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ECONOMIC PROBLEMS IN THE CLASSIFICATION OF LAND

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THE question of how land can be classified in terms of economics is part of one of the most debated problems of farm appraisal—the valuation of land. In principle it is possible to distinguish between two concepts of value—the market value of the land, and its yield value. By market value is meant the value which any field can fetch when bought or sold. By its output or yield value (in monetary units), the value which a field fetches on the basis of the value of its yield.

These questions are at once very important and exceedingly complicated. However, I shall not take up time to describe the principles of land valuation, but keep to the actual title of this paper. This means that I shall concentrate in the first place on the problems which are connected with differences in land values, in other words, the relative land values, not the absolute values as expressed in monetary units. Again, I use the word 'land' in the sense of agricultural land, and not in the sense of whole farm real estate. Classification requires that units which resemble each other in one or more ways be grouped together. However, as the German philosopher Vaihinger points out, a classification is a fiction; it can never be an exact image of reality, only an aid in co-ordinating an enormous variety of quantitative and qualitative factors. Man tries to simplify reality, and in order to do so he uses models.

We must therefore accept the fact that a classification, to some degree at least, consists of figments, though at the same time we pretend that the classes do really exist. The purpose of science is to supplant the fictive elements by real ones. A truly corresponding system is our final goal; the figments must therefore be regarded as being only provisional. Classification may become necessary for many different reasons. But as far as I know the most common reason for a classification is either an official land partition, or taxation. When studying the literature bearing on this question one sees that, in countries where land classification becomes necessary in connexion with land partitions or with taxation, the problems involved have been studied more deeply than in countries where this has not been the case.

The relative value of land depends on a number of different factors. Among them may be named climate, the use of the land whether for ploughing, meadow or pasture, the soil type, the depth and quality of surface soil, the nature of the subsurface soil, the ground water level, soil fertility, the way in which the fields slope, sunshine and shadow, distance from farmstead to field, the quality of the roads, distance to market, and the form and size of field.

When comparing two or more fields, the differences in value are naturally seen to be a result of an interplay between original natural factors and economic forces. In principle it should be emphasized that, when classifying land, the fields which are to be valued should be considered in their economic context. Let me illustrate this by a couple of examples. A hectare of sandy soil situated in a farm which otherwise consists of heavy clay has quite another, and much more important, function than it would have if it belonged to another farm similar in all other respects, but which consisted entirely of sandy soils. Heavy clays and pure sand soils, when they are the only types of soil, are relatively less valuable as production factors on a small farm than they are on a big one. This is because heavy clays cannot be cultivated so efficiently by the small farmer with his simpler equipment, and because sand soils are not suited for producing fodder, which for many reasons plays a decisive part in small-scale farming. The economic value of a field is thus sharply influenced by the type of production which is going on there, by the management, and the organization of the farm. This implies that the value relationship between two fields on farm A can vary significantly from the value relationship between the same two fields were they situated on farm B.

Therefore, if it is accepted as being right in principle that the production and economic function of a field must be taken into consideration when classifying land, it is difficult, if not impossible, to construct a system which gives a realistic quantitative indicator between the factors, at least in certain cases. It is much easier to arrive at a classification which pays attention only to the natural factors. The way in which economic factors are divided up in a classification will therefore be somewhat fictitious, at least to begin with. Natural factors are permanent, economic factors change. In any system of classification that contains them both it will be found therefore that over a longer period of time their mutual proportions change.

Before going any farther, we must glance at the criteria, or exponents, which can be used to determine the relative value of a field—viz. the relation between one field's value and another's.

One of Europe's best-known agricultural economists, the German, Aereboe, asserts that the market value of a piece of land is the only true indication of its real value.[1] In analogy with this view it should be possible to establish a classification based on market values. But even if, in principle, one is in favour of valuation according to market values, in most cases one meets with insuperable difficulties when trying to construct a system having this basis, simply for lack of sufficiently comprehensive statistical data. In most European countries land is not a market commodity, and free supply and demand is a very limited phenomenon.

