic requirement. The second priority has been given to a process-technical requirement, namely the boundary lines of each lot or real estate must form a close figure. The third priority in relation to the

time and money what we spend, is given to the location in the map of such a boundary marks which have not been measured.

In connection of 1:5000 base mapping some minor formal improvements has been planned like attempts somehow to classify old existing boundary information in a homogeneous way etc.

#### Production plan

Until now the National Board of Survey has carried out this new mapping in about forty communes which includes altogether 2500 map sheets (size 0.5 x 0.5 m) at a scale of 1:5000. The statistics of this material shows that on an average there are about 8000- 10000 boundary marks<sub>2</sub> in each commune. The average size of one commune is 300- 400 km<sup>2</sup> and when we have determined co-ordinates for 50 % of all boundary marks the density of the measured boundary marks in our rural areas counts about 10- 15 points/km<sup>2</sup>.

The experiences until now have been quite positive. The voluntary premarking of the boundary marks which is the most critical part of the process has succeeded better than expected before. In this type of mass production the aerial triangulation has shown its suitability comparing to the other possible methods.

According to our present production plan we aim to cover with this new map about 50 % of the country within 20 years. The coverage of the production 1980- 1984 as well as the production plan 1980- 2000 are shown in the appendix II.

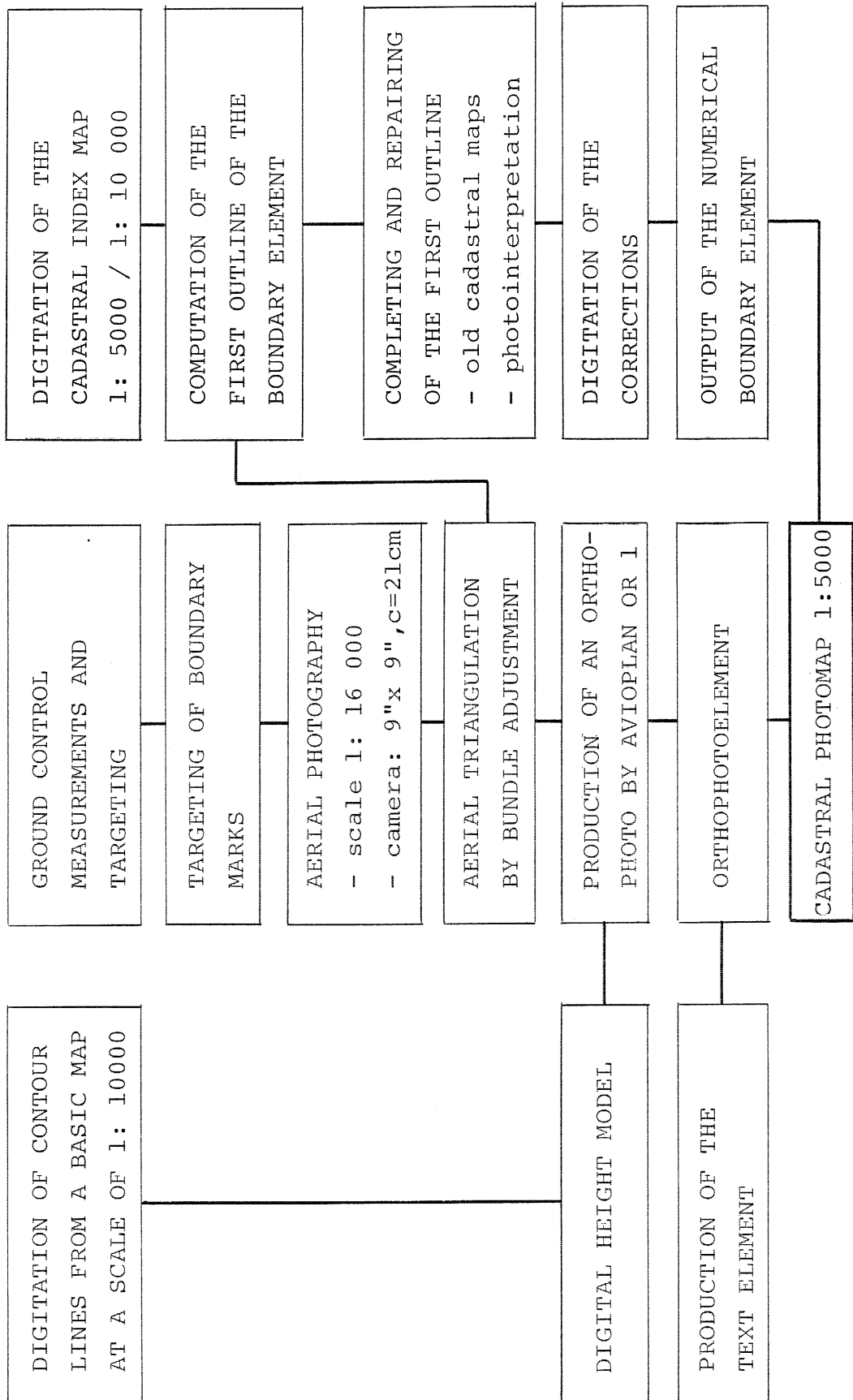
In addition to the cadastral survey the map will serve in rural areas other activities also like planning, fiscal purposes, forestry, agriculture etc. For each specific purpose the user of the map has to prepare his own additional element the cost of which he has to carry himself.

