THE METHODOLOGICAL BASES FOR THE TYPOLOGY OF WORLD AGRICULTURE

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An attempt at ordering the investigated facts and/or processes according to a certain system of classification is a characteristic stage of development of any research discipline. Dealing with almost indefinite array of facts, phenomena, and processes distributed over the earth, geography arrived at this stage of development rather late. At first geographers paid more attention to the regionalization i.e. to the division of the earth surface into territorial units on the basis of their uniformity and dissimilarity to the other. Only the specialization within the field of geography enabled to pass to the stage of systematics or typology i.e. to grouping the investigated facts, phenomena or processes according to their similarity or affinity, For many years, however, the two different concepts, that of regions and that of types have been confused[15].

The same line of development was characteristic for agricultural geography. Founded by a common effort of geographers and agricultural economists, it passed very soon to the stage of looking for syntheses whether of territorial,

regional character /agricultural regions/ or of systematic, typological character /agricultural systems or types of farming/ either for limited territories /individual countries or regions/ or for group of countries, continents or the world. The methods used in such investigations and the results obtained have recently been discussed by J. Henshall,[9] D. Grigg[8], A.N. Rakitnikov[20] and H. F. Gregor[7].

In fact their studies, and in particular the review of the world classifications of agriculture as made by D. Grigg, have released me from the duty of reviewing the criteria, methods and techniques applied by numerous scholars in their typologies and regionalizations of world agriculture.

There were, however some other attempts either published in other than English languages or those that appeared later with which I would like to supplement the Dr. Gripp's review.

First of all French contributions should be mentioned here both that used by Daniel Faucher in his classic book Geographie agraire[4] les cultures itinerantes, les cultures sed entaires avec jacheres, les cultures continues par accumulation du travail humain, les cultures intensives par assolements, l'agriculture scientifique/ and a similar classification for livestock breeding by Paul Weyret[23] elevages marginaux, elevages sentimentaux, elevages sans agriculture, elevages combines avec l'agriculture/ and their subtypes.

In spite of the fact that no criteria for those classifications were offered, one can easily guess that in both cases they were based mainly, if not exclusively, on organizational and technical characteristics of agriculture.

Pierre George represented a different approach, putting more emphasis on the social and economic characteristics of agriculture traditionelle paysanne seche, mediterranéenne et irriguée, 2. les campagnes de l'Europe industrielle de l'Ouest 3. les campagnes speculatives sans paysans, including North American and plantation agriculture, 4. Campagnes en économie socialiste.

In another book[6] the same author singled out the following types of agriculture: 1. l'agriculture de subsistence, 2. l'agriculture de marché, 3. l'agriculture de speculation, 4. l'agriculture des pays d'economie socialiste.

In Poland, in his chapter on land use and agriculture of the Polish World Geography[22], F. Uhorczak presented more developed classification in which he tried to combine the cultural geography /E. Hahn, K. Sapper, H.F. Gregor/ and economic geography /D. Whittlesey and others/ approaches with more emphasis on the commercialization of individual agricultures /Table 1/. Each of the distinguished types has been presented on the map.

Table 1

Types of agriculture - by F. Uhorczak /1963/

Producing mainly for self-subsistence		Producing mainly for internal and world market
Nomadic herding	Exclusively livestock breeding	Commercial livestock grazing
Primitive crop growing /shifting and sedimen tary/	Primitive agriculture /hoe and stick/	
Mixed crop and animalfarming Intensive agriculture - food with padix rice dominant without padi rice dominant - casis agriculture	Mixed crop growing and animal breeding /plough agriculture up to the most mechanized/	Mixed crop and animal farming - Dairy farming - Grain Farming - Mediterraneen agriculture with fruit trees growing dominant with crop growing and animal grazing dominant - Horticulture and fruit farming - Plantations

Few years later G. Enyedi in his "Agriculture of the World"[3] proposed a new, developed, multi-level typolgy with great emphasis on the social differences between agricultures. He distinguished first three groups: traditional /I/, capitalist /II/, and socialist /III/ agriculture, further subdivided, based on organizational, technical and production characteristics, into 10 types /I: nomadic shepherding, shifting cultivation, traditional mediterranean farming, traditional irrigated farming; II: multibranch European type, overseas highly speci-

alized, plantation agriculture; III: agriculture of East Central Europe, agriculture of the USSR, socialist agriculture in some Asian countries and in Cuba.

The "taxonomy" of world agriculture by L. Zobler /24/ should also be mentioned here /table 2/.

Table 2

A Taxonomy of World agriculture L. Zobler /1965/

Management	Activity
Cultigens absent or negligible	Gathering
Plant product harvested	
Animal product harvested	
Non-domesticated	Hunting and fishing
Domesticated	
Subsistent	Herding
Commercial	Grazing
Cultigens predominant	
Individual	
Impermanent	
Subsistent	Swidden
Partly commercial	Bush swidden
Permanent	
Subsistent or weakly commercial	Peasant farming
Commercial	Family farming
Group	
Subsistent or weakly commercial	
Areally concentrated	Manor /extinct/
Areally dispersed	Hacienda
Commercial	
Single ownership	Plantation
Separation of ownership and management	Corporation farming
Joint ownership	Cooperative farming
Limited ownership under state management	Collective farming
State ownership and management	State farm operations

More recently, using the results of the discussion on peasantry and other social forms of farming, Hiroshi Ishida /11/ distinguished four types of world agriculture, namely: 1. tribal subsistence agriculture, 2. peasant agriculture, 3. individualistic capitalist agriculture, and 4. cooperative agriculture subdivided into capitalistic cooperative agriculture and communistic collective agriculture.