There is only one way out of this dilemma—the net output of the fields must be taken as a basis. The fields are grouped in such a way that both the gross output and the costs involved in producing it—rent and interest excluded—are taken into account. The difference, viz. the net output, is taken as index of value. In other words, we apply the principle of output value. The net output may be described as the return on the total capital laid out on a farm. By capitalizing it a yield value is obtained that covers all working and fixed capital on a farm. In the present discussion, however, this value is of little interest to us. What is most important in the context is to fix the output value of the bare land, or, more precisely, an index of this value. This is obtained by deducting from the net output the interest on all capital other than the actual land. The difference is then taken as the land rent. The capitalized land rent is thus identical with the output value of the bare land.

The real implication of these concepts of value is debatable, but here I have no time to go into the question. I may point out however, that the land rent measured in such a way, particularly on small farms, is often a negative quantity. This is due to the very high value of buildings on such farms. This does not prevent a comparison between land values, the problem which, as I have already emphasized, is the essential factor in my paper. Everyone knows how net output can vary enormously, independently of the land's capacity as influenced by the personal capacity of the farmer. Thus we must begin with certain fictions and assume a certain common type of farming to which a certain standard means of production is being applied.

To sum up, real empirical data which could serve as a basis for the construction of a classification (in other words, when it is a question of synthesizing those business economic factors which cause differences in land values) are often lacking. Calculations must therefore

[1] Friedrich Aereboe, *Die Beurteilung von Landgütern und Grundstücken*, 2 durchges. Aufl. Berlin, 1919, 535 pp.

be based on more or less relevant fictions. But this will not hinder us from setting as our goal a classification system which allows all real factors to be judged according to their actual importance. For such a classification one should try to construct the simplest possible system. Only essential elements should be taken into account. If we have too many classes, a survey will be more difficult and the whole operation more expensive and more complicated.

I should also point out that, as agriculture has progressed, the difference between the best and worst agricultural land has steadily widened. This is due to lands which have long been cultivated giving a steady increase in yield as techniques develop, and to the steady increase in population which has made it necessary for ever poorer land to be cultivated.

Considerations of certain economic factors. To pass on now to another part of this essay: the importance of certain economic factors taken in themselves. Quite a lot of experimental data is available, particularly from Scandinavia, which I happen to know best. It may be of some interest to give a systematic account of it here.

First, *shape of field*, *size*, and *number*: in other words, those quantitative units which, if I understand the matter aright, constitute the concept 'farm layout'. It is generally considered that a quadrangular or rectangular shape makes the best fields, since on such fields the boundary is short in proportion to the area. In the future a circular field will perhaps be regarded as best. Small fields have a number of disadvantages.

When judging the disadvantage of small fields, the size of the farm must be taken into account. For example, if on a farm of 10 hectares there are fields of from 1 to 2 hectares, the disadvantage to the farmer is much smaller than if those small fields belonged to a farm of, let us say, 50 hectares. Machinery and other implements on large farms are devised for use on relatively large fields, and their efficiency is diminished on smaller fields.

A comprehensive study of the economic influence of layout has recently been made in Sweden. The material was treated in such a way that the farms were grouped, partly according to their degree of mechanization, partly on the basis of their intensity of production.

In Table 1 can be seen the results for a farm of medium productive intensity. By this concept is meant a crop rotation consisting of two fields of spring grain and four fields of hay. As appears in the table, the length of the field is significant, and its influence becomes more and more of a drawback as the shape of the field is awkward. If the field is made longer, so that its length exceeds 200–300 metres,

however, no great advantage comes from it. The results show that improvement in layout is justified proportionately as the original fields are shorter, the degree of mechanization higher, and crop cultivation intense. The table also shows that, where fields have a satisfactory shape, the labour costs involved in a change-over from unmechanized farming to mechanized farming are reduced. Mechanization to degree A (max.) cannot be exactly compared with the others since threshing was carried out with a combine, while in the other fields this operation is not included in field operations. On the

TABLE I

Relationship between Field Shape, Field Length, Mechanization Degree, and Labour Costs in Index Figures according to a Swedish Investigation

Mech. degree	*Shape of field*	*Field length in metres*			
		50m.	*100m.*	*200m.*	*300m.*
		index of labour cost			
A (max.)	Rectangular	100	75	64	62
	Uneven angles	163	94	71	66
B (normal)	Rectangular	75	59	52	51
	Uneven angles	115	72	57	54
C (min.)	Rectangular	86	71	65	63
	Uneven angles	109	80	68	66

other hand, labour costs show a tendency to rise where the configuration is awkward and the fields short and the more the farm is mechanized. Thus, better layout patently improved the conditions for mechanized production.

