3.3. PRELIMINARY SOIL SURVEY (Stage 2)

The items discussed under 3.2 all refer to work done before the polder is pumped dry. In the following consideration is given to the work done soon after the land has emerged, in so far as the results of preliminary surveys are applied.

a. Final land division

The first task to be undertaken after a polder has been pumped dry is that of constructing a network of main canals, lateral canals and ditches. This network is, obviously, a highly essential part of the general development scheme, and it can be said that after it has been completed no more changes can be made in so far as the scheme of allocation is concerned. In view of this it will be clear that before the canals and ditches are dug, extremely good care is taken to see whether or not the supplementary data on the soil conditions, as obtained from the preliminary survey, make any changes in the scheme of land-division desirable (fig. 8).

b. Preparing specifications for excavation work

The digging of canals, lateral canals and ditches is awarded to a number of private contractors. In order to enable a cost estimate to be made, the works are described in great detail in the specifications. Such description includes the soil conditions of the areas where the canals and ditches are to be dug. The data required to this end are as a rule taken from the preliminary surveys.

c. Determination of the reclamation plan

As is done in the case of the plan for land division, the preliminary soil map is closely studied to ascertain whether the desirability of amending the reclamation plan is indicated.

d. Determination of the spacing of field ditches (trenches)

After ditches have been dug, the parcels are formed. They have a length of from 800 to 1,000 m and a width of from 200 to 300 m (see fig. 9). The permeability of the young soils is as yet so poor, that ditches alone do not effect an adequate drainage of lots of this size, so that a detailed drainage system has to be laid down. During the first few years this system consists of field ditches, which are later on replaced by tile drains. The field ditches are 1.15 m wide at the top, 0.25 m at the bottom and have a depth of 0.60 m. The figures 10, 11 and 12 show some pictures of the modern equipment used to this end and its results.

The principal reason why the soil is initially trenched and later tiledrained is the fact that it is almost impracticable to lay drains in the very young, soft soils. Moreover, at the time of trenching the soil has not yet dried out to any considerable depth, and is uncracked and highly impermeable. Therefore, in case of tile drainage the intervals between the tile-rows would have to be very small.
Fig. 8. General lay out of the Northeast-polder.
Fig. 9. General lay out of the individual lots.
Fig. 10.  
A modern trench-cutting plough with a hydraulic lifting system, pulled by three crawler-tractors.

The distances between the field ditches, which were already estimated for the different areas before the polder was pumped dry are now separately determined for each parcel. Due to the experience gained in the course of the years it has become possible to determine the intervals between the field ditches merely with knowledge of soil condition to a depth of about 60 cm, and the stage of ripening of the soil profile. Table 4 shows the empirical scheme elaborated for distances between field ditches on heavier soils of the Zuiderzee polders.

<table>
<thead>
<tr>
<th>Code</th>
<th>Distance between field ditches shortly after the land emerges</th>
<th>Distance between field ditches after several years' ripening under the influence of spontaneous vegetation</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>5</td>
<td>8</td>
<td>8-10</td>
</tr>
<tr>
<td>6</td>
<td>10</td>
<td>12</td>
</tr>
<tr>
<td>7</td>
<td>12</td>
<td>16</td>
</tr>
<tr>
<td>8</td>
<td>12</td>
<td>16</td>
</tr>
<tr>
<td>9</td>
<td>12</td>
<td>16</td>
</tr>
</tbody>
</table>

**e. Choice of crops and manuring during initial State operations**

Because additional charges make the labour wages in the polders very high during the period of reclamation, only extensively cultivated crops are suitable during the years of initial State management. These are mainly the following: rape seed, winter wheat, spring wheat, spring barley, lucerne and grass.
Rotary-trencher in action in Eastern Flevoland...

Fig. 11

... and the work it has done.

Fig. 12
It should be noted here that the choice of crops at this stage has little to do with soil conditions, but is mainly determined by the possibilities of applying mechanized methods, by the choice of crops requiring intensive labour, by the distribution of tasks, etc. The only thing to be taken into account is that sandy soils should be partly or entirely devoted to grassland to prevent wind erosion.

