

PROCESS OF SETTLEMENT TRANSFORMATION IN THE RURAL SETTLEMENTS OF BÁCS-KISKUN COUNTY

With the Help of Village Typological Factor and Cluster Analysis

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In our opinion, the development of Hungarian settlements took a new trend in the '70s. The major socio-economic changes in the '50s and the '60s, those in the social and proprietary conditions, the repeated and basic transformation of land property conditions, the rapid decrease in the number and ratio of agricultural workers, the industrialization etc., spread only on the 'surface' of the settlement network and rearranged the 'microstructure' of the settlement stock. The basically new structure of the settlement network was incipient; only the first results could be seen. Occupation restratification was also a surface feature of the settlement network; similarly, mass daily commuting had led to indisputable agglomeration only in some regions of the country.

Only a smaller part of the labour force released by agriculture left the villages; there had even been a rise in rural population till 1970. (Its rate was 2% between 1960 and 1970; in the meantime, there was, as a matter of course, a strong decrease of 20 to 25% in certain peripheral areas with small villages, at scattered farmsteads, while in the neighbourhood of the capital and the larger country towns population was growing rapidly.) Except for the so-called socialist towns (i.e. towns with heavy and extractive industries founded after World War II), the population growth of towns lagged far behind the pace of increase in industrial and other employment numbers. But in the 1970s the adaptation of the settlement network to the new regional distribution of the forces of production has accelerated. Apart from the transformation of the settlement stock, alterations also affected the basic structure of the settlement network. These include changes in the number, the occupational, qualificational and demographic structure of population, development in the dimensions and nature of the forces of production, town patterns reshaped by mass housing developments, the elimination of scattered farmsteads ('tanyas') in certain outskirts, transformed land use and man-made environment etc.

We assume the dominance of the network elements, the hierarchic level of the settlements, the standard of supply, the network of institutions, the nature of relationships with the towns etc., in the present development of the settlement stock. It is by their changes that settlement-shaping process are most dynamically catalyzed and directed.

The reaction of the population is keener and keener to the state of the network elements. (In commutation the role of the hierarchic level, supply and living conditions increasingly predominates over the possibility of employment and income perspectives.)

Our attempt at the typology of rural settlements was urged by the recognition of this process. Previous general-purpose settlement classifications were made from few aspects and were based on selected factors presumably determining the nature

of settlements. Hungarian settlements have been classified by their occupational structure (E. LETTRICH 1965, V. KULCSÁR 1975), economic functions (P. BELUSZKY 1965, 1975) and, recently, by development objectives. In our investigations, we intended, in addition to the classification of settlements, to get information about the nature of morphological processes in rural settlements. The investigation was devised so that the investigation itself should provide the answer to the question of what elements predominate in the morphological processes of settlements and what weights they have. Since the intensity of the new trends in settlement development has not yet been defined properly, *the basic aspects and criteria had not been set previous to this study*. Instead, 8 cause-and-effect complexes of process systems directing and reflecting the life and development of rural settlements were determined mathematically. With the help of factor and cluster analysis, we determined which elements of these process systems differentiate between rural settlement and in what degree, i.e. what factors should be considered in the classification and what weights should they have. *The selected method resulted in settlement groups defined not only by statistical data and limit values but by a similarity in the morphological processes of settlements as well* (they can be termed 'process—system' type).

Our investigations covered the whole of Hungary, 3200 villages.¹ For a methodical purpose, calculations were carried out for the counties, too. We have also been interested in what the result of different classification methods is in case of settlements in different areas (small villages, tanyas, industrial villages etc.) in our settlement classification we used the MacQueen, the Ward and the agglomerative methods.

In this paper we present the calculation results achieved in the rural settlements of Bács-Kiskun county. To the study of the 108 rural settlements of the county, about 3,000 basic indicators were collected; 27 data per settlement.

A Short Description of the County Investigated

The area of Bács-Kiskun county lying in the Great Hungarian Plain is 8,362 km²; its population was 572,000 in 1978. Population density is among the lowest in Hungary, it is below 70 people per km². This area of lowland character can be divided into several distinct landscape units; these units differ in their economy and settlement pattern. The major part of the county is *the Sandy Region between the Danube and the Tisza*; the region with half-bound wind-blown dunes was used for grazing until the middle of the last century. But since the 19th century, grape, fruit and vegetable growing have transformed the better part of the area into an intensive agrarian district, have increased population density and have contributed to its urbanization (processing, market for agrarian products). The settlements of the Danube Plain are situated on flood-free terrains surrounded by occasionally flooded plains. They had a

¹ The term 'village' may be considered synonymous with a 'commune' as, with some exceptions, they represent the same territorial units in Hungary. *Communes according to their legal situations on Jan. 1st, 1977* have been the regional units of typology. A commune is an administrative territorial unit consisting of one or more settlements and uninhabited areas, delimited legally and areally and supplied with the legal status of a commune and an official name. A village in a strict sense is a settlement where non-productive functions supply its own population and among productive functions agriculture with extensive land use predominates; a village is not an administrative unit.

certain protection in the one and a half century of the Turkish Occupation, being encircled by areas dissected with oxbow lakes, marshes and flooded meadows hardly passable in the major part of the year. Flood control has been achieved by the second half of the 19th century. The weak soils (because of salting) are used for extensive grain growing and grazing. The southwestern flood-free section of the county (the Bácska) is a flat plain with excellent soils. In this open area settlements were destroyed during the Turkish Occupation but, being a precious agrarian district, it was resettled in the 18th century.

The county has preserved its agrarian character till the 1960s; urbanization was based on agriculture (a good part of the wage-earners in towns themselves were engaged in agriculture as well); towns were markets for agricultural products and centres of processing). As a result of the accelerated industrialization in the 1960s, only 35% of total wage-earners worked in agriculture in 1978; but their ratio in the villages was still above 50% and the majority of villages, 74 out of 108, was pronouncedly agrarian (more than 60% of wage-earners were employed in agriculture).

The settlement network in the county has undergone a peculiar history. During the Turkish Occupation, the majority of the villages was destroyed except for some 'market towns'. Their areas were enormously swelled by the areas of abandoned villages (thus they reached some hundred km²). Urban dwellers, being free from feudal bounds, did not return to villages after the Turks were driven out (end of 1600s); they established a special settlement pattern in order to be able to cultivate their fields lying far away (occasionally in 20 to 30 km distance). Families were permanently resident in towns but in the season of agricultural works they moved to the fields where they built provisional homes. These built-up places functioned at first, as farmyards in the fields. Since the 19th century they are more and more permanently inhabited. After the Second World War, a good part of 'tanyas' was administratively separated from the parent settlements and they became independent administrative units.

The majority of these villages lacked any concentration or village core at the time of their organization. The elimination of 'tanyas' goes on rapidly but, even today, a third of the population of the Sandy Region lives in 'tanyas'.

54% of the population of the county are village dwellers (they live in non-urban settlements). Their number decreases. Villages are populous (there are ones with more than 10,000 inhabitants). The spaces between populous inner residential areas of village character, are filled by 'tanyas'. In the Danube Plain around Kalocsa a 'regular' village network has come about.

Method

Main steps in the investigation procedure are demonstrated in Fig. 1. Basic data for rural settlements and for processes in rural areas were compiled regarding eight aspects:

- A) the physical environment of the villages;
- B) the place of the villages in the settlement network;
- C) the economic function of the villages;
- D) the development of basic supply and service functions of the villages;
- E) the trend and rate of settlement development;

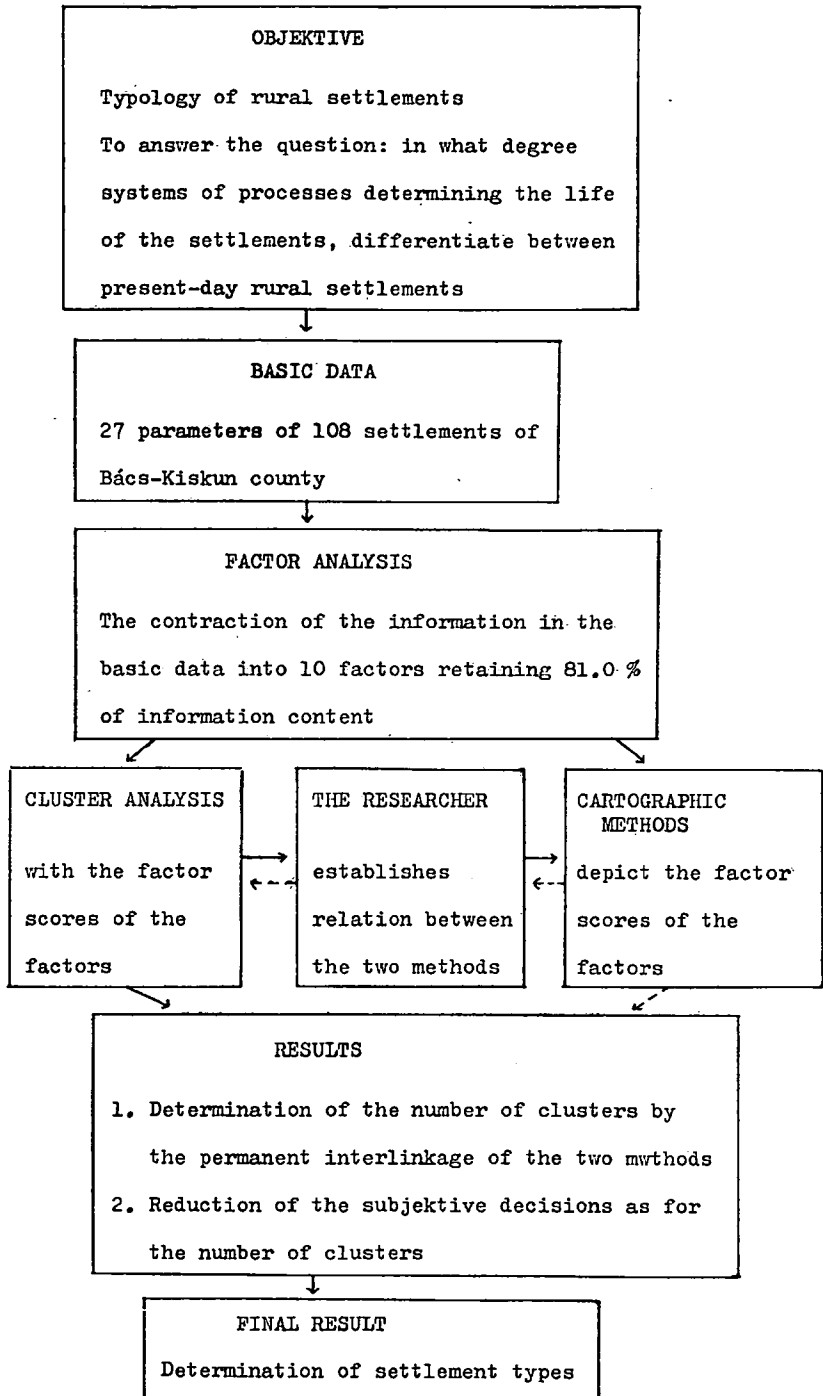


Fig 1. Main steps in the investigation of the rural settlements in Bács-Kiskun county

- F) the location of the villages with regard to transport;
- G) the infrastructural development of the villages;
- H) general level of development in the villages.