Economic factor number two is *distance from farmstead* to field, and this must be dealt with in some detail. Even von Thünen pointed out in his day that production must be adapted to less labour requirement as the distance of the field from farmstead increased, or there would be no land rent to be gathered. The influence of distance from farmstead is seen in two respects. First, costs are increased. This is due to a rise in transport and fieldwork costs. These increases depend not only on the distance, but also on the nature of the roads. The other drawback is seen more indirectly—in the form of decreasing intensity.

The *direct influence* of distance from farmstead takes the form of time losses which increase in direct proportion to the length of the road, if the nature of the road does not change. A long distance requires more capital outlay on carts, roads, &c. Up to a certain limit it is possible to carry on with the same equipment, which is the reason why changes in capital requirements occur in abrupt jumps.

As time has gone by, a number of inquiries have been made, following in von Thünen's footsteps. Most have led to the conclusion, when calculations are compared, that the net output tends to fall as distance increases and at a certain point to disappear altogether, at later stages even assuming a negative value.

In Sweden, Gerhard Larsson has published a thesis on the influence of distance between farmstead and fields on labour requirements and type of farming.[1] His studies were made not on the basis of empirical material, but deductively. Among his results, it may be mentioned that an increase in distance from field to farmstead of one kilometre involved an increase in field work of between 10 and 15 per cent. If both field work and transportation were considered together, then the increase in horse-drawn transport was 25 per cent. per km. of distance from farmstead. Where tractors were used the increase in labour was 12 per cent. per km., the increase being proportionate to the distance.

From this we can draw the conclusion that mechanization reduces the disadvantages of distance between field and farmstead, though its influence only becomes noticeable in cases where transportation is also mechanized, and where relatively high speeds are attained.

In Finland, Suomela carried out another experiment which also throws light on the farmstead-to-field distance factor.[2] His study was made on the basis of book-keeping results on Finnish farms that have kept accounts. He maintains that it is obvious that an unsuitable disposition of fields will lead to greater labour requirements. In particular the time losses will be great when transporting harvest and fertilizers. But this applies only to observations of a single crop. For the farm as a whole an increase in field distance does not imply increased labour requirements—rather the contrary. Taken as a whole the labour requirements on scattered farms are often less than on less scattered farms, owing to the facts that production is less intensive and that special measures are taken both in respect of labour and of farm organization, in view of the distances between field and farmstead.

We are used to assuming that a proportional reduction in net output will follow from any increase in the distance from farmstead and that sooner or later one will arrive at a distance beyond which the net output will be negative. In Suomela's thesis, however, we find that

[1] Gerhard Larsson, *Inflytandet av avståndet från brukningscentrum till inägojorden på arbetsbehov, driftsformer och driftsresultat* ('The influence of the distance between the farm centre and the farm land upon the need of work, the kind of farming and the economic result'), Stockholm, 1947, 250 pp.

[2] Samuli Suomela, *Peltojen sijainnin vaikutuksesta maatilan talouteen* ('On the influence of the location of fields on farming'), Helsinki, 1950, 183 pp.

the net output falls considerably more slowly than had been supposed as a result of theoretical calculations. Thus, if a net output based on a distance of 250 metres is set at 100, a net output for a distance of 1,000 metres will give a value of 75, for a distance of 2,000 metres a value of 51, and for a distance of 3,000 metres a value of 35. This relatively slow fall in net output in respect of increasing distance is a result of each individual farmer's being in a position to adapt his farming according to distance from field to farmstead. It appears that he has rather good opportunities for doing so, but of course the distance factor cannot be eliminated, only diminished. The relationship between net output and distance serves only to give a general idea of the problem. Obviously individual farms vary enormously.