The amount of fertilizers required, however, depends very much on the condition of the soil. In such virgin soils a close correlation exists between the clay content on one hand and potash and phosphate content on the other. With the aid of standards elaborated on trial plots it is possible to indicate the amount of fertilizers required on the basis of the soil maps.

\( f. \) Additional details on soil suitability and land-use

Land-use is also modified in so far as more recent information on the nature of the soil and hence soil suitability call for it.

3.4. DETAILED SOIL SURVEY (Stage 3)

Detailed surveys were used primarily in connection with preparations which have to be made during the initial period of State working for the leasing of the land to private farmers. The provisional detailed drainage system by means of field ditches has to be replaced by a permanent system of tile drains. Wherever necessary, and practicable at a reasonable cost, soil improvements are carried out. Soils susceptible to drought which are not destined for afforestation are given an artificial water supply. The final use of each parcel— as arable land or grassland, or as land devoted to mixed farming, fruit growing, horticulture or afforestation— has to be decided upon, and the size of the farms fixed. After that the houses for tenant farmers and farm labourers have to be built for the farms to be leased out as well as the barns, etc. Finally the rentals have to be fixed.

However, soil conditions make their influence felt not only on the work done during the reclamation and colonization of the polders, but also on the farming by the tenants later on. For this reason not only the items mentioned above will be discussed in the following paragraphs, but also a few additional factors which may be looked upon as tenant uses of the detailed soil maps.

\( a. \) Tile drainage

For reasons already stated in the preceding chapter the young soils are at first drained for a number of years by means of field ditches. However, these field ditches have some drawbacks so that they have to be replaced after a few years by series of drain-pipes (see fig. 13).

The sandy soils (codes 0 to 3) will be left out of consideration for the time being, because they are susceptible to drought. In addition to drainage during the winter half year, these soils require an artificial water supply during summer. It is not the drainage during win-
ter, but the water supply during summer which determines the intervals between the tile drains.

In the heavier textured soils the process of drying out will have made already considerable progress in the subsoil layers at the time that the area is tile drained which takes place about 3 or 4 years after trench draining.

Consequently, these layers have become more or less cracked and permeable according to their clay content. The formation of the soil profile and the structural condition of the layers thus determine the spacing of the tile drains in the heavier textured soils. It has by now become possible to determine the correct distance of the drain rows on the basis of the number and size of the cracks in the soil. (See appendix II.)
Application of soil survey methods

It is beyond the scope of this paper to describe in detail the method by which the soil profiles are classified according to their permeability. It should be merely noted here that the stage of ripening of a profile at a certain moment depends on various factors. Some of these are: the number of years that have elapsed since the soil emerged from the water and since it was trenched; weather conditions during those years; the nature and amount of vegetation; the relative level, and last, but not least, the clay content of the various soil layers.

No mention, finally, has yet been made of seepage. In comparison with soils without seepage, soils with some amount of seepage are slower to ripen, and in deeper layers may even fail to acquire any structure altogether. For this reason these soils often require a far more narrowly spaced tile drainage system than do comparable soils without seepage.

b. Subterranean irrigation by means of tiles

Rainfall and evapotranspiration in the Netherlands are such that there is an annual rainfall surplus. During the summer months, however, the evapotranspiration exceeds the rainfall, so that on soils with a low water retention capacity and/or shallow rooting depth crops may suffer from drought.

In so far as the drought-susceptible soils are not afforested, they are provided with an artificial water supply. Since fresh water is easily and cheaply available from the IJssel Lake, and the soils concerned are sufficiently flat, the water supply takes place in the form of sub-irrigation. Subterranean irrigation is considerably cheaper than surface and sprinkler irrigation. There is no danger of salinization of the land since the small quantity of salt accumulated in the top layers during summer is more than adequately washed out during winter.

By this system of subirrigation the water in the boundary ditches is dammed up to a certain level above the rows of tiles. The water is subsequently led through a horizontal series of tiles into the lots, so that the entire area is provided with an artificially maintained water table, and the roots of the plants can absorb water from the capillary zone.

Sandy soils (codes O to 3) are susceptible to drought the more, the coarser and the poorer in clay content the soil. Furthermore, shallow soils are susceptible to drought, i.e. soils with a shallow layer of heavier textured soil overlying relatively coarse sand. The more shallow the clayey layer, the more serious the susceptibility to drought. A study of the soil map will reveal which areas stand in need of sub-irrigation.