Some of the indicators themselves comprise several data (e.g. the indicator of the supply with basic service institutions comprises the existence and level of 15 basic institutions). For the purpose of factor analysis numerical data can be used; therefore, some 'derivate' indicators had to be applied, e.g. touristic function numerified by scores, elsewhere we have simplified qualitative factors to a degree that they are condensed into a single indicator, e.g. the physical environment which is constituted of innumerable elements is represented by a few types of the environment.

The basic indicators used for the investigations are the following (after the indicators in parentheses the average values for the villages of Bács-Kiskun county stand):

- A) *The physical environment of the villages*
 1. Dominant type of the physical environment in the neighbourhood of the villages² (3.68 scores);
 2. Land use (the ratio of arable land in total area of villages) (53.0%);
 3. Agricultural endowments of habitat in the villages (after the 'Planning and Economic Atlas of the South Great Plain') (36.8 scores)
- B) *The place of the villages in the settlement network*
 4. population of the villages in 1970 (3455 inhabitants),
 5. the ratio of outskirts population in 1970 (37.1%),
 6. average settlement size in the environs in 1970 3495 inhabitants),
- C) *The economic function of the villages*
 7. the ratio of industrial and construction workers in total wage-earners³ in 1970 (20.1%),
 8. the ratio of tertiary sector workers (communication, commercial and other workers) in total wage-earners in 1970 (14.0%),
 9. outcommuters as a percentage of total wage-earners in 1970 (20.4%),
 10. number of workers employed at the industrial sites of the village (133),
 11. inactive wage-earners⁴ as a percentage of population in 1970 (10.8%),
 12. the level of touristic functions in the village (in scores)⁵ (0.7 scores),

² 10 types of the environment have been differentiated during the national study:

- flood plains, seasonally wet terrains,
- marginal situation in flood plain,
- flood-free plains, loess plateaux,
- sand ridges, alluvial fan plains with terraces,
- flood plains and flood-free terrains alternating mosaiclike,
- moderately dissected hilly region, mountain foreland,
- southern foothills,
- highly dissected hilly regions,
- mountains of medium elevation,
- intramontane basins, valley floors.

³ Inactive wage-earners include employees, cooperative members and independent ones such as pensioners, annuitants, mothers with child care benefit and people with widow's pension; in respect to the conditions of employment, they are equi valent to active wage-earners.

⁴ Touristic endowments and facilities as well as other factors in connection with tourism, primarily location with regard to transport, relative position to tourist corridors etc. are indicated on a scale from 0 to 25 scores.

⁵ The level of basic institution network was quantified in scores regarding the existence or absence of institutions. The degree and level of supply (e.g. places per infants, the level of the cont-primary school, its supply with specialized teachers etc.) could not be measured.

- D) *The development of basic supply and service functions of the villages*
13. the quality of basic supply and service investigations (in scores) (11.6 scores);
 14. value of the retail turnover of industrial goods per capita (4510 Ft),
- E) *The trend and pace of settlement development*
15. rate of changes in the actual population between 1949 and 1970 (84.3%),
 16. commutation of population between 1960 and 1970 (-15.5%),
 17. pace of occupational restratification between 1960 and 1970⁶ (2.32),
 18. the ratio of dwellings built between 1960 and 1970 in total (13.0%),
 19. population change between 1970 and 1976.
- F) *The position of the villages with regard to transport*
20. the completeness of communication networks (5.6 scores),
 21. time span within which the next town (or district seat of village status) can be reached (34.2 min), by the most rapid means of transport available
 22. the frequency of the means of mass communication towards towns (206 runs per week).
- G) *The infrastructural development level (equipment of dwellings)*
23. the ratio of dwelling-houses built after 1945 (30.1%),
 24. the ratio of single-home dwelling-houses in total dwelling-houses in 1970 (94.8%),
 25. the ratio of single-room dwellings of all dwellings in 1970 (52.3%),
 26. the ratio of dwellings with plumbing in total dwellings in 1970 (13.2%),
- H) *General level of development of the villages*
27. general level of development of the villages (in scores)⁷ (78.9 scores);

On the basis of the indicators enumerated, we carried out factor analysis for 108 villages of Bács-Kiskun county (applying the so-called principal components method)⁸. The factor analysis facilitates the integration of numerous indicators into fewer groups (factors). Computations were made in several variations. Eventually, we decided on a 10-factor variation of 0.7 eigenvalue as a basis for further investigations; this is responsible for 81.0% of the square deviations of variables (Table 1.)

⁶ Calculated by the formula of dr J. Tóth:

$$\bar{A} = \frac{L_1 \times Mg_2}{L_2 \times Mg_1},$$

where

L_1 = population in 1970

L_2 = population in 1960

Mg_1 = agricultural wage-earners in 1970

Mg_2 = agricultural wage-earners in 1960

⁷ For the system of indicators see Gy. Enyedi: Regional Types of Rural Living Conditions in Hungary.

⁸ Calculations were made by the CDC 3300 computer in the Research Institute for Computation and Automatization of the Hungarian Academy of Sciences.

Table 1.
Percentages of eigenvalues

Bács-Kiskun county

Factor	Eigenvalue	Percentage	Commulative percentage
F ₁	6.68	24.74	24.70
F ₂	4.36	16.16	40.90
F ₃	2.28	8.48	49.38
F ₄	1.83	6.78	56.16
F ₅	1.42	5.26	61.42
F ₆	1.33	4.93	66.36
F ₇	1.21	4.49	70.85
F ₈	1.07	3.98	74.84
F ₉	0.95	3.53	78.38
F ₁₀	0.71	2.63	81.01

To retain 81.01% of the original information for the further studies is a favourable result in the scientific analysis of social phenomena. We carried on research on the basis of the rotated factors of this variation. The fact that the 3 most important factors contain 49.38% of total information, should be considered an achievement.

In the evaluation of the results of factor analysis, first let us review the correlations between factors in pairs (Fig. 2). The inner correlations of the indicator system are weak. In 240 cases out of the 351 possible bilateral relations, those of at least medium intensity, i.e. with correlation coefficient higher than 0.3, cannot be found. This is easy to understand as the indicators, though they are parts of a process or a 'phenomenon', i.e. the change in the settlement stock and the rural settlements, resp., according to our very objective, *represent different aspects*; they are devised so as not to be in immediate connections, as much as possible, with one another. Fig. 2 clearly shows that within the indicator groups reflecting the individual aspects (see principal groups A to H), mean or more intensive correlations are characteristic. Indicator 27 of synthetizing nature, which reflects the average level of development of the villages, deserves special attention. It is in mean or strong correlations with 17 of the indicators; first of all, with variables N° 4, 5, 8, 13, 19, 25 and 26 its relation is intensive. These latter indicators are actually important elements of 'advancement' in settlements. According to the correlation matrix, apart from indicator 27, indicator 4, the population of the villages, has 11 mean or close correlations; N° 5, the ratio of population in the outskirts, has 9; N° 7 has 12; N° 8 has 11; N° 20 has 10; N° 19 has 8 and finally, N° 22 has 9 mean or intensive correlations. These correlations, too, point to the fact that beside occupation structure, indicators 7 and 8, elements of the settlement network such as the general level of development, settlement size, the ratio of population in the outskirts, communications affecting network elements, are in connection with the majority of the morphological processes of the villages; thus they are important elements in the indicator (factor) system characterizing settlement types. This assumption of ours was, in a good part, confirmed by the identification of factors.

Identified contents of individual factors

Factor F₁ contains 24.7% of total information; its weight in the formation of settlement types is one and a half times larger than that of the next one in order.

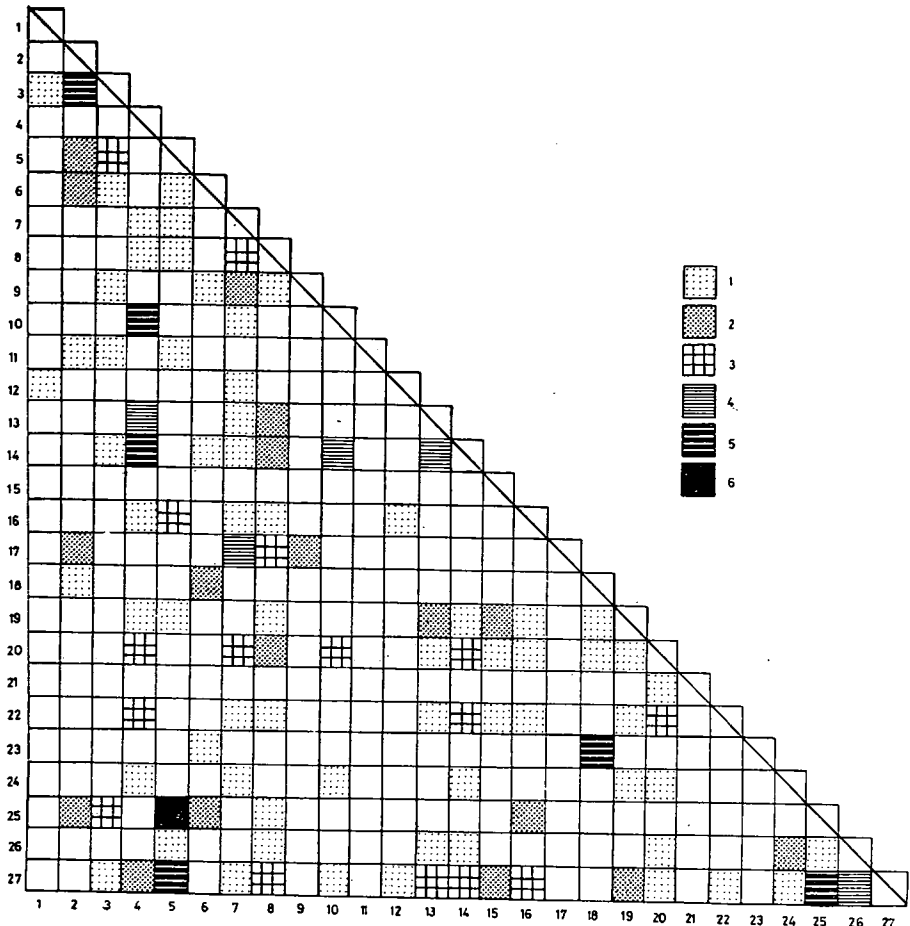


Fig. 2. Correlations of the 27 indicators used in village typology in pairs (for the names of indicators see the text). The values of correlation coefficients in the legend:

1 = 0.30—0.39; 2 = 0.40—0.49; 3 = 0.50—0.59; 4 = 0.60—0.69; 5 = 0.70—0.79; 6 = 0.80—0.89.