Quite a different approach to the classification of world agriculture has recently been offered by A.N. Duckham and G.B. Masefield /2/ Putting on the coordinates the intensity of farming, starting from the most extensive to the most intensive, on one side and forms of land use from tree crops through tillage with or without livestock, alternating tillage with grass, bush or forest /including fallow and field-grass systems/ to grassland use on another, with a subdivision of each resulting category into temperate and tropical systems, they distinguished 28 systems of world agriculture.

An interesting table has recently been produced by S.N. Dicken and T. Pitts in the last edition of their textbook /1/ in which they distinguished 9 types of agriculture /migratory agriculture, bush swidden, "savage" fallow, European manorial system, oriental rice farming with dry winter grains, mixed farming, Mediterranean agriculture, tropical plantations and mid-latitude monoculture /with capitalist and socialist varieties/, each characterized by their characteristic agricultural tools, crop emphasis, typical crops, land pattern, dominant animals, ownership

pattern, settlement type, economic stage, population density and typical areas. The table was supplemented by a commentary. However, except F. Uhorczak, none of the above mentioned authors produced any map of their types, systems or regions of world agriculture.

Most of these and other classifications, typologies or regionalizations have been based on general knowledge and experience of their authors, only some of them listed the criteria and none proposed any methods by which an individual case could be classified into one or another type of agriculture.

The IGU Commission on Agricultural Typology, established in 1964, has approached this problem in a different way /10, 12, 13, 14, 15, 16, 17/
First, on the basis of two questionnaires, distributed among numerous scholars, the criteria, methods and techniques of agriculture were discussed. The particular stages of this work as well as numerous case studies that tested the proposed criteria, methods and techniques were discussed at the Commission meetings in Mexico City /1966/, /21/ New Delhi /1968/ /18/ and Verona /1970/ /19/

On the basis of those discussions a list of variables representing all the important characteristics of agriculture together with their ranges, classifications and proposed thresholds were compiled and sent to the Commission regular and corresponding members /Questionnaire No. 3/.

The answers to that Questionnaire, which modified some of the proposed indices and thresholds, served as a basis for the preliminary scheme of the typology of world agriculture as presented in this paper.

The following variables /table 1/ have been used, each reduced to five thresholds based on their world ranges /for measurable variables/ or on simplified classifications /for non-measurable ones/. The first have been expressed by indices whereas the latter by symbols.

Table 1.
Variables adopted

I. Social and ownership characteristics

1. System of land tenure
   A. Common. B. Tenancy for services or share-cropping
   C. Owner-operated. D. Corporation or Co-operative
   E. Collective

2. Average size of farms
   /1/ below 2.
   /2/ 2-10.
   /3/ 10-50.
   /4/ 50-200.
   /5/ over 200 hectares.

II. Organizational and technical characteristics

2. Inputs of live and mechanized power

3.1. Inputs of labour
   /1/ below 10. /2/ 10-20. /3/ 20-40.
   /4/ 40-80.
   /5/ over 80 persons employed in agriculture per 100 hectares of agricultural land.

3.2. Inputs of animal power

/1/ below 4. /2/ 4-8.
/3/ 8-15. /4/ 15-25.
/5/ over 25 of conventional animal horse equivalent units per 100 hectares of agricultural land.

3.3. Inputs of mechanical power

/1/ below 0,5. /2/ 0,5-1.
/3/ 1-2. /4/ 2-5.
/5/ over 5 tractors in conventional /15 HP/ units per 100 ha of cultivated land.

4. Soil fertilization

4.1. Organic manuring

/1/ below 20. /2/ 20-40.
/3/ 40-80. /4/ 80-150.
/5/ over 150 conventional /big 500 kg/ animal units per 100 ha of cultivated land.

4.2. Chemical fertilizing

/1/ below 50. /2/ 50-100.
/3/ 100-200. /4/ 200-400.
/5/ over 400 kg of chemical fertilizers in pure content /NPK/ per 1 hectare of cultivated land.

5. Irrigation

5.1. Extent of irrigation

/1/ below 10. /2/ 10-20.
/3/ 20-40. /4/ 40-60.
/5/ over 60 per cent of agricultural land.

5.2. System of irrigation

A. Flooding /floodwater/ seasonal irrigation by gravity flow. B. Gravity flow irrigation from permanent streams, springs, wells or tanks. C. Irrigation by lifting ground water. D. Irrigation by pumping water. E. Sprinkler irrigation.

6. Systems of farming

6.1. Systems of land use

A. Permanent rough grassland.
B. Improved grassland.
C. Arable land.
D. Mixed arable and perennial crops.
E. Perennial and semi-perennial crops.