Since not only susceptibility to drought but also drain row distance and the level to which the water has to be dammed up depend on the soil condition, the soil map may be used for these purposes, too.1)

c. Designation and execution of soil improvement schemes

Generally speaking the condition of the soil must be accepted as given by nature and it should be considered highly fortunate that the quality of the soil in the Zuiderzee polders is generally very good.

1) For further details see: Ir. C. Kalisvaart: "Subirrigation in the Zuiderzee polders", publication no. 2 of the International Institute for Land Reclamation and Improvement, 1958.
However, there are also areas where soil conditions are poorer than might have been wished. As a rule there is nothing to do but to accept the poorer quality of the soil during reclamation, during initial State management as well as later on when it is worked by the tenant farmers.

Locally, however, soil improvements may be carried out. Soil improvement implies all those measures which are executed only once and result in a lasting improvement of the soil profile. Soil improvement measures applied are deep ploughing to reverse soil layers, and deep ploughing to mix soil layers.

In ploughing for the first mentioned purpose, the maximum ploughing depth that should be reached is about 1.90 m. It is done when a sandy layer of not more than 1 m thick lies on top of a heavier subsoil (see fig. 14). In deep ploughing the object is to reverse the profile. It is, however, not possible quantitatively to bring the heavier subsoil to the top. In the greatest ploughing depths losses of at least 20% have to be reckoned with. A further aim is to make the heavy top layer as thick as possible because - as was previously pointed out - shallow soils have a few less desirable properties. With respect to the thick-

Fig. 14. Deep-ploughing up to 1.30 m (4 feet appr.); the sandy topsoil has to be replaced by clay loam from the subsoil.
Application of soil survey methods

ness of the heavy layer brought to the top, it should be noted that it becomes thinner through settling.
The soil maps will show where it is possible to plough with a view to reversing the soil layers.
Deep ploughing with the object of mixing the soil layers is done in order to deepen shallow soils. Investigations have shown that with respect to soils having a shallow layer of heavier textured soil overlying a sandy subsoil, the susceptibility to drought depends almost solely on the thickness of the top layer and not on its clay content. A thicker, light-textured layer is thus more favourable than a shallower, heavy-textured layer.
The above implies that ploughing with the object of adding sand and mixing it as thoroughly as possible with the heavier topsoil represents an essential soil improvement. Consequently, this measure is often applied.
The soil maps show the areas which might benefit from the treatment described here.

d. General pattern of land use

The suitability of the soil has been referred to several times in the preceding chapter. Rough data on this subject are needed at an early stage, since they are required for planning of land utilization.
During the last stage prior to leasing the land, the soil suitability of each separate lot has to be known, in order to decide upon the definitive use of the land and the size of the farm, and so that the buildings required may be designed and built. A detailed soil map is indispensable here.
The concepts of soil suitability and land use overlap only partially. On the one hand the use of land for purely arable farming is possible only if the soil suitability allows it; on the other hand, however, the soil suitability – for instance – may warrant its use as grassland, as arable land or as horticultural land, whereas its use is as a rule restricted to only one of these three possibilities. Soil suitability, therefore, solely concerns the technical aspects of agriculture. In land use, on the other hand, economic considerations and those prescribed by the prevailing agricultural policy are also involved.
This is clearly apparent in the case of loam and clay soils. These soils are suitable for use as arable land, as grassland, for mixed farming, for fruit, and for the cultivation of vegetables of lower economic return. However, extensive areas of fruits and vegetables are not wanted because they are liable to result in overproduction. For this reason only a limited area is to be used for such purposes.
Consequently, utilization as arable land, as grassland, and for mixed farming is left. The choice between these three is not difficult to make: the use as arable land is preferred, both by the owner and by the tenant. For the owner, the buildings for a purely arable farm (without any accommodation for cattle) are cheapest, and for the tenant the profit-earning capacity of arable farming is greater than that of cattle farming.
In its ultimate form a plan for land use consists of a map which indicates not only the
### Composition of the top soil