Here are some examples of how such adaptation occurs in practice. In areas where distances are usually great, an increase in the distance brings fewer disadvantages than it does in areas where distances are usually short. And this is due to the farmers planning production on the basis of longer or shorter distances. In an area where distances are great, farmers judge the distance factor differently from the way farmers judge it in an area where they are small. To what extent the influence of the distance factor depends on the natural fertility of the soil is another question to be discussed.

The third economic factor bearing on this issue is the *external distance*. By this term I mean the distance from the farm to the market place. On general grounds it may be supposed that since smaller farms do not have the same contact with markets as large farms do, they suffer less from an increase in the distance from such markets. According to Padberg's studies in Germany, however, this is not the case.

Certain changes in marketing procedure have weakened the influence of external distance. For instance, progress that has been made in refrigeration, packing, drying, and preserving slightly damaged goods has reduced its importance. Similar progress in co-operative marketing, and the application of a price system whereby all producers receive the same price for their goods, independently of the distance they have to travel, has had the same effect, though this factor is still important.

Among other economic factors bearing upon the relative value of land should be mentioned the *size of the farm* and the *type of farming organization*. I have already given examples of the relative frequency of different types of soil and their importance to business economics. Similar principles apply to the other production factors, such as buildings, inventories, and stores.

Some land-classification systems. This paper is based on experience and experiments in various European countries, and I propose to state briefly the principles used for valuing and classifying land in these countries. The list cannot be complete, and I must limit myself to a few countries in Europe. I have been in contact with some authorities and research institutes in Great Britain, Germany, Holland, Switzerland, Denmark, Sweden, and Finland. I found that the whole problem is regarded as being of widely differing importance in different countries. In several countries the interest is directed in the first place to a valuation of farms as a whole, the land being only a component therein. On the other hand, in countries where taxation and land partitions are based chiefly on the capacity of the land and its value, the classification of land has been given greater attention.

I shall begin with **Switzerland.** There, agricultural land is valued, as a rule, as part of a valuation of the whole farm. To obtain an average land value, the value of the buildings (40–50 per cent.) is deducted from the total value of the farm, and also the value of any fruit trees. In cases where large numbers of farm valuations are available and the farms are of the same type, an average land value for farms of this type is obtained. When estimating the value of individual pieces of land, a number of different land value classes are established, based on the average yield value. Each field is then placed in its class, according to its situation, the nature of the soil, the shape of the field, its contour, and the road conditions. As an aid to a valuation of the individual factors a system of points is used. Five factors are valued, the significance of each being expressed in points on a scale which varies from 1 to 15. Each field is placed in a definite land-value group, according to the number of points it has scored. In this way it is possible to establish the deviations of each field from the average yield per hectare.

The factors bearing on classification are as follows:

(i) The original fertility capacity of the soil: maximum 15 points.
(ii) Cultural level of the field: maximum 5 points.
(iii) General conditions for crop production, configuration, size, and workability: maximum 15 points.
(iv) Distance from farmstead: maximum 10 points.
(v) Transport conditions: maximum 5 points.

When the total number of points per unit of area has been determined by using this points scale, the scores of the various fields are placed in their respective value-classes. As I have stated, the average

value-class is taken as a basis. The method can be seen diagrammatically in Table 2.

This Swiss system has been used for several years now, and according to the literature studied by me, it seems to have proved satisfactory.

In **Finland** a new system has been introduced, and, like the Swiss, it is built on a valuation in terms of points. It has been devised for use in taxation. For this purpose the capacity of the land has for many years been taken as a basis of calculation. However, the old system

TABLE 2

Class-values for appraising the Value of Fields without Buildings in Switzerland

Sum of points	*Digression of the class-value from the average yield-value**
48–50	+12
43–47	+ 9
38–42	+ 6
33–37	+ 3
28–32	± 0
23–27	− 3
18–22	− 6
13–17	− 9
10–12	−12
	and more

* The digression is expressed in rappens per square metre. One rappen = 1/100 Swiss franc.

which has been used up to now has proved too schematic in many respects, and this is why a more refined system of classification is being studied. I should point out that our experiences of the new system are very limited, since it is only quite recently that it has been applied. It may none the less be of interest to give some account of the principles underlying it.

It is based on the area of agricultural land, by which is meant arable land, pasture land, and meadows. Their values are calculated on the basis of the natural capacity of the land, its degree of cultivation, and the layout.