According to our earlier experiments the method mentioned above was seen accurate and reliable enough for this type of multi-purpose mapping and from the economical point of view it was the only reasonable selection.

#### REFERENCES

- /1/ PUBLICATION of the National Board of Survey, No. 45: Maastokartoitusten koordinointi (Coordination of Mapping Works). Kartastoasiain neuvottelukunnan maastokarttajaoston koordinointityöryhmän mietintö (in Finnish), Helsinki 1977.
- /2/ JAAKKOLA M, NOUKKA P Cadastral photomap 1:5000. Tenth United Nations Regional Cartographic Conference for Asia and the Pacific, Bangkok 1983.

## PRODUCTION OF THE CADASTRAL PHOTOMAP 1:5000

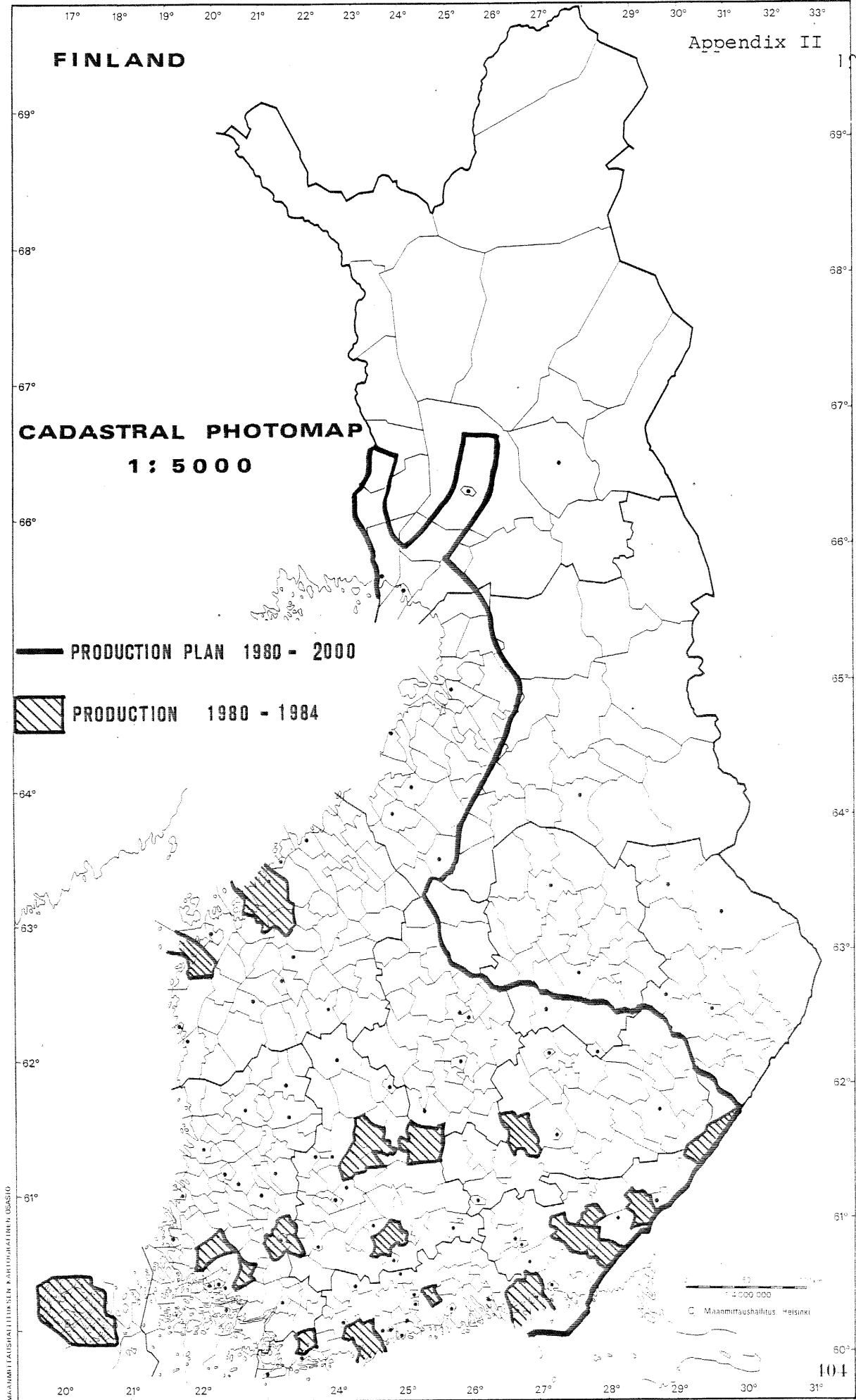


**FINLAND**

**CADASTRAL PHOTOMAP  
1 : 5 0 0 0**

 **PRODUCTION PLAN 1980 - 2000**

 **PRODUCTION 1980 - 1984**



MAANMITTAUSLAITOKSEN KARTTOJASTO

MAANMITTAUSLAITOKSEN KARTTOJASTO