<table>
<thead>
<tr>
<th>clay-content</th>
<th>U-figure</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-3</td>
<td>50-120</td>
<td>coarse sand, poor in clay</td>
</tr>
<tr>
<td>3-8</td>
<td>50-120</td>
<td>coarse sand, clayey</td>
</tr>
<tr>
<td>1j-5</td>
<td>120-400</td>
<td>fine sand</td>
</tr>
<tr>
<td>5-8</td>
<td>&gt;120</td>
<td>sandy loam A</td>
</tr>
<tr>
<td>8-12</td>
<td></td>
<td>sandy loam B</td>
</tr>
<tr>
<td>12-17</td>
<td></td>
<td>sandy loam C</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>clay-content</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>17-25</td>
<td>loam + silty loam</td>
</tr>
<tr>
<td>25-35</td>
<td>(silty) clay loam</td>
</tr>
<tr>
<td>35-50</td>
<td>(silty) clay</td>
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<tr>
<td></td>
<td>peat</td>
</tr>
<tr>
<td></td>
<td>peat decretic</td>
</tr>
<tr>
<td></td>
<td>pleistocene sand</td>
</tr>
<tr>
<td></td>
<td>boulder clay</td>
</tr>
</tbody>
</table>

Fig. 15. Simplified soil-map of the Northeast polder.
Fig. 16. Simplified map showing the land-use pattern of the Northeast-polder.
farms and their sizes, but also the type of farming (see fig. 16). The following types of land use are found in the young polders:

- purely arable farms;
- mixed farms with 1/6 of the area allotted to grassland;
- mixed farms with 2/6 of the area allotted to grassland;
- mixed farms with 3/6 of the area allotted to grassland;
- mixed farms with 4/6 of the area allotted to grassland;
- mixed farms with 5/6 of the area allotted to grassland;
- horticultural holdings (vegetables and fruit);
- forests.

With respect to fruit growing and market gardening holdings it has already been stated in passing that only a limited number may be established because of economic considerations. Since these holdings need a lot of capital and/or intensive cultivation, the most suitable soils are allotted to them. As these areas are strictly limited the requirements which soils used to these ends have to meet will not be dealt with in greater detail here. For afforestation relatively small areas are indicated which are either unsuitable, or relatively so, for agriculture, viz. boulder clay soils, coarse sandy soils or regions where soil conditions show wide differences within a small area.

By far the largest area is used for purely arable farms and for mixed farms with a larger or smaller area of grassland. It has already been pointed out that arable land is chosen wherever possible, and grassland wherever necessary. The necessity of assigning part of the farm land having a certain type of soil to grass is mainly determined by the susceptibility to wind erosion and to deterioration of the structure of the soil surface. The soils containing less than 7 to 8% of clay are subject to wind erosion. These are primarily sandy soils, which are more easily eroded by the wind since the soil is coarser and has a lower clay content. According to their properties, sandy soils are used for mixed farming with 3/6, 4/6 or 5/6 of the area taken up by grassland. In the soils of code 4 the danger of wind erosion is no longer great as a result of the relatively high clay content and the fineness of the sand particles. In these soils it is not on account of the danger of wind erosion that part of them have to be laid down to grass. The reason is the lack of stability in the soil structure, that shows a tendency to a compact plate structure; if cultivated too much it becomes powdery, after rains a surface seal is developed. This may result in newly sown crops shooting up late or irregularly; occasionally they fail to come up at all. For this reason it is necessary that the structure be made as stable as possible. This may be done by allowing the soil a period of fallow from time to time by laying it down to grass, and by the application of farmyard manure produced by the cattle on the grassland. A great deal of attention should also be given to green manures. Only in the case of the soils with code 4 it is considered necessary to remedy the sus-
ceptibility to formation of a surface seal by assignation of mixed farms on them, in which 1/6 or 2/6 of the area is allotted to grassland.

On soils with the codes 5 to 9, therefore, purely arable farms may be established. As far as the soils with code 5 are concerned, however, it should be borne in mind that they are susceptible to formation of a surface seal, although to a lesser extent than those with code 4.

**e. Size of farms**

Table 5 shows that the distribution of farm sizes varies in the different polders.

