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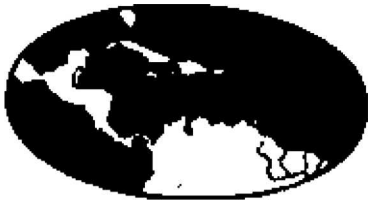

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SOIL SUITABILITY FOR GROUNDNUT CULTURE IN SURINAME

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SUMMARY

Between 1966 and 1977 the local production of groundnuts dropped from 827 tons in 1966 (local area 712 ha) to 338 tons in 1977 (local area 282 ha).

After 1966 the import of groundnuts increased rapidly and at this moment the import of groundnuts (in 1977: 446 tons) is more than the local production (in 1977: 338 tons).

It is of great importance to increase the local production as much as possible and decrease the import.

The required area to substitute the import of groundnuts is about 400 ha. Research was done by the author in order to find out "which type of soil was the most suitable and the total acreage of these soils. The requirements with respect to soil properties for groundnut culture are:

a. texture: loamy sand or sandy loam or sand with some organic matter
b. drainage class: moderately well drained or well drained
c. no impermeable or slowly permeable layer within a depth of 100 cm
d. at least 0,6 meq Ca/100 gram of soil

More than 80% of the local area lies on soils suitable for groundnut culture. In the young coastal plain the suitable soils occur on the shell – and sand ridges of the Comowine – and Molesonphase and on sand ridges of the Wanicaphase.

In the old coastal plain the suitable soils occur on sand ridges of the Lelydorp landscape. In the Zandery belt and the terraces the suitable soils occur mostly on plateaus and sometimes on slopes.

The most important possibilities for enlargement of groundnut culture are on the Zandery belt and the young coastal plain. On the Zandery belt fertilization with Ca is necessary.

The total area of the suitable soils is several times more than the required area to substitute the import.

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General information

Table 1. Local production and import of groundnuts in Suriname

Year	Local production (in tons)	Local area (in hectares)	Import (in tons)	Required area to substitute the import (in hectares)
1965	628	648	no figures	no figures
1966	827	712	"	"
1967	640	601	"	"
1968	492	429	"	"
1969	247	240	"	"
1970	281	284	"	"
1971	215	220	"	"
1972	183	212	"	"
1973	344	287	203	169
1974	382	318	487	406
1975	391	326	331	276
1976	290	242	427	356
1977	338	282	446	372

Source Mahabir 1978

Conclusions:

- After 1966 the local production and the local area decreased
- In 1977 the total required area for the whole production was smaller than the local area in 1966. In other words the import of groundnuts would not have been necessary if the local area in 1977 had been as large as that of 1966.

Information about the present groundnut areas

Suriname can be divided from North to South in:

- Coastal plain, subdivided in the young and old coastal plain.
  The coastal plain is about 40 km wide in the East and about 120 km in the West. It is almost flat and consists mainly of marine sediments with heavily textured clay soils, locally with swamps and sand – and shell ridges. Its elevation varies from about 0 (in the North) to about 10 m (in the South).

- The Zandery belt

  The Zandery belt forms a zone which is widest in the western part and narrowest in the eastern part.
  It consists of flat to undulating forest land and savannes, bordered in the North by the coastal plain and in the South by the interior uplands.
  Most of the cover landscape consists of well drained to excessively drained soils, with swamps bordering creeks and rivers. Its elevation varies from about 10 m (in the North) to

about 50 m (in the South).

The interior Uplands

They occupy more than 80% of the total area of Suriname, varying from undulating to steep and rugged land with an elevation of 50 to about 1280 m and underlain by the Precambrian Crystalline Basement rocks, belonging to the Guiana Shield.

The parent material mainly consists of deeply weathered gneiss, schist, granite, diorite and dolerite.

The present groundnut areas lie mostly on ridge soils of the young and old coastal plain, especially on ridges with shells or fine sand. These ridges are mostly well-drained at the top and moderately well drained or imperfectly drained on the slopes.

Since 1972 different research workers have made different experiments with groundnuts on the Cover landscape.