We had to choose between an absolute and a relative valuation according to quality. By a relative valuation is meant one in which, in each village, the best land is taken as the norm, and the other lands estimated in relation to it. This method has the advantage that local conditions can be studied; its disadvantage is that results for various villages are not comparable with one another. This lack of compara-

tive data must be regarded as a great shortcoming when taxing a whole country's agriculture. So we chose the other way out—an absolute valuation, so-called. The whole country is valued according to standard norms. These are based on the capacity of the land. But even this system has the drawback that variations in climate between one part of the country and another cannot be taken into account. The real yield of a field situated in a district with favourable climatic conditions is higher, of course, than the yield of a field of the same capacity but situated in a less favourable climate. This drawback however, is not too great in a small country.

Briefly the system is as follows. Each field is given a number of basic points per hectare, according to the quality of the soil. Their number varies between 30 and 100. The lowest is given to coarse sand and peat land, the highest to pure mould. Other types of soil vary between these extreme values. Additions and deductions are made to or from these basic markings, the following factors being taken into account. Plus markings are made for thickness of surface soil layer and mould content, existing drainage, and other factors which increase the potential net output of the lands. Deductions are made for stoniness, lack of drainage, unsatisfactory level conditions, lack of soil improvements, local frost, and similar factors having a bad effect on the productivity of a field. Deductions are also made from the total basic points where fields are exceptionally scattered, configuration particularly awkward, and the distance from the farmstead great.

Each field is reduced to 100-points land, i.e. a taxable hectare. This reduction is made in such a way that the area of the field in hectares is multiplied by its score of points, and the product divided by 100. The quantity of taxable hectares is called the tax-hectare figure of the farm.

The scale for judging points can be seen in Table 3. It can be seen there that the various factors are allotted points according to the weight and significance attributed to them. The figures in the table apply to arable land. As already mentioned, meadow-land and pasture-land are classified on the same principles.

A system of pointing such as the Swiss and the Finnish obviously has certain disadvantages as well as advantages. One is that the authorities are obliged to make a detailed study of all the factors which can be supposed to influence the relative value of land. Its weakness lies in the uncertainty in measuring the part played by the individual value-factors, in other words, when the maximum point score for each factor has to be decided on. Here a certain amount of

subjectivity cannot be avoided, at least so long as there is a lack of exact data. Of course it is questionable whether any instrument permitting a real quantitative measurement of the various factors will ever be arrived at. In theory the problem can be approached in such a way that all factors are held as constants, except for one variable, and in this way the influence of this variable is fixed. In practice, however, everything is infinitely more complicated and many-sided. To this must be added the fact that the value relations vary greatly

TABLE 3

The Point Scale in Classification of Land in Finland

Soil type	*Basic points* 30–100 *Additional points, maximum*
Mould proportion of the soil (mineral soils) or quality of the peat (organic soils)	10–25
Depth of the mould layer	30
	Deductable points, maximum
Defective drainage	30
Unprofitable slope of the field	25
Stones on mineral soils or stubs on peat soils	30
Defective content of fertilizers	20
Frost susceptibility	30
Shade of trees	20
Shape and size of field	20
Field distance from farmstead and division into plots	30

between different areas in the same country, and this means that the same field would have a completely different business value in each of them.

A system which is different from these in several respects is used in **Germany.** That system, like the Finnish, has been worked out with a view to taxation. It was designed by the well-known German agronomist, Professor Rothkegel, and was in use before the war.[1] My correspondence with German experts leads me to believe that the same system is still in use today.

The first stage in this system is that the type of soil, its geological origins, and degree of cultivation are determined. These three factors are then compared with corresponding conditions on a high grade farm specially chosen for the purpose, i.e. one of the best farms in Germany. The capacity of all the farms in Germany is then measured

[1] Walter Rothkegel, *Landwirtschaftliche Schätzungslehre*, Stuttgart, 1947, 149 pp., and *Geschichtliche Entwicklung der Bodenbonitierungen und Wesen und Bedeutung der deutschen Bodenschätzung*, Stuttgart, 147 pp.

in relation to this peak farm. The next stage is the allotment of an index of value for each field shape. The fields are placed in their classes, with a certain allowance made for variations. These value indexes are formed on the basis of the net output. Here the conditions obtaining on the peak farms are taken as basic. They are the following: (i) an average climate for the whole of Germany; (ii) level of slightly sloping fields; (iii) production conditions such as obtain for medium and large farms in Middle Saxony.