6.2. Systems of crop /or land rotation/

A. Shifting cultivation.
B. Crop rotation with current fallow.
C. Continuous crup growing with regular or irregular rotation.
D. Field-grass rotation /ley/.
E. No crop rotation.

6.3. Intensity of cropland use

Ratio of harvested to arable /fallow included/ land

/1/ below 0,3. /2/ 0,3-0,7.
/3/ 0,7-1,3. /4/ 1,3-2,0.
/5/ over 2,0.

6.4. Cropping systems

A. Digging stick or hoe.
B. Wooden arable implements.
C. Animal-drawn iron plough with share.
D. Animal-drawn steel plough with associated machinery.
E. Tractor-drawn machinery.

6.5. Systems of livestock breeding

A. Nomadic.

B. Transchumance and seasonal grazing.

C. Grazing on permanent pastures /ranching, otgon, etc. systems/.

D. Livestock breeding within mixed livestock and crop farming.

E. Dry-lot breeding.

III. Production characteristics

7. Agricultural productivity

7.1. Land productivity

/1/ below 20. /2/ 20-40.
/3/ 40-80. /4/ 80-120.
/5/ over 120 grain equivalent units of gross production per 1 ha of agricultural land

7.2. Labour productivity

/1/ below 50. /2/ 50-100.
/3/ 100-250. /4/ 250-500.
/5/ over 500 grain equivalent units of gross production per 1 ha of agricultural land

8. Commercialization of agriculture

8.1. Level of commercialization

/1/ below 10. /2/ 10-20.
/3/ 20-40. /4/ 40-100.
/5/ over 100 grain equivalent units of commercial production per 1 ha of agricultural land.

8.2. Degree of commercialization

/1/ below 20. /2/ 20-40.
/3/ 40-60. /4/ 60-80.
/5/ over 80 per cent of gross production is a commercial production.

9. Orientation of agriculture

9.1. Ratio of animal to total production within gross production in 20 per cent thresholds.

9.2. Ratio of animal to total production within commercial production in 20 per cent thresholds.

These indices or symbols have been ascribed to 33 model types of world agriculture singled out on the basis of the previous classifications, statistical yearbooks and vast literature concerning areal differentiation of world agriculture.

Apart from the selection and adequate expression of variables characterizing various aspects of agriculture, the next important methodological problem in agricultural typology, that in spite of many attempts has not as yet found a satisfactory solution, is the method of their combination i.e. of comparing individual units as characterized by sets of those variables. Both methodological problems are interrelated, since the expression of variables is closely connected with the method of their combination.

There are many reasons of this state of things. First, as one can see from the above, many variables characterizing important aspects of agriculture cannot be expressed in a mea-

surable way or at least by single indices due to their structural character.

This makes it difficult to apply - when combining variables - most of the quantitative methods used in many research works to single out homogeneous units. The other problem revealed in course of the discussion held in Verona[+] is that most of those methods, based on the averages for a certain area and certain time, do not meet the principal requirement of agricultural typology, which is the full comparability of results both in time and space. Also unreliable statistics and lack of both computers and trained staff in most of the developing countries makes it difficult or even quite impossible to use more refined, quantitative methhods of combining variables.

For this reason, the combination of the two simpler methods has been used in the present study namely of the graphic method of typograms /star diagrams/ and the deviation from the model type method tested already by several regional studies.[++]

First typograms have been constructed for each of the assumed 33 model types of world agriculture. As the use of typograms implies the use of indices representing quantitative characteristics, only 12 out of 20 variables could be used in their construction. The additional 8 have been marked either by symbols /if non-measurable/ or by figures /if measurable but representing qualitative characteristics/ on the axes of the typograms.

[+] The proceedings are in print.

[++] See: J. Kostrowicki, W. Tyszkiewicz /Eds./. Essays... J. Bonnamour. Typologie agraire en France. W. Stola. La typologie agricole d'une mésoregion. Comparaison des résultats obtenus par deux méthodes divers. J. Kostrowicki, R. Szczesny. A new approach to the typology of Polish agriculture - all in the proceedings of the Verona meeting /in print/. Recently the typogram method has been adapted to the developmental studies in Borgo-Mozzano by the Shell Company agricultural station and is also tested in planning agricultural areas in Poland.

At first glance, the distribution of variables on the axes of the typogram /Fig. 1/ seems to be haphazard. In fact, in order to attain the best comparability of the individual typograms, the variables have been very carefully arranged. The indices that usually correlate or influence each other have been placed either next to each other or on the opposite axes.

As the indices represent in fact certain classes or thresholds, each of the typograms constructed consists actually of two typograms showing - for each type - maximal and minimal range of indices between which individual cases representing a given type have to be contained. Of course if such a case exceeds in 1 or 2 indices the established minima or maxima, it still could be considered as being of the same type.

The use of the deviation method implies the formalized presentation of variables. The following formula has thus been applied:

$$T = S \frac{O}{P}$$

in which T means type of agriculture, S - social characteristics, O - organizational and technical characteristics, P - production characteristics.