The content of Factor F_1 is constituted by the following indicators:

10. number of workers employed at the industrial sites of the village — fs⁹: 0.9081

4. population of the village in 1970 — fs: 0.8048

14. retail turnover of industrial goods per capita fs: 0.7482

20. completeness of communication networks — fs: 0.5660

Consequently Factor F_1 signifies the size and basic supply of the settlements (the number of workers employed at industrial sites is in close correlation with population number, thus it indicates, as a matter of fact, settlement size as well) (Fig. 3). Circumstances determining Factor F_1 control the morphological processes of the settlements in rural areas and differentiate between settlements in a county. The factor

⁹ fs — factor weight.

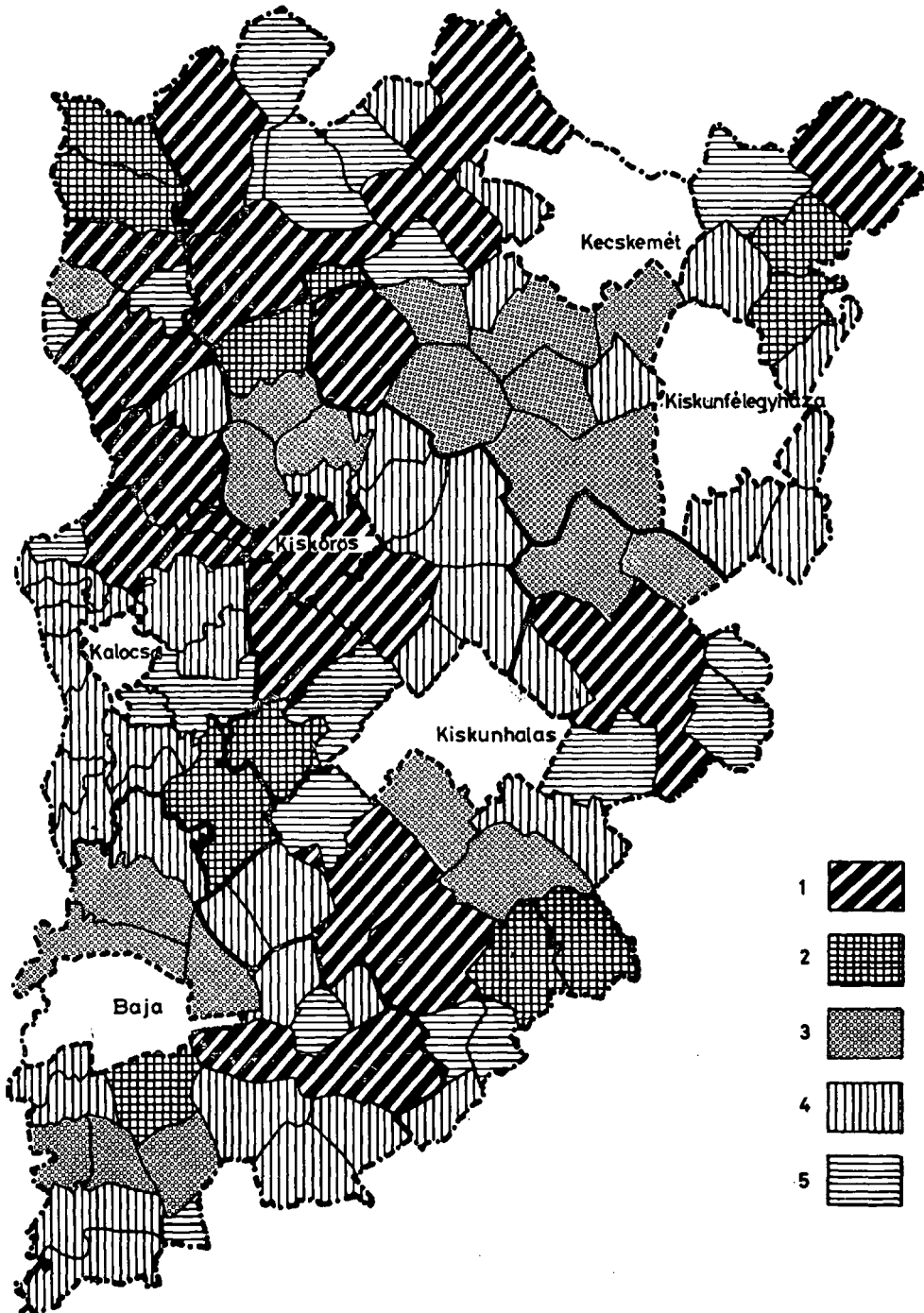


Fig. 3. Factor scores of Factor F_1 in Bács-Kiskun county
 1 = above 3.1000; 2 = 0.6001—3.0999; 3 = 0.6000— -0.6000;
 4 = -0.6001— -3.0999; 5 = below -3.1000.

analysis supports our proposition that network elements have acquired dominance over the functions and life of the villages.

The contrast with the '50s and '60s is striking: at that time the economic function of the villages, its reflection in the occupational structure and the degree of commutation were responsible for the most promiscuous differences between villages. It was evident and justifiable that previous settlement typologies were almost exclusively based on economic function, the occupational structure of population (E. LETTRICH 1962, 1965, P. BELUSZKY 1965; V. KULCSÁR 1975). The changes in the '70s are observable simply through contemplation: the advancement, the outlook of villages, living conditions, way of life and the demographic processes of their population are less and less determined by their economic partly because incomes in agriculture and in industry are levelled character. Instead, the *numerous phenomena in connection with the size, location and supply of the villages, the possibility of relations to dynamic areas, have decisive imprints on the character of a settlement, on the trends of its development and on the reactions of its population.* The demographic processes of settlements, commutation and its consequences: the composition of the population by age, education and qualification, the level of development of infrastructure etc. are interlinked with the above factors. Changes in the basic factors differentiating between rural settlements, inevitably call for the revision of the principles of social policy with its regional implications and some elements of settlement planning.

Similar results have been achieved during the investigations in Borsod-Abaúj-Zemplén, Vas, Veszprém and Szolnok counties; the result in Bács-Kiskun deserves attention as differences in the population numbers of rural settlements are smaller than in the above counties (except for Szolnok county). Especially small villages are scarce; in 1970 there were only seven villages with less than 1,000 population in the county; the majority of the villages (76 out of the 108) has more than 2,000 inhabitants and also a lot of institutions of basic supply (primary school, nursery, district doctors, food-shops, post-office etc.) can be found. The average population number of the villages in the county is 3240 (in 1976); this is easy to understand that out of the 16 institutions taken into consideration at the investigation of the basic institution network 11.6 can be found, in the average, in the villages of the county. Except for the single settlement with less than 500 inhabitants, there in every village a primary school, basic administration, (a) grocer's shop (s), a post-office, a building for cultural life, a library, private artisans, departments where orders for services can be placed etc. Villages having more than 5,000 inhabitants are characteristic; 5 of them has a population of 10,000 to 14,000. In these settlements, beside basic supply, certain elements of urban supply (specialized shops, services, e.g. electric machine repairs, specialists etc.) occur. 46% of the village population live in 21 large villages. Their administration is intermediate between town and village administration. This concentrated settlement structure is slightly modified by the high percentages of people living on the outskirts, at scattered farmsteads, 'tanyas' but, nevertheless, it is evident that *settlement size, settlement hierarchy at village level, does not cause differences only between areas with small villages but between the medium and large villages of the Great Hungarian Plain as well.* (Though the weight of Factor F_1 is somewhat less here than in Borsod county where small villages dominate.) Factor scores of Factor F_1 are shown in Fig. 3.

In the northern and northwestern part of the county, Factor F_1 has high factor scores. Here the higher value for average settlement size is coupled with the concent-

ration of the major part of the county's industry; commuting to Budapest, Dunaújváros and Paks is mainly from here. (Commutors to the latter settlements travel by the buses of their enterprises.)

Factor F_2 is dependent on the ratio of the population living at 'tanyas' and the concomitants of the 'tanya' settlement structure; this factor contains 16.1% of total information. The influence of the following indicators is outstanding on it:

Indicator 5 — the outskirts population in 1970 — fs: 0.8717, Indicator 25 — the ratio of single-room dwellings —

fs: 0.8221,

Indicator 27 — the general level of development of the villages —

fs: 0.7949,

Indicator 16 — commutation of the population between 1960 and 1970 —

fs: 0.6887.

Between the factor scores of Factor F_1 and F_2 a slightly stronger than mean (-0.58) Spearman's rank correlation can be observed. The relation between factor scores of Factor F_1 and F_2 are shown in Fig. 4. Within Factor F_2 , there are strong

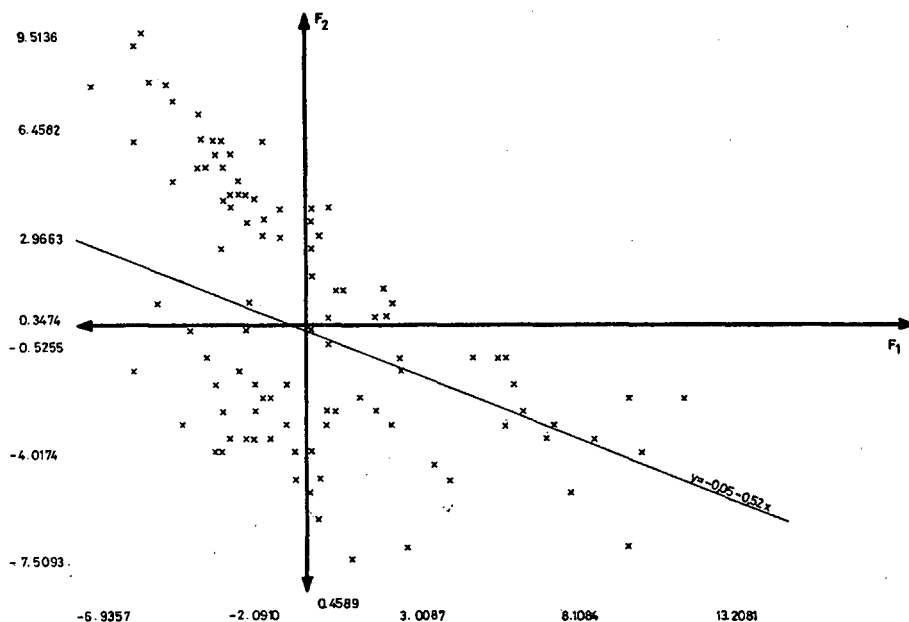


Fig. 4. Diagram of factor scores of Factors F_1 and F_2 and the regressional function $y = -0.05 - 0.52x$ —

correlations between the level of development of the villages and the ratio of outskirts population and the ratio of single-room dwellings (in the 'tanyas' building was prohibited by law for about a quarter of a century, the stock of dwellings has not been modernized). It is not a surprise that the ratio of population in the 'tanyas' and the concomitants of the 'tanya' settlement structure are constituents of Factor F_2 , since

Bács-Kiskun county is characterized, to a large measure, by this settlement form; about 120,000 to 130,000 people live in 'tanyas' today (Fig. 5).