The value indexes obtained in this way are called land indexes. Corrections are made for deviations in yield conditions due to different soil type, frost danger, &c., from those conditions which exist on the peak farm. Variations in economic conditions are first taken into account at a later stage in the valuation. These corrections are made both for arable land and for meadows and pasture land. In this way a specific so-called land-climate index is obtained for each farm. This shows the relation between the farm's real estate value for taxation purposes, and that of the above-named peak farm, which has a land-climate index of 100. In other words, the system means that all farms are placed in relation to a peak farm. Obviously it is very important that the net output, fixed on as a basis for taxing the peak farm, should be established with very great care. It is also important to note the rate of interest at which the net output is capitalized. In the following example I take the net output per hectare on the peak farm as 200 Rm., being capitalized at 4 per cent. The output value will thus be 5,000 Rm. per hectare.

This method, which I have briefly described, applies chiefly to the taxation of the whole of German farm real estate. But it can also be used when valuing land only by subtracting the buildings and inventory from the total real estate value. In Table 4 can be seen an example taken from Rothkegel's books.

In calculating the value of land in this way attention should be paid to the varying value of buildings and inventory on farms of different sizes. As is known, this value is very high on small farms, which means that, if the value of the land is regarded as a remainder after the value of the buildings has been subtracted, the land value will often be a negative quantity. This is the case in the examples given here. As to the logic of such a result, it is obviously questionable. But to go into this aspect of the matter would exceed the bounds of my present paper, so I shall restrict myself to stating the facts.

The influence of economic factors on the valuation of land has here been only lightly touched on. Working from the indexes in the table as basic, additions and deductions should be made for fields and

farms respectively. The following economic factors are observed in Germany: (i) external transport conditions; (ii) internal transport conditions, by which is meant the state of the roads and the size and shape of fields; (iii) degree of cultivation; (iv) growing crops; and (v) types of soil and cultivation in the region.

Since I have no time here to give a more detailed account of the calculation methods used in Germany, I must direct you to Rothkegel's instructive book.

The Swiss, in particular, have been critical of the German system.

TABLE 4

Value of Land without Buildings derived from the Farm (Real Estate) Value according to the German System in Classification of Land

Soil-climate figure	*Yield value of the real estate in Rm. per ha.*	*Value of one hectare on farms of different sizes in Rm. Size classes (hectare)*				
		5	10	20	50	100
15	750	−1,150	−440	−80	130	200
20	1,000	−970	−250	100	320	390
30	1,500	−600	120	470	690	760
50	2,500	150	860	1,220	1,430	1,500
70	3,500	890	1,610	1,960	2,180	2,250
100	5,000	2,010	2,720	3,080	3,290	3,360

They have pointed out that it is based too exclusively on natural conditions and pays too little attention to economic factors. According to the Swiss critics, it is an unrealistic way of going to work to relate production factors in all farms to those which obtain on a single farm. Nor is the size of farms taken into account, and the conversion of economic and production factors on the peak farm, to farms with which it really cannot be compared, is much too schematic.

I have tried to give some account of the land classification question, using Switzerland, Finland, and Germany to illustrate different methods. It is evident, I hope, that the problem is one of the most debated in agricultural economics, and that science has still a great deal of valuable work to do.

OTHER REFERENCES

JOSEF GRIES, *Die Wertermittlung des Grund-und Bodens für die Zwecke der Wirtschaftlichen Zusammenlegung der Grundstücke*, Koblenz, 1950, 127 pp.

ERNST JAGGI, *Methodik und Technik der Ertragswertschätzung landwirtschaftlicher Betriebe und Grundstücke*, Brugg, 1945, 137 pp.

Undersökningar rörande brukningskostnadernas samband med åkerfältens storlek, form och beskaffenhet (Statens offentliga utredningar, 1950, 20), Stockholm.