In such a formula variables can be arranged in the following way:

$$T = /1,2/ \frac{/3.1,\ 3.2,\ 3.3/\ /4.1,\ 4.2/\ /5.1,\ 5.2//6.1,6.2,6.3,6.4,6.5/}{/7.1,\ 7.2/\ /8.1,\ 8.2/\ /9.1,\ 9.2/}$$

Each individual case can thus be compared with the formula representing the most similar model type. If there are no more than 4 deviations /1/5 of the total/ from the model type, a given case could still be considered as being of the same type. The cases with the deviations going in the same direction could then be grouped into subtypes. The case which differs from a model type by more than 4 deviations, might be either of different type of agriculture or of intermediate or composed character, the latter relative to the case when one has to deal with aggregate units. Such cases have to be investigated individually.

The comparison of the typograms and formulas made for the preliminary 33 model types of world agriculture /for examples see Fig. 2/ revealed that some of them are very similar to each other and might be considered as subtypes rather than types of the first order of world agriculture. In result the number of types has been reduced to the following 24, each characterized by particular sets of variables that are only partly reflected in their names. These types were then assembled into 4 groups of types /or subtypes/:

I. Primitive agriculture

1. Shifting /long fallow/ agriculture
2. Nomadic herding

II. Traditional agriculture

3. Current fallow agriculture
4. Continuing extensive, mixed agriculture
5. Labour intensive non-irrigated crop agriculture

6. Labour intensive irrigated crop agriculture
7. Labour intensive irrigated semi-commercial crop agriculture
8. Labour intensive non-irrigated semi-commercial crop agriculture
9. Low intensive semi-commercial crop agriculture
10. Large-scale, low intensive, semi-commercial agriculture /latifundium/

III. Market-oriented agriculture

11. Intensive mixed agriculture
12. Intensive agriculture with fruit crops growing or/and market-gardening dominant
13. Specialized large-scale agriculture with livestock breeding dominant
14. Plantation agriculture
15. Specialized irrigated agriculture
16. Specialized large-scale grain crop agriculture
17. Specialized large-scale grazing /ranching/

IV. Socialized agriculture

18. Mixed agriculture
19. Specialized fruit and vegetable agriculture
20. Specialized industrial crop agriculture
21. Specialized grain crop agriculture
22. Specialized grazing
23. Intensive non-irrigated crop agriculture
24. Intensive irrigated crop agriculture

The typology of world agriculture as presented above has to be considered as a preliminary step in approaching the classification of world agriculture based on the established in advance uniform criteria, methods and techniques as well as on the uniform variables. As a preliminary one it contains a lot of inconsistencies and errors. It is hoped, however, that it could provide an adequate basis for discussion that would eventually lead to its improvement and to a more acceptable and agreed version of the typology of world agriculture. Only such a typology could be recommended as a framework for more detailed and more accurate regional studies. It is felt that only then the distribution of the proposed types can be presented on a map. In the meanwhile, however, it is both possible and desirable to start working on mapping the individual aspects of agriculture represented by the proposed variables and expressed by the indices, structures and classifications. To do so, the data from the 1970 World Agricultural Census should be applied. These will test once again the validity of the proposed methods and classifications.

Certainly, further more detailed and more accurate regional studies going deepet into the subtypes of various order will change both the number and characterization of individual types of world agriculture.

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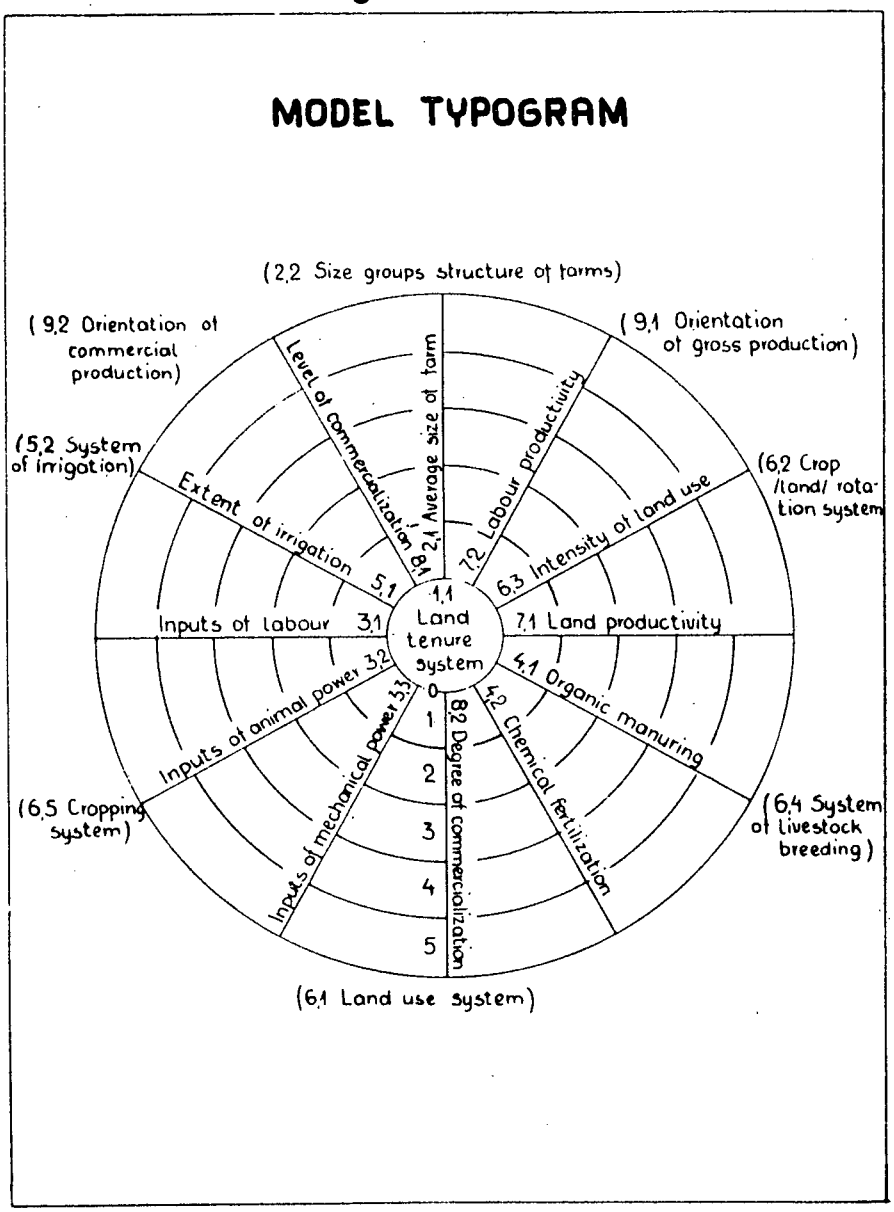
Fig 1