The 'tanyas' have an uneven regional distribution; along the Danube, around Kalocsa and Baja they either have not come about or had been organized into villages by the turn of the century or, incidentally, as they were primarily involved in agricultural production, they were eliminated after the collectivization of agriculture. This is reflected in the low values for areas along the Danube in Fig. 5. Factor scores are influenced, apart from the density of 'tanyas', by the ratio of population living in 'tanyas'; thus, in the case of settlements with populous built-up inner areas where high densities of 'tanyas' do not result in high ratios of outskirts population, factor scores may be lower. Values for Factor F_2 are highest in villages formed on detached parts of 'market-towns' with extended outskirts and given independent administration (expecting movements of their population to the built-up inner areas of these villages). Moreover, the high percentage of fruit, grape and vegetables production and the 'specialized cooperatives' containing elements of an agriculture of small-holders (where production in individual farms is characteristic) preserved the system of 'tanyas' in the districts of Kecskemét, Kiskunhalas and Kiskőrös of the sandy region between the Danube and the Tisza. ('Specialized cooperatives' occupy a fourth of the cultivated area of the sandy region; this value for the Kiskőrös district is 70 to 72%). The majority of the population of its villages live in 'tanyas', scattered farmsteads (Imrehegy 94.0%, Bácsszőlős 90.0%, Balotaszállás 86.1%, Bócsa 84.2% etc.). The settlements with the dominance of 'tanyas' are handicapped, in the first place, in the level of the stock of dwellings and in the incomplete infrastructure (electrification of the 'tanyas' has started just recently).

Factor F_3 contains 8.4% of total information. The factor is determined by Indicator 17 — the rate of occupational restratification between 1960 and 1970 — fs: 0.8175,

Indicator 7 — wage-earners in industry and construction — fs: 0.7471,

Indicator 8 — wage-earners in transport and commerce and other sectors — fs: 0.6767,

Indicator 9 — the ratio of outcommuters — fs: 0.7396.

F_3 is the factor of occupational structure and communitatio (Fig. 6). The values of Factor F_3 are similar to those achieved in Szolnok county. Occupational restratification is made possible by the rapid spreading of commutation, in spite of the fact that this county is among the least developed industrially in Hungary. But it has a concentrated industry; except for towns, only some large villages have considerable industrial sites. Female labour force employed in the county is higher than the national average. In the sandy region between the Danube and the Tisza or in the Kalocsa district, women are employed in smaller numbers than the national average. The reason for this is that the dominant occupation of women is mainly at household plots in vegetable, fruit and (around Kalocsa) paprika growing districts.

The occupational structure and economic character (as our previous results in Vas, Szolnok and the present ones in Bács-Kiskun counties show) have lost their decisive role in the differentiation between villages despite the advancement of occupational restratification in these counties as well. It also deserves attention that, as a result of industry concentrated in the towns, the agricultural function of non-urban areas is still considerable; the majority of wage-earners in the villages worked in

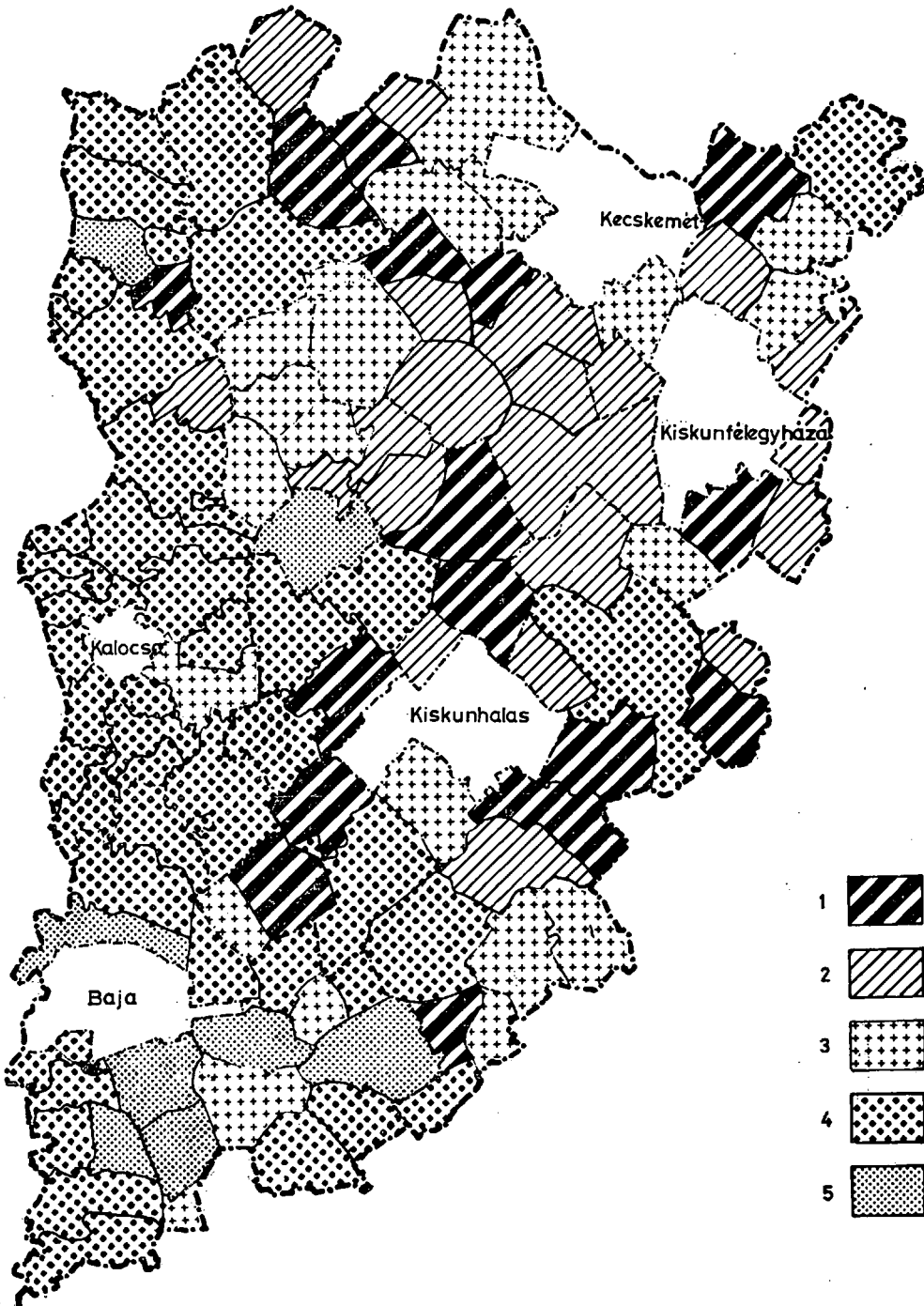


Fig. 5. Factor scores of F_2 in the villages of Bács-Kiskun county

1=above 5.1000; 2=1.6001—5.0999; 3=1.6000—-1.6000; 4=-1.6001—-5.0999; 5=below—
 1=above 5.1000; 2=1.6001—5.0999; 3=1.6000—-1.6000; 4=-1.6001—-5.0999;
 5=below—5.1000.

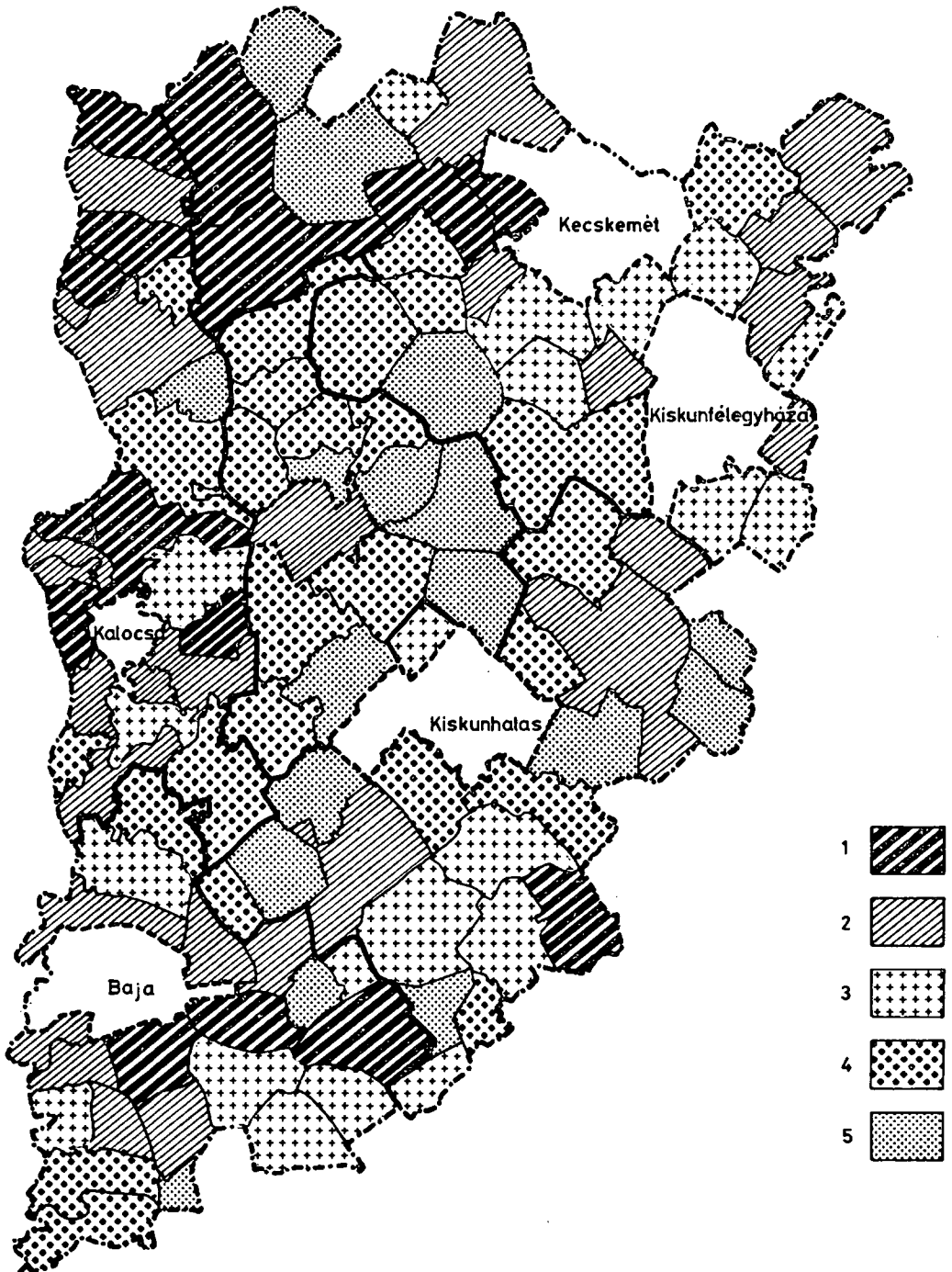


Fig. 6. Factor scores of F_3 in Bács-Kiskun county
 1 = above 3.1000; 2 = 1.1001—3.0999; 3 = 1.0000— -1.0000; 4 = -1.0001— -3.0999;
 5 = below -3.1000.

agriculture. The labour attraction of towns spreads to good agricultural areas in the county; thus villages around towns will not become purely residential places.

