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AND USE OF RURAL AREAS**

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# A MACHINE PROCESSED SURVEY OF THE DIVISION AND USE OF RURAL AREAS

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## Introduction

In this paper a short description is given of a land use inventory system, the Land Division Survey. Especially with regard to the planning of land consolidation projects there is an urgent need for information concerning the structure of rural areas. Therefore a machine processed land use inventory system was developed by the Institute for Land and Water Management Research. The system has been in operational use for more than five years in which period an area of some 700,000 ha of the total of 2.2 million ha of cultivated land was inventorized. Included in this inventory were 92 future land consolidation projects.

Many systems of description of rural areas exist and in principle there are two approaches:

- . statistics of agricultural and horticultural holdings in a certain region and for the country as a whole;
- . physical-geographical descriptions of a region, based on topographical features.

In the Netherlands both types are needed and preferably in conjunction with each other, giving a systematic survey of all facets that are of importance to farming in relatively large areas. This became imperative when the demand for rationalization of agriculture gave rise to large scale reconstructions of rural regions, trying to make them efficient and economically optimum for agriculture and horticulture, and good to live in for the rural population as well as for people seeking outdoor recreation. Such reconstruction schemes mean the buying of land to enlarge the remaining holdings; the re-allocation of lots; the improvement of the road quality and road network, of the water management and soils of the area; installing tile-drainage, digging new water courses and constructing new pumping plants; improving size and shape of lots and holdings by removing ditches, earthen banks, non-scenic hedges and vertical drops; re-siting farmbuildings from village to field; laying of electricity, drinking water and telephone mains to the new sites; making facilities for outdoor recreation and sites for second homes. All this while protecting or improving scenic landscapes and nature conservancies. On January 1, 1973 such reconstructions of rural areas had been realized for 463,000 ha, 576,000 ha is in execution, 500,000 ha in preparation and 700,000 ha is applied for.

The planning and execution of such intricate improvement schemes ask for exact, comprehensive and up to date information on the area in the initial situation. It soon became evident that important information was either lacking or was gathered and worked out in a non-uniform manner. Increased knowledge on the effect of the separate reconstruction elements and their functional relations made it possible to devise a uniform system of classification, giving a combination of all the rural facets that are involved (see scheme Structure factors of the rural area).

It proved possible to work out input and output routines, based on features registered on data charts, with which a computer IBM 370/145-512K programmed with PL-1, gives final data in lists and tables. In this way it is now relatively easy to produce uniform reports for all regions. Such surveys are used in a routine basis, in the beginning for the selection of areas to be reconstructed and at the moment as a prerequisite for the planning and execution of all major rural reconstruction projects in the Netherlands.

### Principles and procedure

The unit around which the system was devised is the farm holding, comprising all land owned or leaseheld by one land user (holding operator). Within the holding, the lot (a piece of land of one holding operator surrounded by land of others) was taken as basic unit, being the smallest unit of which the distinguishing features are described. For practical purposes, especially to characterize the scatter, the compound lot was introduced, this being a combination of one or more adjacent lots separated by easily passable non-owned roads, canals, etc. The lot is subdivided into topographical parcels (subdivisions of a lot by means of topographical boundaries as ditches, hedges, vertical drops, etc.). At the other end of the scale the holdings are combined to land users districts (areas with holdings oriented towards one or more specific village centres and within which as much land as possible of these holding operators concerned is contained). The land users districts are combined to blocks (varying from 1000 to 100,000 ha), each of them generally being one project for rural reconstruction.

The inventorizing and processing consist of five, more or less consecutive stages. As the method is used in a routine sphere the making of the inventory is delegated to non-research organizations. The Institute, however, retains the final supervision and the responsibility for the survey.

Stage 1. Preparatory work. Assembling the existing maps and drawing of other necessary field maps on which an inventory of all roads according to quality as well as the water courses are given. Furthermore the ordnance co-ordinate system is transferred to the field maps.

Stage 2. Registration of land use. Gaining of information on land use, whether or not on the basis of cadastral plans, from well-informed inhabitants of the region and making the field map of land users holdings. Filling in the data charts of each holding with census data. The field map is transformed to a fair land users map.