Still the area planted with groundnuts in this landscape is small. On terraces a small area is planted with groundnuts.

South of the Cover landscape, on the interior Uplands the groundnut areas are negligible. In most cases groundnuts are planted by small holders on small areas from about 0.25 ha to about 5 ha. Soil preparation, weeding and earthing up are often mechanized.

Soil suitability for groundnut culture

Suitability of soil for groundnut culture depends on its suitability for:

a. the growth and development of the groundnuts
b. workability of the land
c. the ease of harvesting without loss of pods

Growth and development and ultimately the production, of groundnuts depends on:

a. moisture availability
b. nutrient availability
c. oxygen availability in the root zone
d. rate of soil toxicity
e. the rooting possibility

From experiments made on soil suitability we may draw the following conclusions:

Texture

Groundnuts grow better on light (textured) soil. The reasons are:

a. In most cases rooting of groundnut is much better on light (textured) soils than on heavy (textured) soils (Go Ban Hong and Van Schuylenborgh, 1953). Good rooting on heavy (textured) soils only takes place on soils with a crumbly structure.
b. The gynophore penetrates much easier into the ground on light (textured) soils.

c. During the growth of the pods they increase in volume. The pods cannot easily increase in volume and cannot penetrate further into the soil if the soil is too heavy. In light soil, which is sand or a mixture of sand and clay, the pods grow easily.
d. During the ripening of the pods different processes occur which need oxygen and produce carbon dioxide.
   This breathing of the pods only takes place if the soil is well areated. Normally light soils are well aerated if the groundwater table is not to high. Heavy soils mostly have a bad aeration because of a slow permeability.
e. Lifting of the groundnut to plant and pods at harvesting will be much easier on light soils than on heavy ones; very few pods will be left in the ground if the soil is light (Van Slobbe, 1973). In Suriname the most suitable soils for groundnut culture are the loamy sands and sandy loam (Ter Horst, 1969; Hoving, 1973), and sandy soils with some calcium.
   Sandy soils, low in organic matter have the following disadvantages:
   1) a very low soil fertility
   2) a very low cation exchange capacity
   3) a low moisture availability

   Hoving (1973) found on Coebiti that on sandy soils the yield to the hectare was lower than on loamy sands (because of reasons mentioned above).

The occurrence of sufficient calcium in the soil

In groundnuts calcium plays a very important role in determining the yield and the quality of the groundnut.
Ca is important for the nitrogen fixation, the fruit setting and the development of the pods. Gynophores and pods pick up the calcium from the soil.
Reasearch in- and outside Suriname shows that for a good yield and a good quality of the pods the soil must contain at least 0,6 meq calcium / 100 gram of soil. (Van Muylwijk, 1974).

Drainage class

During different stages in the development of the groundnut the moisture availability determines he resulting yield and quality of the groundnut. At periods of germination, strong vegetative growth and flower formation the plant needs sufficient water for the different physiological processes. During the growth and development and harvest of the pods there must not be much water in the soil. This for the following reasons:

a) if there is too much water in the soil the pods may rot.
b) for breathing of the pods during the ripening the soil must be well aerated. If there is too much water aeration can hardly take place.
c) if the soil is too moist the seeds may germinate.
d) harvesting in a dry soil is much better because when the soil is too moist different pods may stick on the clods (Wienk, 1972).

The yield of the groundnuts was high on the top of ridge soils of the young coastal plain

with a groundwater table at a depth of 40 cm during the rainy season and a depth of 120 cm during the dry season, (Ter Horst, 1961). On the lower laying side of the ridges the yield was much lower.
soil, suitable for groundnut culture, needs one of the following drainage classes:
well drained or moderately well drained.

The occurrence of impermeable or slowly permeable layers within the profile

An impermeable or a slowly permeable layer is important for the groundnut culture when it influences the rooting and the moisture content in the rooting zone.
Such a layer is very often unfavourable during the rainy season and sometimes favourable during the dry season. Furthermore root growth is stunted.
Combining all these conclusions we see that suitable soils for groundnut culture have the following special features:

a. texture: loamy sand or sandy loam (or loam) or sand with some organic matter
b. Ca: at least 0.6 meq Ca/100 gram soil
c. drainage class: well drained or moderately well drained
d. impermeable or slowly permeable layer: not within a depth of 100 cm.