MODEL TYPOGRAM
(2.2 Size groups structure of farms)
(9.2 Orientation of commercial production)
(9.1 Orientation of gross production)
(5.2 System of irrigation)
(6.2 Crop /land/ rotation system
(6.5 Cropping system)
(6.4 System of livestock breeding)
(6.1 Land use system)
Level of commercialization 8.1
2.1 Average size of farm
7.2 Labour productivity
Extent of irrigation 5.1
6.3 Intensity of land use
Inputs of labour 3.1
1.1 Land tenure system
7.1 Land productivity
Inputs of animal power 3.2
4.1 Organic manuring
Inputs of mechanical power 3.3
8.2 Degree of commercialization
4.2 Chemical fertilization
0
1
2
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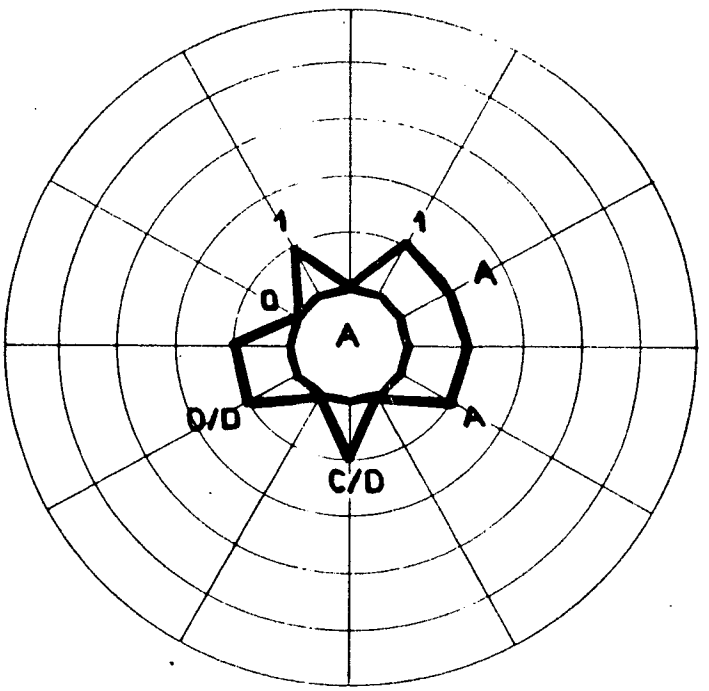
4
5

Fig 2

Type 1



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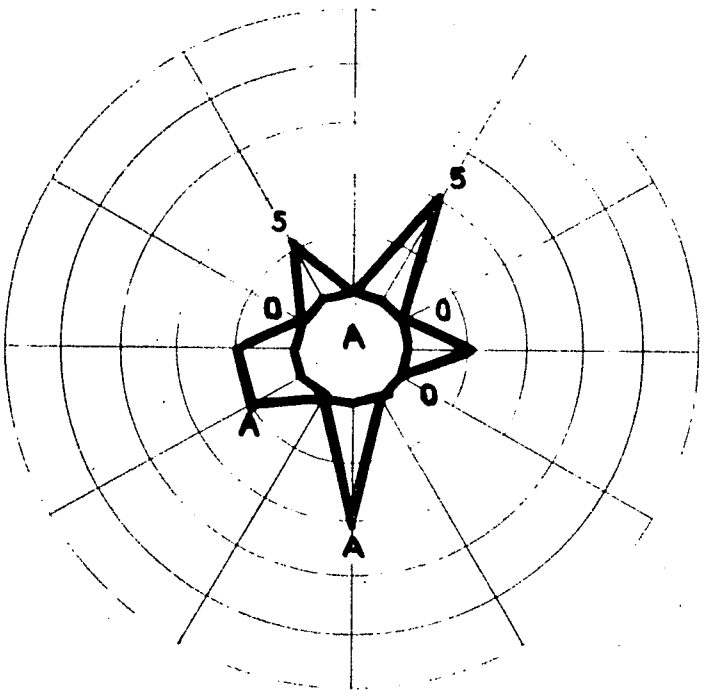