Stage 3. Completing the data charts. With aid of the land users map the data are registered according to special uniform prescriptions. A conspectus of these data is given in the scheme of structure factors in rural areas.

Stage 4. Card punching and making preliminary maps, after punching, the input data are listed by the computer and checked by a special program which automatically signals contradictions. From the input lists, address lists are produced in numerical (registration number) and alphabetical (name holding operator) order. Preliminary maps are designed, drawn and coloured during which visual checks are carried out.

Stage 5. Output and making definitive maps. The data of the checked and corrected input lists are run through the computer which produces 14 standard tables as output in a directly readable form. Input and output in reduced size are gathered into books.

## Data presented in tables and maps

At the end of each survey the final input (data per lot), the input data compiled per holding and the output are available. The output consists of 14 tables of which numbers, titles and the subjects concerned are given below.

Table 1. Parcellation and land use of holdings inside block with operator having main occupation agriculturist (L) per land users district and per block. The same per block for the occupations: horticulturist (T), specialist (S), subsidiary occupation in agriculture (NL); and the holdings outside block without occupational division.

Data on: land users districts and block  
main occupations  
holdings  
lots  
compound lots  
area arable land, grassland, orchard, tree nursery and lots exclusively for farmbuildings  
area house lots  
area house compound lots  
glasshouse horticulture  
real and weighted distance from farmbuilding to centre of lots  
accessibility distance from centre lots to nearest metalled road  
mean age of holding operators  
holdings inside village centre

As in this paper it is impossible to show the total machine printed input and the 14 tables of the output, only the second part of table 1 of the output is given. The example concerns the block Kessel, a reallocation area in the province of Limburg in the Netherlands. This example shows the final, reduced, size with the translation in English added.

Table 2. Holding size and ratio owned-leaseheld tenure of holdings inside block with farmbuildings inside village centre; per main occupation (table 2A). Table 2B and 2C concern the same subject but now for holdings with farmbuilding outside village centre and for all holdings together resp.

Data on: main occupations  
site of farmbuildings  
holding size distribution  
% leaseheld tenure

Table 3. Total holding area inside and outside own land users district of holdings inside block and area inside block of holdings outside block for main occupation agriculturist (L) and for all holdings together.

Data on: land users districts  
main occupation agriculturist and total  
total area of the holdings and distribution of this area over land users districts  
geographical territories

Table 4. Holding size, holding type and number of assisting sons of holdings inside block per main occupation.

Data on: main occupations  
holding size distribution  
holding types (based on standard operation units)

**Table 5. Distribution of holdings inside block according to number of compound lots per holding, for the main occupation agriculturist, horticulturist, specialist, subsidiary occupation and all occupation together resp.**

**Data on: main occupations**  
holdings  
compound lots  
components of compound lots  
mean holding size  
kind of partition in compound lots

**Table 6. Distribution of compound lots of holdings inside block for main occupation agriculturist among house and field compound lots with the corresponding distance to centre of lots; per holding size class (table 6A).**

**Table 6B gives the same information as table 6A but for all main occupations.**

**Data on: main occupation agriculturist**  
holding size  
house compound lots  
field compound lots according to size rank  
real distance to centre of compound lots

**Table 7. Distribution according to size of the compound lots of holdings inside block for main occupation agriculturist; as well as the kind of partitions in the compound lots (table 7A). Table 7B gives the same information as table 7A but for all main occupations together.**

**Data on: main occupation agriculturist**  
compound lot size  
house compound lots  
field compound lots  
kind of partitions in compound lots  
components of compound lots  
topographical parcels

**Table 8. Distribution of lots of holdings inside block for main occupation agriculturist and all holdings respectively; shape and division in topographical parcels.**

**Data on: main occupation agriculturist and total**  
lot size distribution  
lot shape  
area and shape topographical parcels

**Table 9. Per land users district (geographical territory), number, shape and mean area of topographical parcels (excl. lots exclusively for farm buildings) divided according to kind of culture; of the holdings inside block for main occupation agriculturist and total.**