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The term 'land classification' means different things to different people. It sometimes refers to physical soil classifications. It sometimes embodies economic aspects of classification. This is the type to which Professor Westermarck's paper is devoted and is in line with Dr. Kellogg's plea that the term 'soil classification' should be used for physical groupings and that the term 'land classification' should be reserved for classifications involving economic considerations.

In the sphere of land classification, however, further differentiation might be made. Land evaluation or farm appraisal is one kind of classification. This is the type discussed by Professor Westermarck. A different type of classification is one which delineates broad groups of economic land classes and these may be in the form of submarginal, marginal, and supramarginal grades of land in a particular use. The term 'land classification' is generally reserved for this kind of classification in North America. Vast areas of western Canada have been classified in this manner. It serves as a guide to administrators in designing land and related policy and to farmers and prospective farmers in selecting economically desirable farms and in formulating desirable land use.

Professor Westermarck has raised the question of how to arrive at land value—a value which is to be used principally for taxation. He considered two types of value: market value and capitalized net product value. He rejects the use of market value because of the absence of market information from which to establish value. I think this is essentially sound. Not only are records of representative sales difficult to obtain, but also sale values are sometimes influenced by factors which have little or no relation to the income-producing capacity of the land. Therefore if the principle of taxation according to income is accepted, the most direct approach is to establish a value based on the net earnings of the land.

One of the difficulties involved in this method, however, is the selection of the interest rate at which earnings are capitalized. A difference of one per cent. in the interest rate will result in a large difference in the value obtained. In a freely operating economic system the capitalization rate for farm appraisal should approach the rate which can be obtained in an enterprise involving a similar degree of risk. For this purpose a rate corresponding to the usual mortgage rate of interest might be the appropriate one to use.

Actually, if the values are to be used for taxation purposes only, the rate at which the net products are capitalized is not so important, since it is the relative land values which are significant. However, assessed values are often used for other purposes and therefore careful attention should be paid to the capitalization rate.

A point on which I am not entirely clear is in connexion with the deductions made for distance from the field to the farmstead. In one section of Professor Westermarck's paper he states that a study by Suomela shows that if a field 250 metres from a farmstead had a net output index of 100, a field 2,000 metres from the farmstead would have a net output index of 51, or nearly a 50 per cent. reduction. However, in Table 3, showing the point scale in classification, only 30 points can be deducted for distance from field to farmstead out of a maximum of 205 points. Therefore, the maximum deduction for this factor is about 15 per cent. This lesser deduction may be more in line with the real situation since Suomela's study appears to put excessive weight on distance of field from farmstead. Taking distance from field to farmstead into consideration involves the difficulty, too, of changing the appraised value whenever a parcel of land changes from one farm to another.

Professor Westermarck indicates that the system of evaluating the whole of Finland, according to standard norms, does not take into account the differences in climates for two tracts of land which are otherwise identical. I wondered if there might not be some self-adjustment for this. Points in the scale are given for soil of different types, for different proportions, and depths of mould. To the extent that these characteristics themselves are the result of climate, they would provide adjustments for differences in climate. There does not appear, however, to be any allowance made for different degrees of weather risk, except frost, to which different areas may be subject.

No system of farm appraisal can be absolutely precise and completely objective. This does not mean, however, that attempts should not be made to approach these objectives. Professor Westermarck's paper outlines many of the important factors to be considered in attaining that end.

H. E. Conklin, *Land Economics Division, Cornell University, Ithaca, N.Y., U.S.A.*

There are two questions regarding the completeness of the coverage of Professor Westermarck's paper relative to the classification problems that appear important in the general area of economic development.

Firstly, is Professor Westermarck discussing land classification or does his paper actually deal instead with what we know as farm appraisal? The difference between these two areas of activity is not necessarily great. Land classification may, and often does, involve farm appraisal, but it also involves problems of categorical and cartographic generalization, problems not touched upon by Professor Westermarck.

Secondly, I would question the suitability of the approach Professor Westermarck has outlined in situations where changes that are possible, expected, or hoped for dominate the picture. I would not deny that many of the items he discusses would be relevant to a consideration of opportunities for development, but I do not see in his paper a vivid picture of a classification that would long endure social, institutional, and economic change, nor one that would guide such change. He did emphasize such basic factors as soil and climate, but he summed up his consideration of these into a final composite that was visualized as being as current as problems of taxation.