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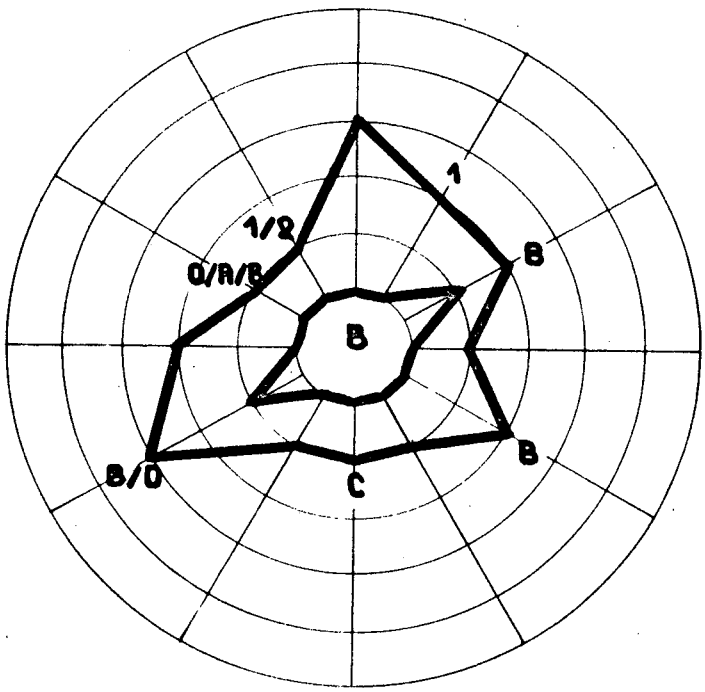

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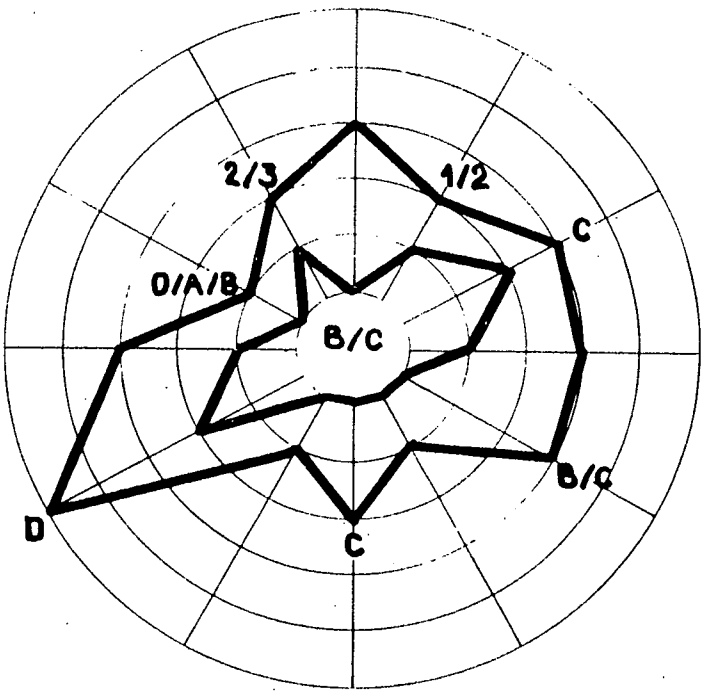

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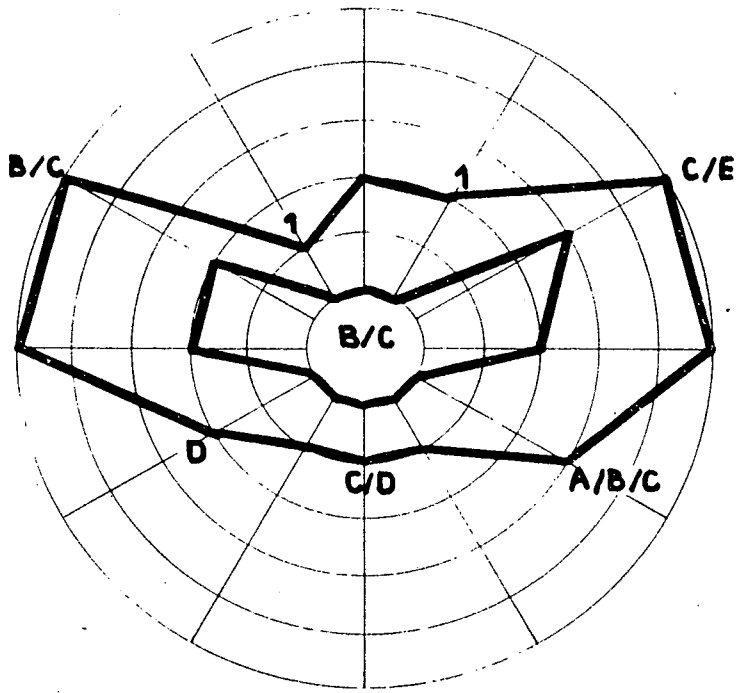