**Data on: land users districts**  
main occupation agriculturist and total  
kind of culture  
number, mean area and shape of topographical parcels

**Table 10. Mean real distance to centre of lots according to road quality and total for holdings inside block per main occupation and total.**

**Data on: land users districts**  
main occupations  
road quality: metalled road, semi-metalled road, non-metalled road, water, field, lots themselves and total  
total real distance to centre of field lots

total weighted distance to centre of all lots  
total weighted distance to centre of field lots  
traverses: railways, highways, ferries (whether or not in combination), own lots  
lots situated in municipal planning schemes  
lots with another than agrarian purpose, excepted municipal planning schemes

Table 11. Distribution of holdings inside block for main occupation agriculturist and the pertaining lots according to real distance to centre of lots, also for all holdings inside block together.

Data on: main occupation agriculturist and total  
real distance to centre of lots  
number and area of holdings and the pertaining mean  $\frac{1}{2}$  depth of lots  
number and area of lots and the pertaining  $\frac{1}{2}$  depth

Table 12A gives in the first place per main occupation, the accessibility of the farmbuildings of holdings inside block; per land users district and total.

Data on: land users districts  
main occupations  
real distance of buildings to the nearest metalled road (in classes)  
number and area of the holdings

Table 12B gives further information about the holdings inside block with farmbuildings more than 50 m from the metalled road. Per real distance-class a specification is given of this distance according to road quality.

Table 13. Accessibility of lots per main occupation and total for lots directly situated on metalled road (table 13A) as well as for lots not directly situated on metalled road (table 13B) and also for all lots together (table 13C).

Data on: main occupations  
real distance from centre of lots to the nearest metalled road  
accessibility distance  
number and area of lots

Furthermore the mentioned three tables are presented for holdings inside block, for holdings outside block and for all holdings together respectively.

Table 14. Horticulture; number of holdings with horticulture, the kind of horticulture per main occupation and the types of horticultural holdings.

Data on: main occupations  
number of holdings  
holding size  
holding type  
kinds of horticulture

In addition to the tables the following maps are supplied per block:

- . map of land users districts, on which block boundary as well as the boundaries and the names of the land users districts are mentioned.
- . map of land users holdings. On this map, being the base of the system, the lots of each holding are given. Each lot carries the registration number of the holding operator followed by the lot number e.g. 92500344/1. Both numbers correspond with the data chart. Furthermore the lots situated in another than the own land users district are indicated.
- . map with site of farmbuildings. This map gives the exact place of the farmbuildings by means of an arrow, registration number of the holding operator combined with the indication of the main occupation, holding size and number of compound lots.

- . map of compound lots. This map gives a first indication on the scatter within the block. In colour 4 classes are distinguished: house compound lots (blue), 1st field compound lots (green), 2nd-4th field compound lots (yellow), 5th and following compound lots (red). Per class the concerning areas are mentioned in ha and % respectively.
- . distance map. Per lot the distance from farmbuildings to centre of the lot is known. According to this the lot is classified and coloured. There are 8 classes: < 200 m (blue), 200-400 m (dark green), 400-700 m (light green), 700-1000 m (yellow), 1000-1500 m (orange), 1500-2000 m (rose), 2000-3000 m (red),  $\geq 3000$  m (violet). Per class the concerning areas are mentioned in ha and % respectively.
- . accessibility map. Per lot the accessibility (distance from centre of the lot to nearest metalled road in m over fields) is known and presented on the map in 8 classes:  $\leq 200$  m (blue), 200-400 m (dark green), 400-700 m (light green), 700-1000 m (yellow), 1000-1500 m (orange), 1500-2000 m (rose), 2000-3000 m (red),  $\geq 3000$  m (violet). Per class the concerning areas are mentioned in ha and % respectively.
- . slope map. Only in slopy areas such a map is produced. Per lot the slope % and main slope direction are known and given on the map. Slope in 6 classes:  $\leq 1\%$  (blue), 1-2% (dark green), 2-5% (light green), 5-8% (yellow), 8-12% (rose),  $\geq 12\%$  (red). The main slope direction is indicated by the eight main directions of the compass.