Correlations between variables influencing the previously analyzed F_1 , F_2 and F_3 factors, are to be demonstrated by a correlogram (Fig. 7). In the case of Factors F_1 and F_2 , factorforming variables are in close correlation, which is also reflected in the value of the Spearman rank correlation index (-0.58). There are looser stochastic relations between Factors F_2 and F_3 and between F_1 and F_3 reflected in rank correlations: -0.51 for Factors F_2 and F_3 , while the value is only $+0.42$ in case of F_1 and F_3 . These relations and the correspondence or disharmony of factor scores deserve further study; let it suffice here to state that close or looser correlations demand caution when judging the weights of the factors. Individual factors partly reflect the values of others.

F_4 is the factor of housing development settlement dynamism determined by Indicator 18 — the ratio of dwellings built between 1960 and 1970 — fs: 0.8431, Indicator 23 — the ratio of dwellings built after 1945 — fs: 0.8531, and Indicator 6 — average settlement size in the environs fs: 0.5827.

F_5 is the factor of location with regard to transport. It is controlled by

Indicator 21 — the travelling time to the next town — fs: 0.8677,

and Indicator 20 — the completeness of the transport network — fs: 0.5173.

The disadvantage of the long travelling time to the next town in Bács-Kiskun (in comparison with Vas and Szolnok counties) is compensated by the much higher density of runs (206 runs per week in Bács-Kiskun county against 169 for Vas and 110 for Szolnok).

Other factors have shares of only 2 to 5 per cent in the explanation of square deviation. Their names and contents are the following:

Factor F_6 — the physical environment (touristic endowments);

Factor F_7 — the equipment of dwellings;

Factor F_8 — the endowments of habitats in agriculture;

Factor F_9 — the dynamism of population change

and finally

Factor F_{10} — basic supply.

Types of Rural Settlements in Bács-Kiskun Country

With the factor scores of the 10 factors formed in the factor analysis we have carried out a cluster analysis (using the Mac Queen algorithm). Group formation was checked in dendograms as well.

The special advantage of dendograms is in the visual demonstration of the grouping of investigation objects (settlements); the number of types and subtypes, the subtlety of the classification can be altered at will; variations with a larger number of types can be ranged within the frames of variations with less types without remainder and overlapping. At the same time, a certain rigidity characterizes it: the elementary clusters are 'treated' together by the method; there is no possibility to 'redistribute' the investigation units at different levels of the classification.

The number of the resultative groups can be changed during the cluster analysis, since the lower and upper limits of the radii of groups formed out of points (villages) of space (of 10 dimensions in our case) should be given. Investigation units are re-

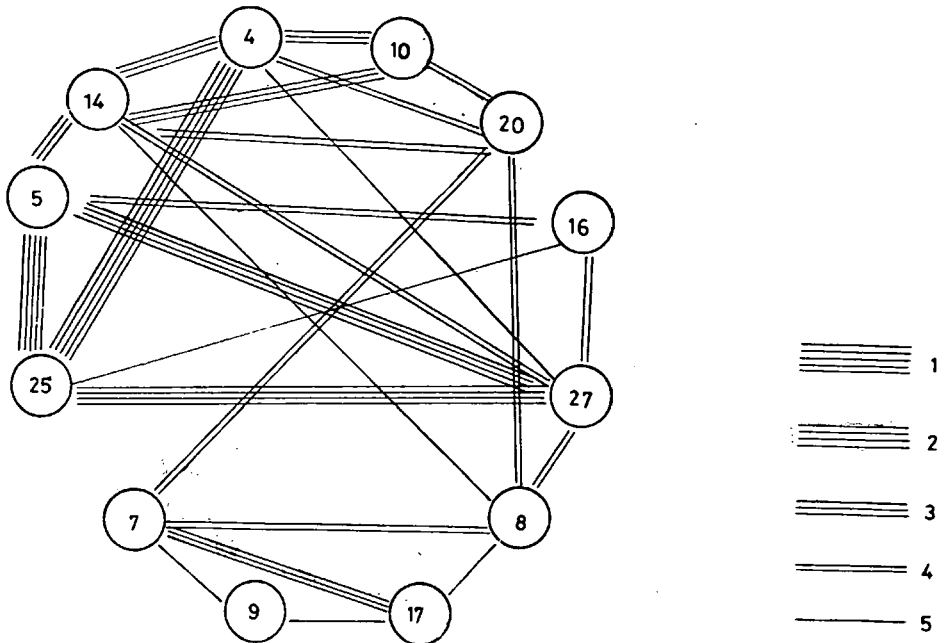


Fig. 7. Correlogram of circumstances influencing Factors F_1 , F_2 and F_3
 1 = 0.80—0.89; 2 = 0.70—0.79; 3 = 0.60—0.69; 4 = 0.50—0.59; 5 = 0.40—0.49.

distributed again and again in variations where the 'fining and coarsing' parameters alternate; therefore, e.g., a variation with several clusters cannot be adjusted or compared to another one with less clusters.

Results of hierarchical cluster analyses are well demonstrated by dendograms. Their application enables us to trace how observation units merge into clusters and how clusters merge with one another, regarding various levels of clusters. After preliminary inquiry, 3 methods seemed to give usable results.

The presupposition in the *Ward method* is that the contraction of groups leads to loss of information. The decisionmaking function minimizes this loss. Ward defines the loss of information as square deviation from the average of the groups of observations. The criterion of decision is the minimization of square deviation within the group:

$$D(I, J) = \frac{m_1 m_2}{m_1 + m_2} (\bar{X} - \bar{Y})^2, \text{ where } \bar{X} \text{ and } \bar{Y} \text{ are}$$

average vectors of the two clusters (I and J);

$i = 1 \dots m_1$

$j = 1 \dots m_2$ are the number of observation units in clusters N° I and J

This deviation is nothing else but the variance within groups. If T stands for the variance of the whole sample, the decomposition $T = B + K$ is valid, where B is the total variance within groups and K is the total variance between groups. The values of B and K change with grouping. The object is to find clusters where B has a minimum

value. The method is deficient inasmuch as it does not always give optimum solutions, only local optimums for the minimum value of B.

The Ward 7 method differs from the Ward method in the formation of clusters; it is carried out here by the centroid method on the basis of the Ward criterion described above.

To reveal and interpret relations between groups in more detail, we have also applied the average linkage method. This defines an average linkage between clusters taking each element of the groups into consideration; with their help, an amoeboid, relatively closed cluster has been achieved.

Dendograms of different origin emphasize different aspects of classification; thus characteristic deviations may arise between their results. It is worthwhile to compare here the results of the Ward 7 (centroid clustering) and the Ward hierarchical agglomerative method. The Ward 7 method emphasizes the intensity of village character in the formation of principal groups (Fig. 8—9). This way, the first main group comprises traditionally rural settlements with a small population number, agrarian character and the lack of an agglomerative tendency; while in the second group more populous (in Bács-Kiskun county there are also villages with 5,000 to 14,000 inhabitants), agrarian—mixed, urbanizing villages are gathered; they incidentally have urban institutions as well. In contrast, the hierarchical agglomerative method separates the 39 settlements with 'tanyas' (scattered farmsteads), i.e. higher percentage of outskirts population and without larger inner residential area from others (Fig. 10—11). Due to the comparison of the results, finer classifications are possible, e.g. the group of settlements with a pronounced rural character as well as 'tanyas' and the group of rural settlements without 'tanyas' etc. can be differentiated. Average linkage clustering (Fig. 12—13) has led to results similar to those of the hierarchical agglomerative method.

Examining the numerous variations of clusters and dendograms, we decided on a variation with 11 clusters as a base of classification; we were regarding dendograms as well. Thus we were able, in case it seemed necessary, to form subtypes and we were guided in the contraction of clusters, in the formation of principal types; in some cases categorization was also modified.

The cluster analysis itself does not characterize the groups but forms clusters according to analogy, the degree of similarity of factor scores.

As a consequence of our objective and the selected method of typology, groups cannot be described by a single 'characteristic', the value limits of certain parameters. The villages of the clusters *can be characterized by the settlement morphological processes* rather than by various data and independent characteristics; clusters can be identified by these processes.

Finally, the villages of the county are referred to 4 basic types:

- I. extremely agrarian scattered settlements with a rapidly decreasing population number ('tanya'-villages);
- II. 'tradition' agrarian villages of medium size with a negligible outskirts population and a moderately decreasing population number (along the Danube, in the Bácska region);
- III. agrarian-mixed village with a populous inner residential area, stagnated population number, developed basic industrial network and a considerable number of 'tanyas';
- IV. giant villages with urban functions, settlements of urban character.