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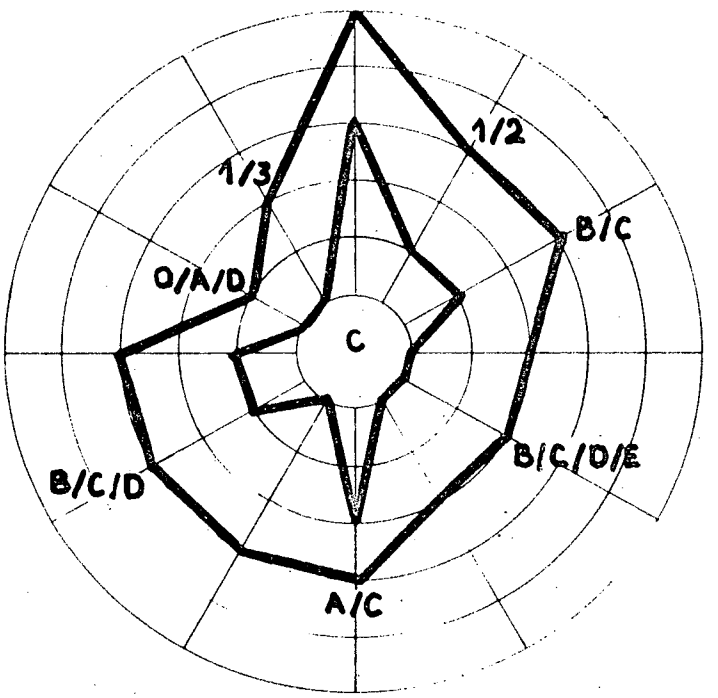

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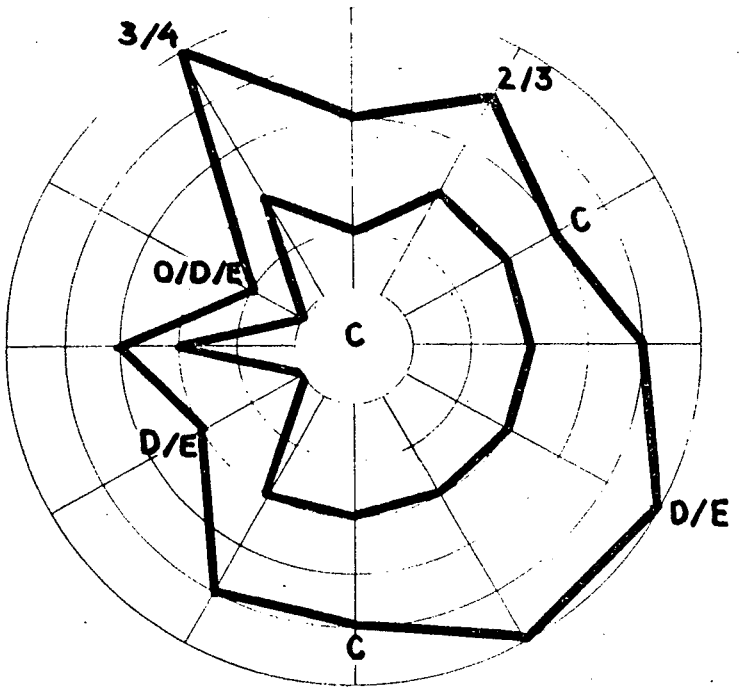

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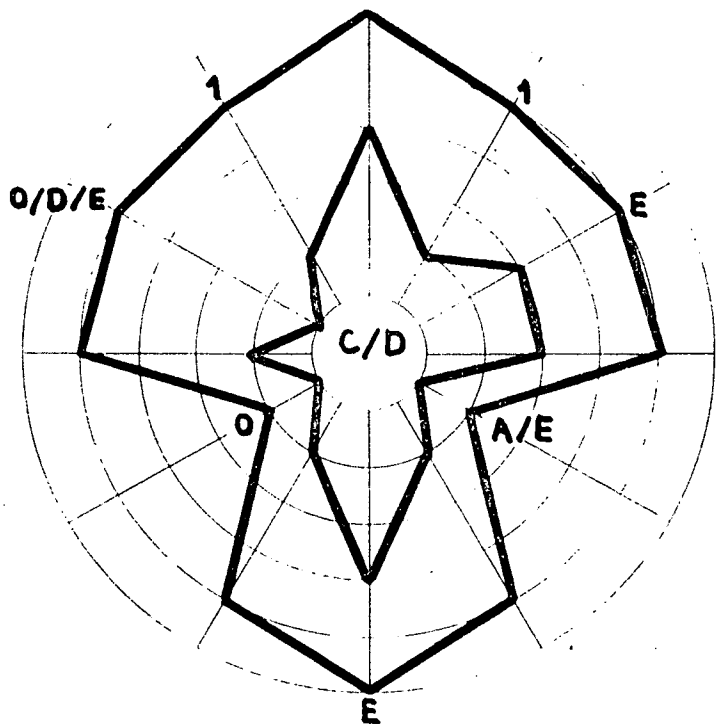