<table>
<thead>
<tr>
<th>Surface</th>
<th>Wieringermeer polder</th>
<th>Northeast polder</th>
<th>Eastern Flevoland polder</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>Per cent</td>
<td>Number</td>
</tr>
<tr>
<td>hectares</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-10</td>
<td>63</td>
<td>12</td>
<td>-</td>
</tr>
<tr>
<td>10-20</td>
<td>101</td>
<td>20</td>
<td>521</td>
</tr>
<tr>
<td>20-30</td>
<td>79</td>
<td>16</td>
<td>626</td>
</tr>
<tr>
<td>30-40</td>
<td>90</td>
<td>18</td>
<td>270</td>
</tr>
<tr>
<td>40-50</td>
<td>115</td>
<td>23</td>
<td>169</td>
</tr>
<tr>
<td>More than 50</td>
<td>63</td>
<td>12</td>
<td>16</td>
</tr>
<tr>
<td>Total</td>
<td>511</td>
<td>100</td>
<td>1602</td>
</tr>
</tbody>
</table>

Gross surface approx. | 20,000 ha | 48,000 ha | 54,200 ha

The data are not entirely comparable one with another since no mention was made of the market gardening and of the fruit growing holdings for the two last mentioned polders. These are generally smaller than 10 ha.

The average size of the holdings in the Wieringermeer, the Northeastern polder and Eastern Flevoland is respectively; 32, 25 and 23 ha (80, 62 and 57 acres).

Furthermore financial, political and social considerations lead to a determination of the average size of the holdings and to the number of holdings in the different classes. The most important considerations are the following:

In order to improve the social well-being of the farming population, it is desirable to choose the size of the smallest holdings so that they can provide adequate income for the farming families.

Under the present circumstances this requirement can be amply met if the smallest arable holdings are 12 to 15 ha (30 to 38 acres) provided the soil condition is reasonably good.
Holdings with at least half grassland (code 0, 1, 2 and 3) which are to be established on sandy soil only, must have a size of 20 to 30 ha (50 to 75 acres). Holdings having less than half grassland can be somewhat smaller.

Purely arable holdings may have any current size.

The cost per hectare for the farm buildings increases as the size of the holdings decreases. With a view to the great number of applicants for farms in the new polders, however, it is necessary to choose the average size.

In connection with the wish to attain a harmonious structure of the agrarian population, it is desirable to choose different sizes of holdings. Besides, having such holdings guarantees a place to candidates of varying personal capacities and financial means. The size of the holding is only partly determined by the condition of the soil. The smallest farms (10 to 18 ha or 25 to 45 acres) are not established on soils with codes 8 and 9. These soils require so much tractive power in tilling that it would impose too heavy a burden on the small farms. On the other hand the small farms are not established on sandy soils, (codes 0 to 3) nor on the lightest soils of heavier texture (code 4), since these soils offer too little scope for small holdings. Small farms, therefore, are to be found on good soils that are not difficult to till (codes 5 and 7).

On sandy soils only medium sized farms are established (18 to 30 ha or 45 to 75 acres). The quality of the soil is considered inadequate for small holdings, while large mixed farms are considered less desirable.

**f. Fixing of rent**

The land is not let to those who are prepared to pay the highest rentals. Land hunger in the Netherlands is so great that many would be willing to pay unjustifiably high rentals if that would enable them to become farmers. The object of the land reclamation, viz. that of enriching the Netherlands with prosperous agricultural areas would decidedly not be achieved in this way.

For this reason the rentals are fixed at such a level that they do not preclude a reasonable subsistence for the tenant farmers. It is, for that matter, not only in the young Zuiderzee polders that a policy of controlled rentals is followed; it holds good for the whole of the Netherlands.

The fixing of the rentals constitutes a problem which as yet is very far from being solved, because here not only the returns, but also the expenditures are involved.

The rentals are fixed per individual farm as fairly as possible on the basis of returns and the experience of State operation during the initial years, and with the aid of soil maps of the farms.

Rentals for the poorest and the best soils now stand in a proportion of about 1 to 4. The poorest soils are the coarse sandy soils, whereas the best soils are those with codes 5 or 6 and higher. The absolute level of the farm rents is in agreement with that of comparable soils in the remainder of the Netherlands.

The rentals may be revised at the end of every three years. This makes it possible to take
into account new ideas as to the relationship of values and possible changes in the economic situation.