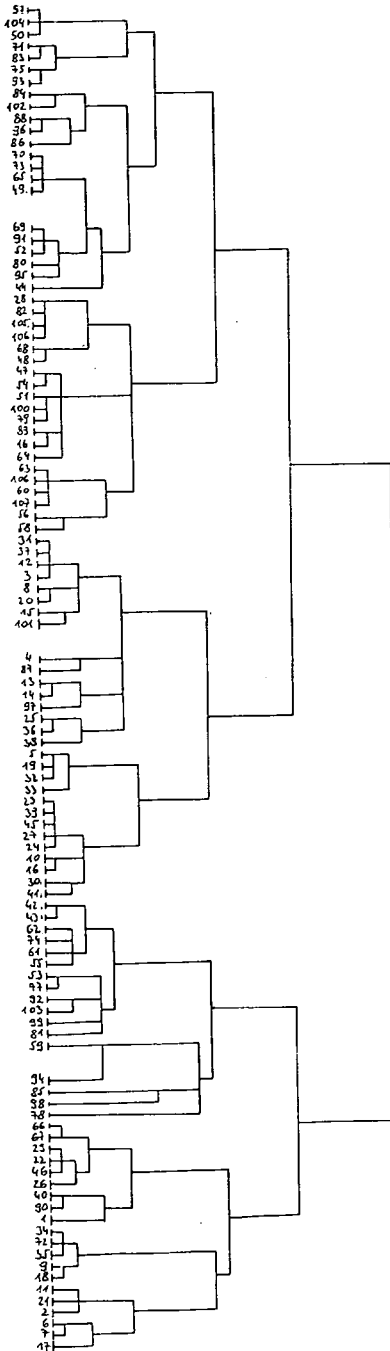


Fig. 8. Dendrogram of Ward 7 centroid clustering for the rural settlements of Bács-Kiskun county

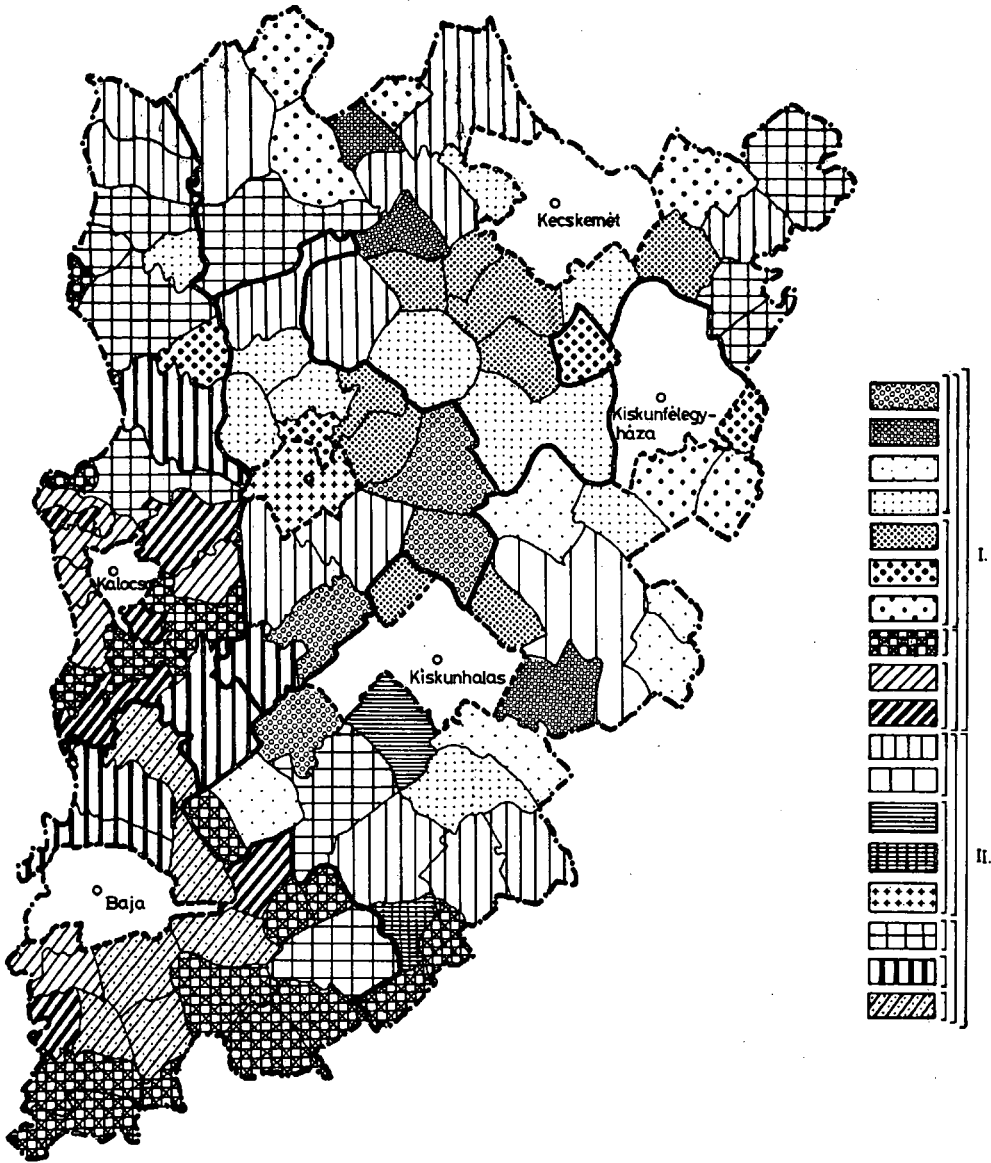


Fig. 9. Ward 7 centroid clustering for the rural settlements of Bács-Kiskun county
 Types formed after the 6th, 11th, 16th and 18th steps are indicated in legend

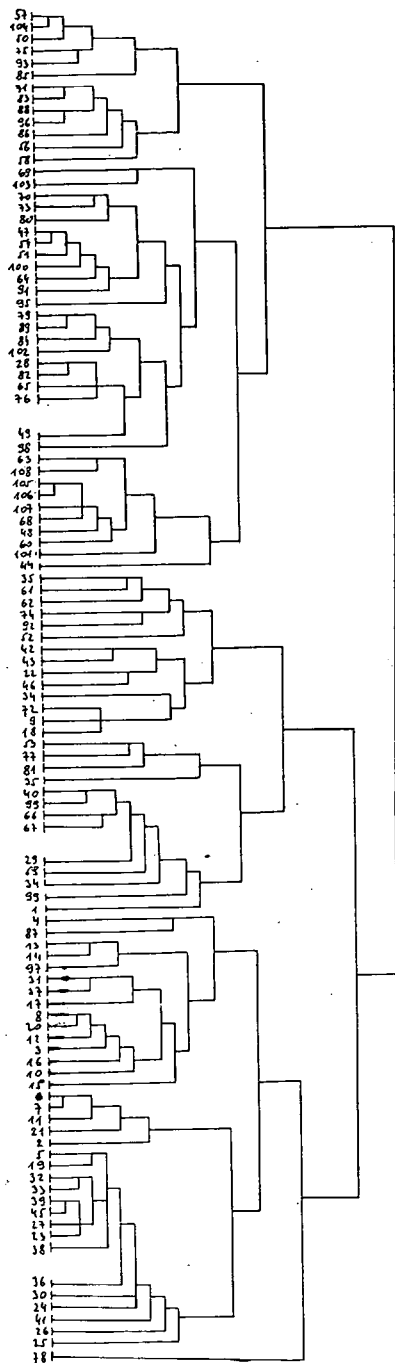


Fig. 10. Dendrogram of Ward hierarchical agglomerative method clustering for the rural settlements of Bács-Kiskun county

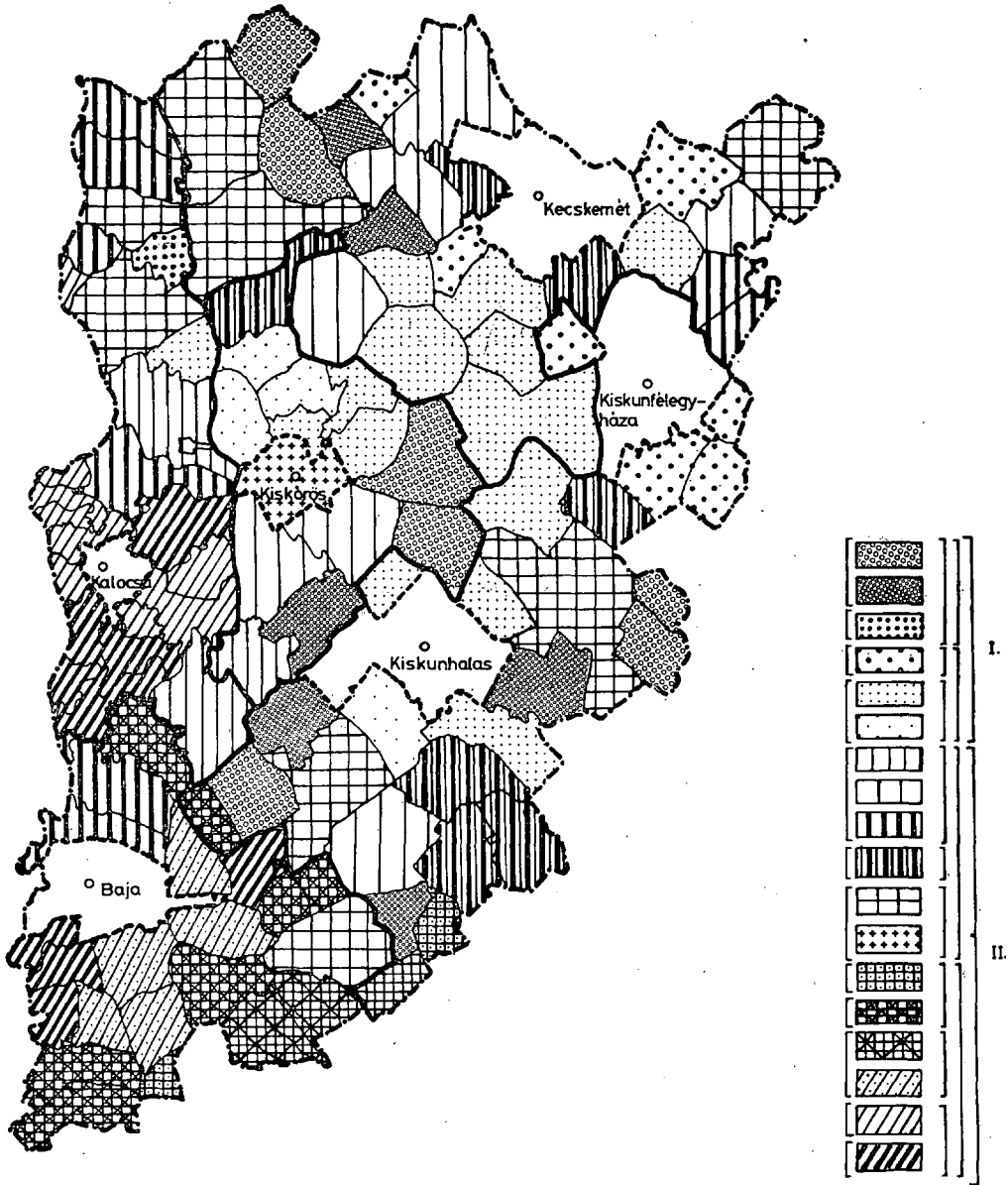


Fig. 11. Ward hierarchical agglomerative method clustering for the rural settlements of Bács-Kiskun county