#### Present uses and future possibilities

The logical form and the rigid consistency in nomenclature and presentation make it possible to handle the given information very easily. The present standard uses with regard to the selection, planning and execution of rural reconstructions have already been mentioned. Furthermore the data have lead to a special separate machine program to the optimization of lot distance in actual re-siting of farmbuildings and via another program to the construction of holding models representative for certain groups of holdings in a region. These models are for example used for benefit-cost analyses of rural reconstruction measures. Prognoses on the future development of holding size and automation of re-allotment are in research. It is expected that within the field of rural reconstruction many more uses in science and practice will be found. The application in many other fields connected with physical planning has started and certainly will increase.

A start was made to extend the system by coupling the land user (holding operator) registration and the registration of ownership (land-survey register). This will be easier when the land-survey register is automatized too. In a test area of some 2, 500 ha both registrations are coupled. A machine program for analysis of these data is in preparation. Furthermore it is tried to incorporate soil characteristics in the system, which data up to now were available per block without any coupling to the lots.

Also a link with landscape elements will be made. Especially from the point of view that nowadays in rural reconstructions landscape elements are of great scenic value as well as of importance for nature science. So an inventory of these elements is being prepared. In future it will be tried to couple the three systems to get an integral system of description of rural areas.

Finally it is thought that now when physical planning is almost everywhere of the greatest importance, a data bank of the kind described dealing with the physical situation of a country should not be lacking.

#### Literature

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TABEL 1. VERKAVELING EN BODEYGEBRUIK PER DORPSECHTEN VAN DE BINNENBLOKBEDEYVEN, MAARVAN MET BEDRYFSHCCFO HOOFDBERCEP  
 LANDBOUWER (L) HEEFT, ALSMEDE HET TOTAAL VAN TUINBOUW- (T), SPECIALISTEN- (S) EN NEVENBEREYPSBEDRYVEN (NL) EN  
 DE BUITENBLOKBEDEYVEN. (For title of table 1 see text)

1	AANTAL BEDRYVEN / number holdings	AANTAL KAVELS / number lots	GEW. AANTAL KAVELS PER BEDRYF/mean number of lots per holding	AANTAL BEDRYFSKAVELS/number compound lots	GEW. AANTAL BEDRYFSKAVELS PER BEDRYF/mean number of lots per holding	GEN. BEDRYFSOPPERVLAKTE HA.A.CA/mean holding size	L 6	T 7	S 8	NL occupations	BUITENBLOK BEDRYVEN holdings outside block	TOTAAL Total	TOTAAL VAN HET GEBIED Total block
	110	56	18	23	207								
OPP. BOUWLAND	843.35.66	82,3	78,5	87,1	66,4								
OPP. GRASLAND	414.97.29	20.69.50	13.06.73	4.40.45	453.13.97								
OPP. BOOMGAARD	31,1	12,4	20,8	10,2	28,2								
OPP. BOOMKWEKERY	61.33.41	4.61.13	0.31.68	0.10.00	66.36.22								
OPP. BEBOUWD	12.47.54	2.21.68	0.00.00	1.01.54	15.70.76								
OPP. CULTUURGROND	1.90.31	2.02.90	0.08.60	0.05.65	4.07.46								
OPP. HUISKAVELS	1334.04.21	166.59.34	62.70.60	43.28.32	1606.62.47								
OPP. HUISBEDRYFSKAVELS	100,0	100,0	100,0	100,0	100,0								
OPP. HUISBEDRYFSKAVELS	259.54.52	44.39.13	21.10.35	22.93.98	347.97.98								
OPP. HUISBEDRYFSKAVELS	19,5	26,6	33,7	53,0	21,7								
OPP. HUISBEDRYFSKAVELS	501.28.27	50.99.18	24.86.95	24.50.28	601.64.68								
OPP. HUISBEDRYFSKAVELS	37,6	30,6	39,7	56,6	37,4								
AANTAL KAVELS MET GLASTEELT	2	15	0	0	17								
GEN. GEM. WERKELYKE AFSTAND V/C GROND (M)	1019	1034	729	758	1002								
GEN. GEM. SCHYNBARE AFSTAND VAN DE GROND	1611	1469	1082	1072	1561								
GEN. GEM. ONTSLUITINGSAFST. (M OVER LAND)	291	215	155	187	275								
GEN. LEEFTYD VAN DE BEDRYFSHOOFDEN (JAREN)	48	43	45	49	47								
BEDEYVEN MET BEDR. GEBUWEN IN CORPSKERN	9	8	3	7	27								
area	95.33.67	19.74.51	6.16.75	8.87.57	130.12.50								