I would like to suggest one possible alternative approach. I think that economists are making a mistake in resting happily upon the assumption that a physical land classification is a magic sort of thing waiting to be fallen upon rather easily by those magicians, the physical scientists. Land can be classified in millions of ways, as I visualize it. How, then, are we to select the *one* way? Even the one physical way? The selection, of course, is to be made in terms of relevance for practical problems—problems of today, and we hope of tomorrow. But a large number of our problems in the final analysis, are economic. For this reason, I think economists can play an important part in the shaping of classifications that we ordinarily identify as purely physical. If production function differences and their implications were accepted more clearly as criteria for identifying the meaningfulness of land differences, I think the role economists might play in shaping physical classification would be especially evident. They could go forward to predictions of what would constitute economic optima under particular circumstances and could work with sociologists, anthropologists, political scientists, and many others in visualizing possibilities yet unrealized.

W. G. MURRAY, *Department of Economics and Sociology, Iowa State College, Ames, Iowa, U.S.A.*

With most of Professor Westermarck's paper I am in agreement. One point, however, I cannot accept. He says that the market value approach is one of insuperable difficulty. But his net yield approach

and the Swiss approach also face insuperable difficulties. On the basis of my experience it is just as difficult to value buildings and subtract them from total value in order to get net land value as it is to use a market value estimate. It is difficult, for example, to obtain a net income because of the problem involved in estimating labour cost. You will find yourselves in these cases doing as much estimating as you would if you estimated the market value. I agree that there are many places where you cannot get good market value statistics, but I want to urge that in many cases, such as in Germany where land value statistics are scarce, the farmers were interested in what market value statistics might be available. This was especially true if one son was interested in buying the farm and his brothers and sisters were interested in what price he paid for it. I think that we often lose sight of the over-all objective, the value of the farm in a market sense. There are other factors besides net yield or income that make up the value of a farm. Its location is an important factor. Many of what we call the intangible features should be added to the productivity estimate. I have no quarrel with Professor Westermarck in using net yield, but I think he should also use market value. Let us use all the factors which make up the value in arriving at a proper index.

L. A. NAZARIO, *Bureau of Agricultural Economics, San Juan, Puerto Rico*

I fully agree with Dr. Conklin's observation that land classification is something different from land assessment. So far as economic land classification is concerned, even in small countries climate is a very important factor, especially in those which have varied topography. In these cases there is likely to be a very large variation of climate. In a country as small as Puerto Rico, we have classified fifty-seven different rain areas. Altitude is another very important factor to take into consideration. In our work, therefore, we have come to the conclusion that even for this very small country it is necessary to define agricultural regions and to make classifications within them. This enables us to decide which type of farm arrangement is most likely to succeed or is most adaptable to each particular area.

Another point which I would like to make in relation to land classification is that in many States of the nation very good land-classification schemes have been devised. But they are still in the hands of the technicians and have not been used for any development purpose. In Puerto Rico we are trying to do something more than just classify the land. I think that this, as any other activity, must be part of a well-rounded, comprehensive developmental programme. If such a job were done as a scheme by itself nothing would

come from it and money would be lost. So we are planning that as soon as the classification is complete we work out recommendations for improved land use. Actually we are already doing it on the basis of the ample information so far accumulated. We are seeing to it that extension agents carry these recommendations to the field, so that farmers can be helped in planning their enterprises for best results.

N. WESTERMARCK (*in reply*)

I can agree with my critics to some extent, but I would point out that in the Scandinavian countries, as in most other European countries, we have no statistical data about the market value of land. We have to choose the only possible way which is open to us, namely the output value. Returning to the question about the definition of land valuation and land classification and how to separate these two subjects, I think it is a large problem and I do not think we can solve it here. In my view farm classification might be regarded as a means for determining the value of land. The problems of land classification and land valuation obviously differ in countries which have a relative abundance of land, as for instance, the United States and Canada, from those in countries which have land shortage. In European countries land is a pretty limited factor and I expect we look at these problems from rather different points of view.