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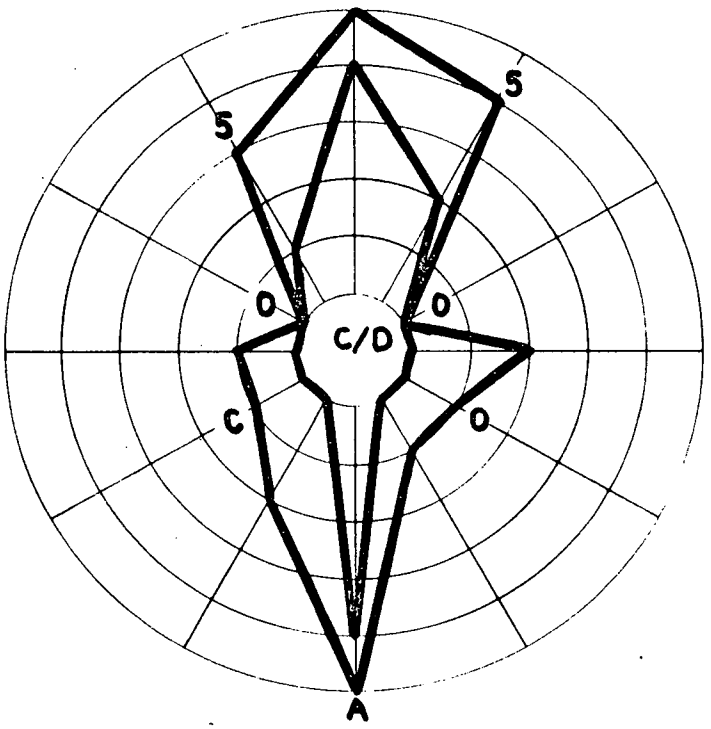

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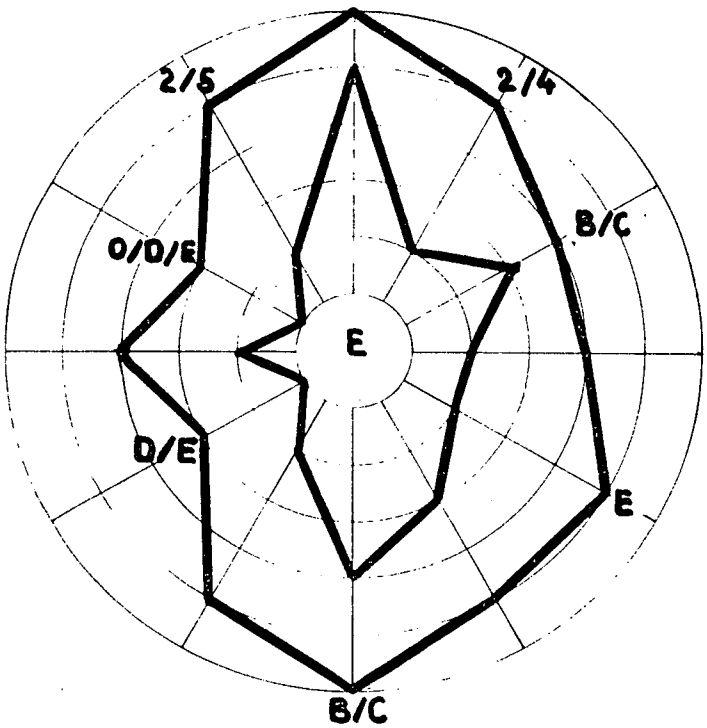

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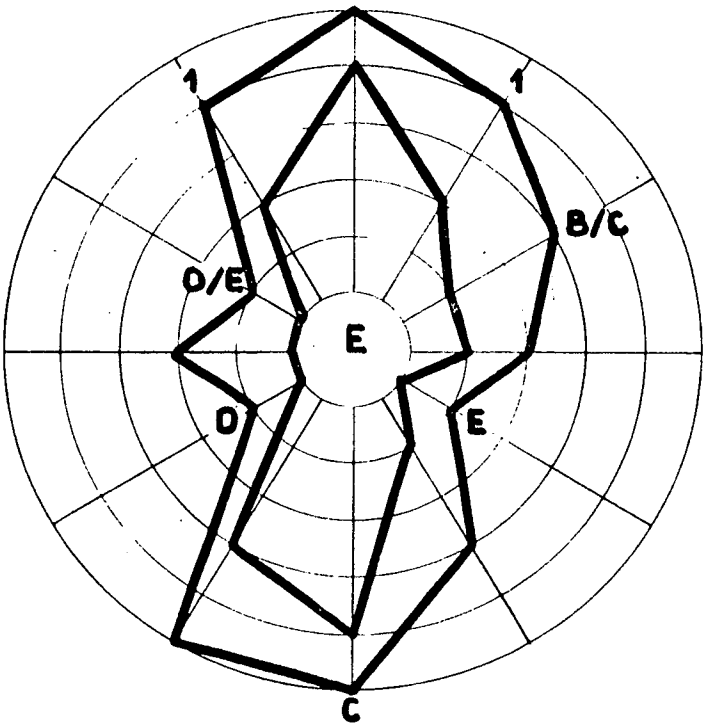

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