\* DIT BETREFT ALLEEN DIE KAVELS WELKE UITSLUITEND BESTAAN UIT BEBOUWDE OPPERVLAKTE.  
 This concerns only those lots exclusively for farmbuildings

number of lots with glasshouse horticulture  
 mean real distance to centre lot (weighted acc. area)  
 mean weighted distance to centre lot (weighted acc. area and road quality)  
 mean accessibility distance (weighted acc. area and road quality)  
 mean age of holding operators in years  
 holdings with farmbuildings inside village centre

STRUCTURE FACTORS OF THE RURAL AREA

SOCIO-ECONOMIC DATA

Block  
 number holding operators  
 occupation distribution  
 mean age holding operators  
 holding size distribution  
 holding type distribution  
 assisting sons  
 mean ratio owned-leaseheld tenure  
 total number standard operation units  
 number s.o.u. soil bound  
 number s.o.u. not soil bound  
 mean number of lessors per holding

Land users district

number holding operators  
 occupation distribution  
 mean age holding operators  
 assisting sons  
 mean ratio owned-leaseheld tenure  
 total number standard operation units  
 number s.o.u. soil bound  
 number s.o.u. not soil bound  
 mean number of lessors

Holding

occupation holding operator  
 age holding operator  
 holding size  
 holding type  
 assisting sons  
 ratio owned-leaseheld tenure  
 total number standard operation units  
 number s.o.u. soil bound  
 number s.o.u. not soil bound  
 number of lessors

TECHNICAL PARCELLATION DATA

Block  
 area  
 topographical site  
 kind culture  
 number holdings  
 holding size distribution  
 holding type distribution  
 topographical site holdings  
 site holdings relative to village centre  
 number of compound lots (scatter)  
 number lots  
 area lots  
 topographical site lots  
 number topographical parcels  
 total holding area inside resp. outside own land users district  
 real distance per road quality  
 weighted (road quality) distance  
 accessibility of farm buildings  
 accessibility of lots  
 distribution lots per slope class  
 vertical drops

Land users district

number districts  
 area  
 topographical site  
 kind culture  
 number holdings  
 topographical site holdings  
 site holdings relative to village centre  
 number compound lots (scatter)  
 number lots  
 area lots  
 topographical site lots  
 number topographical parcels  
 total holding area inside resp. outside own land users districts  
 total holding area  
 real distance per road quality  
 weighted (road quality) distance  
 accessibility of farm buildings  
 accessibility of lots  
 distribution lots per slope class  
 vertical drops

Holding

number holdings  
 area  
 topographical site  
 number compound lots (scatter)  
 number lots  
 area lots  
 topographical site lots  
 kind culture  
 site relative to village centre  
 holding type  
 number topographical parcels  
 real distance per road quality  
 weighted (road quality) distance  
 accessibility of farm buildings  
 accessibility of lots

Compound lot

number compound lots  
 area  
 order of rank  
 % grassland per holding on house compound lot  
 number lots  
 number and kind of partitions  
 topographical site  
 number topographical parcels  
 real distance

Lot

number lots  
 area  
 topographical site  
 order of rank  
 depth  
 kind culture  
 number topographical parcels  
 shape  
 real distance per road quality  
 weighted (road quality) distance  
 accessibility  
 special characteristics  
 slope  
 vertical drops

Topographical parcel

number topographical parcels  
 area  
 shape  
 kind culture