### g. Farm management: tillage, choice of crops, fertilizer requirements

After the land has been let, the task of the ‘Development Board’ is finished. The farmer now starts work assisted by various branches of the Agricultural Advisory Service. On the basis of a detailed soil map (1:10,000) agricultural experts assist the farmer to prepare a detailed plan of land use and treatment. Here a great many factors have to be taken into account such as soil type, size and type of farm (mixed farm or arable farm), personnel and division of labour, mechanical equipment, knowledge of the farmer, conservation of soil fertility, prevention of diseases and pest control, price rates, distribution of risks, etc.

It is beyond the scope of this paper to comment in detail on all these factors and considerations. Therefore only some effects of the soil conditions with respect to farm management will be indicated here.

The heavier soils (i.e. soils with the codes 5-9) not only require more tractive power than the lighter textured soils, but there is also a difference in time at which certain tillage operations have to be carried out. This applies particularly to the time of ploughing. The soils with codes 5 or 6 to 9 should be ploughed before winter whereas the lighter soils allow the farmer more freedom in this respect.

The difference in properties between light and heavy soils becomes furthermore apparent in the possibilities they offer for mechanical lifting of potatoes and beets. If wet weather conditions prevail, it appears that very soon it becomes impossible to harvest these crops mechanically from heavy soils, whereas with lighter soils there is no difficulty.

With regard to the choice of crops on the arable land, it can be said that all arable crops customary in the Netherlands may be grown on the arable farms proper (codes 5 to 9). However, this does not imply that there should be complete freedom as to the cropping plans. On the contrary, the normal rules applying to a proper cropping sequence have to be adhered to and moreover, the division of labour is of great importance.

Although the soils referred to above allow a great deal of freedom as to the choice of crops, the cropping plans show differences after some time. The greater risks attached to the harvesting of potatoes and beets on the heaviest soils, for instance, lead to a decrease in the percentage of the area devoted to these crops.

On the soils with code 4 (and to some extent on those with code 5) some crops involve slightly bigger risks than they do on the heavier soils. This fact is reflected in the cropping plan. Owing to the susceptibility to surface seal formation, there is a greater risk of autumn-sown crops dying out during the winter, and there is a greater chance of crops which require a fine seed-bed when sown in spring (flax, sugar-beets) coming up irregularly or failing to appear at all.
On the sandy soils it is particularly the susceptibility to wind-erosion which restricts the choice of crops. Crops which require a fine seed-bed when sown and those which do not produce an adequate ground cover until fairly late, involve a serious danger of wind-erosion. The tendency of a soil on which tillage has to be restricted to the bare minimum falling a prey to weeds also has some influence. Flax (fine seed-bed), peas (weediness) and beets (fine seed-bed, late ground cover) are crops which are not to be recommended here.

As regards the fertilizer requirements, initially a close correlation exists between the clay content of a soil on the one hand, and its contents of potash and phosphate on the other. This correlation is such that the content of the nutrients referred to, increase proportionally to the clay content.

This implies that the fertilizer standards elaborated on trial plots of different clay content may be applied to all soils whose fertilizer requirements may be determined in this way. The table below indicates – by way of illustration – the relation between the fertilizer requirements and the texture of the Zuiderzee soils.

### Table 6. Classification of young marine soils according to their requirements of phosphate and potash fertilizers

<table>
<thead>
<tr>
<th>Code</th>
<th>Phosphate fertilizer in kg P₂O₅/ha</th>
<th>Potash fertilizer in kg K₂O/ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>20</td>
<td>-</td>
</tr>
<tr>
<td>8</td>
<td>30</td>
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</tr>
<tr>
<td>7</td>
<td>40</td>
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<tr>
<td>5</td>
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<td>4</td>
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<td>80</td>
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<tr>
<td>2b</td>
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<td>1e, 1f</td>
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<td>180</td>
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<tr>
<td>1b</td>
<td>100</td>
<td>200</td>
</tr>
</tbody>
</table>

Since the tenants have different cropping plans nor do all of them apply the same fertilizers, the correlation between the content of plant nutrients of a soil and its clay content gradually becomes less clear.

It will be clear that after some time, an advice on manuring can no longer be based on the clay content. By then it will become necessary to collect soil samples and to determine their potash and phosphate content.