Types formed after the 9th, 11th, 12th, 15th and 21st steps are indicated in the legend

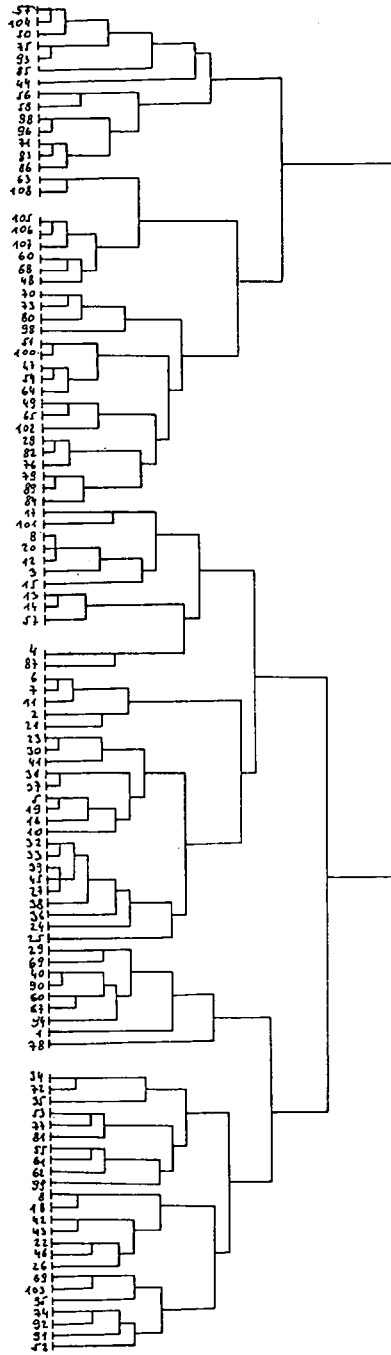


Fig. 12. Dendrogram of average linkage clustering for the rural settlements of Bács-Kiskun county

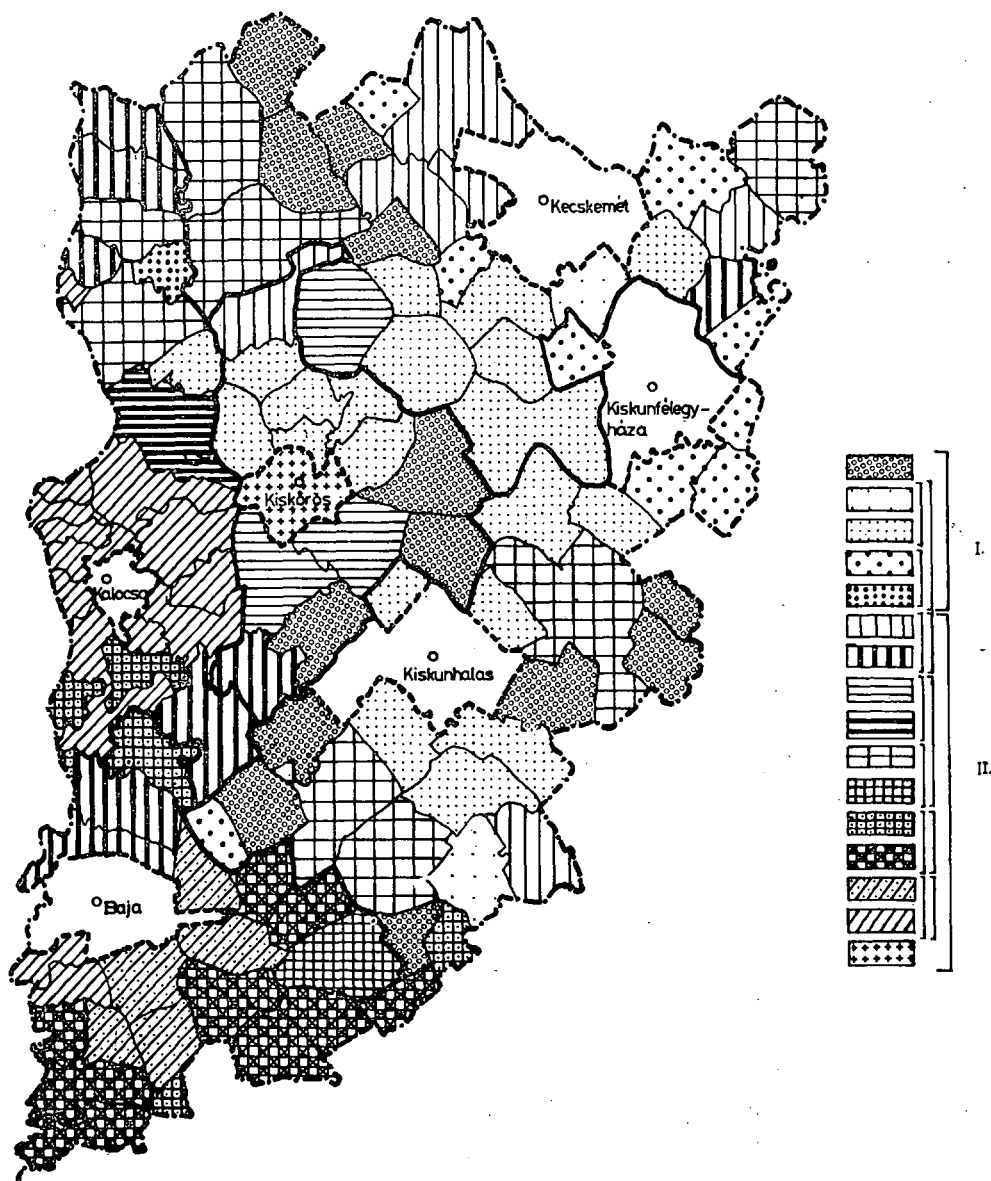


Fig. 13. Average linkage clustering for the rural settlements of Bács-Kiskun county. Types formed after the 10th, 14th, 15th and 22nd steps are indicated in the legend

As a copollary of relatively homogeneous social-economic spatial structure, the general agrarian character of the rural area and the backward hierarchy of the settlement network, the number of types is smaller than at the previous investigation in the Northern Mountains (Borsod-Abaúj-Zemplén county) or in Transdanubia (Vas county). The rural settlements are made homogeneous, in the first place, by occupational restratification and the modest degree of commutation. Therefore, it is the history and the population number of the settlements and its consequences (e.g. the level of basic supply) and the ratio of the outskirts population which primarily differentiate between the villages. This fact is responsible, to a degree, for the variety of different classifications.

I. Extremely agrarian scattered settlements with a rapidly decreasing population 'tanya' villages having an inner residential area with a low population number

By the variation with 11 clusters, 44 villages were gathered into this principal type; they form a continuous zone in the Sandy Region from the boundary of Pest county to the frontier or to the boundary of Csongrád county. Their zone is interrupted only by the populous villages of the third principal type but these latter also have 'tanyas' on their outskirts.

In the Sandy Region a special area of 'tanyas' have come about through the combination of numerous factors. It is here that the history of 'tanyas' goes back the farthest. Grape, fruit and vegetable growing in the sandy areas resulted in mini-mized plot sizes (several acres) and a very dense network of 'tanyas' on them (the density of population on the outskirts in 1970 was 79.3 people per km² in Kecskemét; 67.0 in Hetényegyháza; 62.3 in Ballószög; 61.8 in Helvécia; 60.1 in Csemő). Even after the turn of the century, farmers moved out to the 'tanyas' for good, giving up close relations with towns. The situation of this dense 'tanya' network with loose connections to parent settlements and population engaged in gardening, was particular even after the Liberation. Grape and fruit growing and partly the large number of population in the 'tanyas' were favourable for the organization of economic partnerships at a lower level, the so-called 'specialized cooperatives'. These cultivate a fourth of the area of the Sandy Region. A considerable number of cooperatives lease a part of their land to families, tenants. This way, 'tanyas' retain their economic function; they remain centres of production units. Grape and fruit growing requires being on the alert, much work and supervision; living in a nearby 'tanya' is advantageous from the viewpoint of production as well. Moreover, the Sandy Region with its vineyards and orchards provides more pleasant circumstances for people living in the 'tanyas' than the Trans-Tisza Region (e.g. cart-tracks are passable in the former for a good time of the year).

Population decrease in the 'tanyas' in this area with the large ratio of outskirts population having numerous links with their residence, was 15 to 30%, in a quite steady distribution, between 1960 and 1970.

At the turn of the century, villages of this type were, without exception, still inside the administrative area of neighbourin towns and giant villages (Kecskemét, Kiskunfélegyháza, Kiskunhalas, Kiskőrös, Kiskunmajsa etc.). The gradually increasing final departure to the 'tanyas' led to concentration into denser foci; either certain

institutions moved out to the 'tanya' centres (school, shop, administrative department) or allotment started in the farthest ends of towns to form residential areas of village-like settlements. Many among them obtained administrative independency; but the majority was declared a village after the Second World War. But most of the villages were lacking any concentration at the time of their organization and they are pronouncedly scattered settlements even today.

According to the original supposition (in the late 1940s) the population of the 'tanyas' would have moved into the residential areas of recently established villages in a relatively short time (10 to 15 years). This has proved to be a false assumption from two viewpoints:

- Departure from the 'tanyas' was less significant due to the reasons outlined above;
- the majority of people who left the 'tanyas' moved to towns instead of the new villages.

Thus, on the average, 64% of village dwellers lived on the outskirts even in 1970; but villages with a ratio of 80 to 90% for population in the 'tanyas' are not all rare either (Kékeshalom 94.6%; Zsana 92.7%; Lászlófalva 91.6%; Helvécia 92.2% etc.). In the inner residential areas of villages with populations about 2.300 on the average, very few people live; in several villages less than 200. A consequence of the outlined trends of migration is the rapid population decrease in these villages in the 1970s (9% between 1970 and 1976).

The intensive agriculture yielding high incomes and the poor facilities for daily commutation have preserved the one-sided agrarian character of these villages to our days; 75% of the working population was engaged with farming. The ratio of commuters is 16.8%. The special settlement pattern, the long prohibition of building on the outskirts, the difficulties in the establishment of the public utility services result in the low level of infrastructure, the equipment of dwellings and the living standards. (In 1970 67 to 70% of the dwellings had only one room; only some per cent had plumbing and the majority had no electricity.) Clusters 4, 6, 7, 8, 9 and 11 were referred to this type (Fig. 14).