When we examine the local area on the features, mentioned before, than it appears that more than 80% of the local area lie on soils suitable for groundnut culture.

The occurrence of suitable soils in Suriname

Research was done on:

a. the Young coastal plain
b. the Old coastal plain
c. the Zandery belt
d. the Terraces

The reasons for doing this only on these landscapes are:

- the present groundnut area lies mostly in the young and old coastal plain;
- most of the soil research work done in Suriname, was made on these landscapes.

By selecting the suitable soils on the different soil maps (scale 1:100.000) we will find the following possibilities:

1. Young coastal plain
1.1. Ridge soils of the Comowine- and Molesonphase
1.1.1. Well (to poorly) drained shells, shell grit, shellsand, medium and fine sand
Total area ± 3200 ha
Present usage a) horticultural (and agricultural) purposes (vegetables)
b) dwelling
c) material for road construction etc.

Part of these soils is inaccessible at this moment because of the surrounding swamps. From these soils the most suitable sites must be selected; sites with shell-grit, shellsand and some organic matter and as drainage class well drained or moderately well drained.

1.1.2 Well drained medium and fine sand to sandy loam

Total area ± 4600 ha
Present usage
a) horticultural purposes (vegetables)
b) dwelling
c) material for heightening farmyards etc.

A reasonable part of these soils is till now inaccesable because of the surrounding swamps. The most suitable sites are the heavier ones (loamy sand or sandy loam) or sand with some organic matter.

1.2. Ridge soils of the Wanica phase

1.2.1. (Moderately) well drained medium and fine sand
Total area ± 52000 ha
Present usage:
a) horticultural purposes (vegetables)
b) agricultural purposes (plantations)
c) dwelling

Part of these soils is not exploited. Some of them occur within the old plantations. The most suitable sites are the fine sand ones with some organic matter.

2. Old coastal plain
2.1. Ridge soils of the Lelydorp landscape
2.1.1. Well drained, locally bleached, fine and very fine sand

Total area 13.300 ha
Present usage:
a) horticultural purposes
b) agricultural purposes
c) dwelling (in the neighbourhood of Pad van Wanica)

The most suitable sites are the non-bleached ones with some organic matter.
2.1.2. Moderately well drained weakly to moderately bleached fine and very fine sand over loam

Total area 9.600 ha
Present usage:
a) pastures
b) horticultural purposes
c) dwelling

The most suitable sites are the weakly bleached ones with some organic matter. The depth at which the loam occurs is also important.

3. Zandery belt
3.1. Plateau Soils
3.1.1. Well drained medium and coarse sand to sandy clay loam

Total area 55.000 ha

Present usage: forestry (extraction forestry and artificial forestry)

The most suitable sites are soils with loamy sand and sandy loam (or sand with some organic matter). Fertilizing with Ca is necessary because of a deficiency of Ca in these soils.

3.2. Slope and Plateau Soils
3.2.1. Moderately well and imperfectly drained sandy loam (to sandy clay loam)

Total area 8.400 ha

Present usage: forestry (extraction forestry)

The most suitable sites are the sandy loam ones, that are moderately well drained. Fertilizing with Ca is necessary because of a deficiency of Ca in these soils.

4. Terraces
4.1. Plateau and Slope Soils
4.1.1. Well drained and moderately well drained medium and coarse sand and (sandy) loam to sandy clay loam and (sandy) clay

Present usage:
a) pastures
b) agricultural purposes (oranges, oilpalm)

The most suitable sites are the medium coarse sand (with some organic matter), the sandy loam and the loam soils. Of the suitable soils, mentioned before, the most important possibilities for enlargement of the groundnut culture are on the Zandery belt and the Young coastal plain (especially the shell ridges).

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