II. Medium-size 'traditional' agrarian villages with a negligible outskirts population and a moderate population decrease, along the Danube and in the Bácska region (clusters 2 and 3)

31 settlements (more than a fourth of the population of the county) make up this type which is subdivided into two subtypes. These villages are also in a continuous zone along the Danube and around Kalocsa and in the Bácska, to the south-south-east of Baja. While the villages around Kalocsa form a uniform block even at detailed analyses (with many clusters), the villages in the Bácska (i.e. within the Danube — Baja — Bácsalamás — the frontier quadrangle) show a mosaic pattern at detailed investigations; their grouping alters with the different analyses.

They differ in history: the villages along the Danube have survived the Turkish occupation; those to the east of Kalocsa (Szakmár, Öregcsertő, Homokmégy etc.) were transformed into villages from 'tanya'-groups around the turn of the century. The Bácska villages were re-populated in the early 1700s, mainly by foreign settlers.

Their present similarity comes from their 'regular', least transformed rural

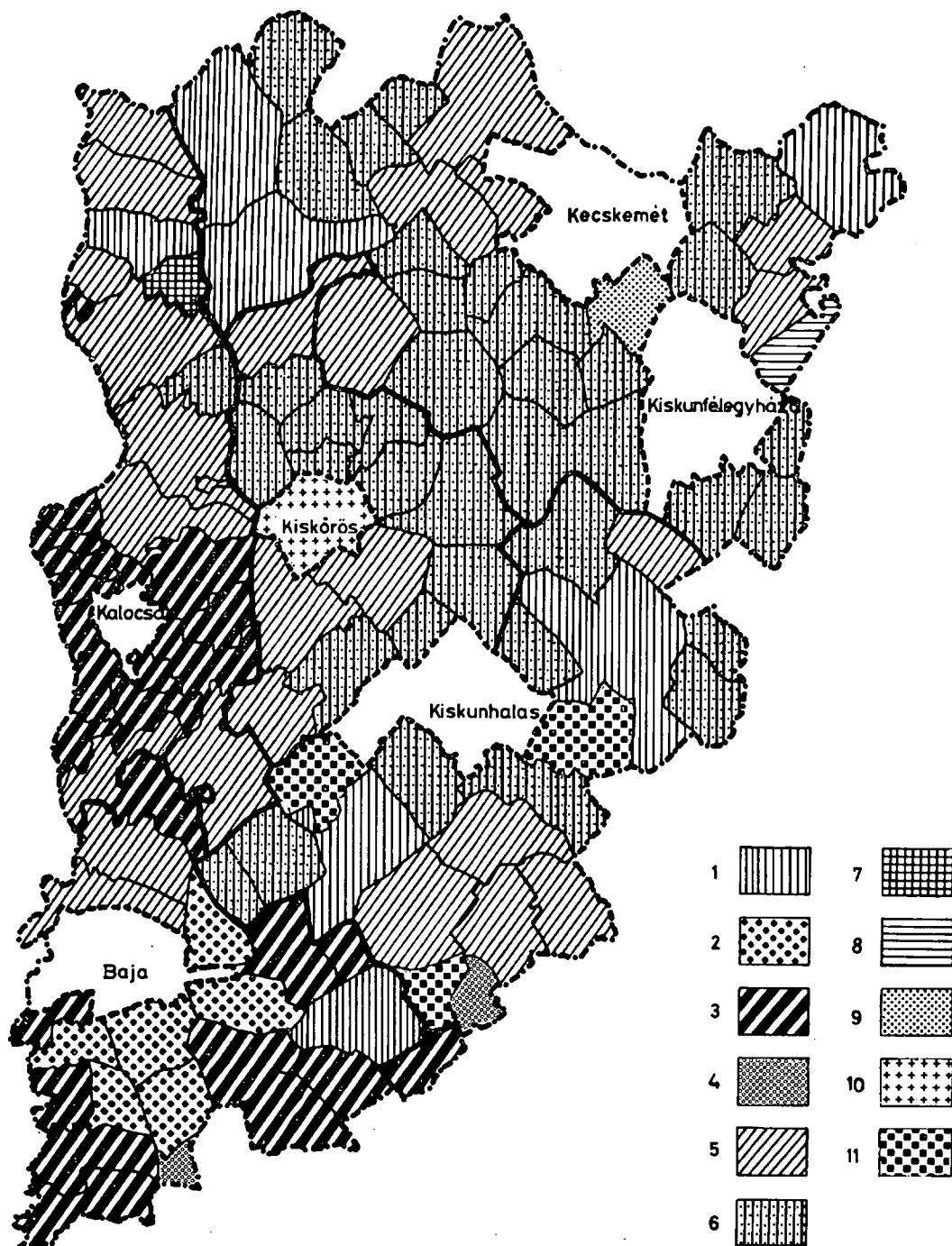


Fig. 14. Types of rural settlements in Bács-Kiskun county
(based on the Mac Queen algorithm)

character. This is reflected by the occupational structure of their population: it is still dominantly agrarian in 1970 (87.4% of the working population in cluster 2 and 64.0% of the working population in cluster 3 were engaged in agriculture); at the same time, with the advent of occupational restratification, the residence character arose as a secondary function; more than a fourth of workers are commuters; commutation is facilitated by the rapidly increasing industry in the 7 urban centres of these rural areas (there were 6,875 workers in the socialist industry in Kalocsa and 10,498 in Baja in 1978). The 7 towns can be reached in a half an hour from most of the villages. Population has not been stabilized by commutation but commutation has stopped the extremely high outmigration from these villages (between 1970 and 1976 population decreased with 5% in cluster 2 and 7.6% in cluster 3).

The 'regular' rural character involves the very low ratio of outskirts population. As a consequence, medium size (above 3,000 in cluster 2 and 2,2000 in cluster 3) and the traditionally developed technical networks, both the network of basic institutions and the infrastructure are advanced (e.g. the ratio of single room dwellings is 27.2% in cluster 2, while it is 75.1% in cluster 11, as a contrast).

III. Agrarian-mixed villages with populous inner residential areas, developed basic institution network and stagnant population

The 25 villages of cluster 5, with few exceptions, are in the zone of the 'tanyas'; the density of the 'tanyas' is high. Nevertheless, the inner residential areas of these villages are also populous (their population numbers are above 5,000 on the average — Lajosmizse 12,600; Kecel 10,000; Soltvadkert 7,700), the ratio of outskirts population (28.6%) is not so high. The villages of the cluster present a special settlement type: life in the populous innerresidential areas differs from the usual village in most countries (just because of village size); though they have characteristic village functions. At the same time, these inner areas are surrounded by extended zones of 'tanyas'. It is a corollary of population number that the basic institution network is well-developed; incidentally urban institutions (specialist's shops, medical specialists, services) also occur. The villages are important centres of agriculture (centres of state-farms, processing of agricultural products, wine-cellars etc.). They have kept their agrarian character (in 1970 almost 60% of all workers were employed in agriculture). The relations between inner areas and the 'tanyas' are close; the former are the centres of supply and services. Inner areas develop dynamically; a part of people who left the outskirts move there. Thanks to this, their population is increasing in a negligible degree (between 1970 and 1976 37%; while there was a growth in the population of the inner areas).

IV. Giant villages with partial urban functions, town-like settlements

The 7 villages of cluster 1 differs, as a matter of fact, in population number from the previous type; on the average, almost 10,000 people live in each of these settlements. This involves that the number and choice of urban institutions (secondary schools, polyclinics, specialist's shops etc.). At the same time, they bear witness to their rural origin. Purely for the sake of visualization, they may be described as systems of three rings: the core with urban functions and morphology is encircled by an enormous

village belt which is followed by the extended zone of 'tanyas'; 24.6% of their population lived in 'tanyas' in 1970. Among wage-earners, a third was employed in industry and construction, more than a fifth in the tertiary sector but the ratio of agrarian workers was still above 40%. They even have a considerable manufacturing industry which employs a thousand workers per factory on the average. Consequently, their population number is stable.

In the meantime, Kiskőrös, an urban settlement of cluster 10 was declared a town legally.

Appendix

The Settlements of Bács-Kiskun County

<i>N°</i>	<i>Settlement</i>	<i>N°</i>	<i>Settlement</i>
1.	Bácsalmás	34.	Hajós
2.	Bácsbokod	35.	Harta
3.	Bácsborsod	36.	Homokmégy
4.	Bácsszentgyörgy	37.	Miske
5.	Bátmonostor	38.	Ordas
6.	Csátalja	39.	Öregcsertő
7.	Csávoly	40.	Solt
8.	Dávod	41.	Szakmár
9.	Érsekcsanád	42.	Szalkszentmárton
10.	Felsőszentiván	43.	Tass
11.	Gara	44.	Újsolt
12.	Hercegszántó	45.	Uzsód
13.	Katymár	46.	Alpár
14.	Madaras	47.	Ágasegyháza
15.	Mátételke	48.	Ballószög
16.	Nagybaracska	49.	Bugac
17.	Nemesnádudvar	50.	Fülöpháza
18.	Sükösd	51.	Helvécia
19.	Szeremle	52.	Hetényegyháza
20.	Tataháza	53.	Izsák
21.	Vaskút	54.	Jakabszállás
22.	Apostag	55.	Kerekegyháza
23.	Bátya	56.	Kunadacs
24.	Drágszél	57.	Kunbaracs
25.	Dunaegyháza	58.	Kunpeszér
26.	Dunapataj	59.	Kunszentmiklós
27.	Dunaszentbenedek	60.	Ladánybene
28.	Dunatétlen	61.	Lajosmizse
29.	Dunavecse	62.	Lakitelek
30.	Dusnok	63.	Lászlófalva
31.	Fajsz	64.	Nyárlőrinc
32.	Foktő	65.	Orgovány
33.	Géderlak	66.	Szabadszállás

<i>N^o Settlement</i>	<i>N^o Settlement</i>
67. Tizsakécske	88. Csólyospálos
68. Tiszaújfalva	89. Harkakötöny
69. Városföld	90. Jánoshalma
70. Akasztó	91. Jászszentlászló
71. Bócsa	92. Kelebia
72. Császártöltés	93. Kéleshalom
73. Csengőd	94. Kiskunmajsa
74. Fülöpszállás	95. Kisszállás
75. Imrehegy	96. Kömpöc
76. Kaskantyú	97. Kunbaja
77. Kecel	98. Kunfehértó
78. Kiskőrös	99. Mélykút
79. Páhi	100. Pirtó
80. Soltszentimre	101. Rém
81. Soltvadkert	102. Szank
82. Tabdi	103. Tompa
83. Tázlár	104. Zsana
84. Balotaszállás	105. Gátér
85. Bácsszőlős	106. Kunszállás
86. Porota	107. Pálmonostora
87. Csikéria	108. Petőfiszállás

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