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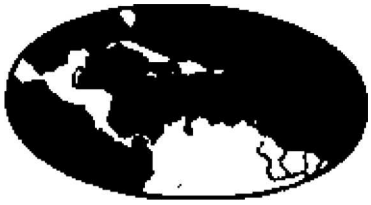

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PEANUT CULTIVATION IN SURINAME

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SUMMARY

In spite of the fact that research on peanut began 75 years ago and positive results were obtained, peanut cultivation in Suriname is still in its primitive form, which essentially means that a wide gulf exists between scientists/administrators and farmers. This gap needs be bridged by reorienting strategies and their effective implementation to equip the farmers with latest technology and resources in order to generate farmers interest in peanut cultivation.

INTRODUCTION

The peanut is recognized as one of the most important crop plants of the tropical and subtropical world. Suriname being in the equatorial zone has the climate most preferred by this crop plant. Now with it known that peanuts originated in tropical and subtropical South America, especially countries falling along the Amazon river to about 35^{o}S, it could be possible that peanuts grew in Suriname as well since centuries. However if peanuts were grown within the present limits of Suriname by its original inhabitants, the Amer-Indians, in pre-colonial times is not known, but we do have authentic reports of peanut cultivation during colonial period.

Prior to 1900, peanuts were grown in the country but on a small scale only as the inland peanut varieties were of long duration and low yielding.

Peanut in Suriname has been a crop of small land holders (± 2 - 4ha) especially javanese, whose families provide the needed labour. The bulk of the peanut farming is traditional and of a subsistence nature as the farmers, largely, follow the centuries old systems and practices as were inherited from their ancestors. The best examples are their land tilling tools which, barring few, are primitive. The area planted under peanut by these farmers is seldom more than one hectare. Up till now peanut is mainly used for butter and salted nuts.

GENERAL

Climate

Suriname owing to its situation ($2^{o} - 6^{o}$ N latitude and $54^{o} - 58^{o}$ W longtitude) has a humid tropical climate. The average annual rainfall ranges between 2,000 – 2,500 mm spread over two seasons – one long season covering May to mid August (± 1,200 mm and a short season from mid November to mid February (± 900 mm). The main season never goes dry but varies in duration and intensity, however, the minor rainy season is comparatively less reliable (Ostendorf, 1957). The maximum temperature varies between $28^{o} - 33^{o}$ C average being 30.9^{o}C where as the average minimum temperature centers around 23^{o}C. The relative humidity all through the year remains very high (70 - 90%) except on a few days when it drops down to around 50%. during 10.30 A.M. – 4.10 P.M. Besides, the climate is strongly influenced by North-East trade winds (Voets, 1959 a, 1959 b. 1960).

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Peanuts are mainly grown just after the long rainy season but a considerable area is also planted in the short season.

Soils

Peanut is mainly planted on long ridges of medium drained light textured soils ranging from sand, very fine to sandy loams of the Young coastal plain. These soils are acidic in reaction (pH (H_2O) ranging from 5,3 – 6,2), and of low natural fertility (Van Amson, 1958 – 1963).

The soil structure is very poor due to a low organic matter content (1,8%) and low clay content. As a result the soil becomes very hard after one or two rains.

Depending on the drainage conditions of the field, peanuts are planted on beds or on flat land without beds.

Area and Production trends

The figures on area and production (table 1) indicate a downward trend after 1966 the year of maximum production (827 t), although yield per hectare remaining the same (900 – 1,000 kg). The districts of Saramacca and Commewijne were the main peanut producers. The decline has been more sharp in the Saramacca district – from 485 ha in 1965 to 80 ha in 1972, followed by Suriname district – from 46 ha in 1965 to 14 ha in 1972.

It is dishearting to note that from the position of surplus production in the late fiftees and early sixtees, which earned Sf. 79,000 through export, we slumped in production so much so that at this moment an amount of Approx -- Sf. 1,000,000 is annually incurred on import of different peanut products to meet the home needs.

Table 1. Area and Production of Peanut

Year	Area (ha)	Production (ton)	Average (kg/ha)
1945	360	412	1144
1946	452	350	774
1947	657	480	734
1948	360	277	769
1949	391	322	824
1950	480	284	592
1951	661	463	700
1952	459	377	821
1953	338	272	805
1954	423	476	1125
1955	315	419	1330
1956	466	553	1187
1957	434	337	776
1958	598	625	1045
1959	328	325	991
1960	461	422	915
1961	449	443	986
1962	513	551	1074
1963	627	669	1067
1964	606	605	998
1965	648	628	969
1966	712	827	1160
1967	601	640	1065
1968	429	492	1147
1969	240	247	1029
1970	284	281	989
1971	220	215	977
1972	203	183	901

EXISTING MANAGEMENT PRACTICES

Peanut production level is below the economic level being 1000 kg/ha only, which is attributable to farmers attitude towards the crop and nature of farming being subsistence.

Crop rotation

The practice in vogue is monoculture cropping, however occasionally, it is rotated with vegetable.

Land Preparation

Peanut is traditionally planted on permanently laid raised beds. The land is tilled with a hoe or a digging fork, however, gradually farmers are switching over from subsistence tradional farming to mechanized farming by introducing 2 wheel tractors. The tilling is continued till the required tilth is obtained followed by little bit levelling.

Planting

The crop is planted in rows at a distance of 30 x 15 cm and depth of 3 – 4 cm with a drill stick.

Occasionally, pre-germinated seeds are sown in order to ensure good stand. Seeds used for planting is stored by farmers in the forms of pods, which are shelled just before planting and good kernels are selected.

The variety used is mostly Broll; although Matjan is also now planted by a few farmers.

Weed control

The practice consists of hand-weeding during the first month followed by hilling at 4 weeks stage.

Fertillization

The crop is generally grown without liming and fertilizer application. A few farmers have adopted fertilization, but they too apply a very low amount – mainly NPK mixture at hilling time.

Diseases and Pests

The peanut during growth is attacked by several pests, mainly caterpillars *(Spodoptora frugiperda* and *Stegasta basquella),* and diseases, *Cercospora* and rust being most common and deadly. However, no control measures, not even pre-cautionary measures like seed treatment and crop rotation are taken by the farmers.

Harvesting and stripping

Harvesting consists of pulling plants by hand and investing them to facilitate drying followed by hand-picking.

CONTRAINTS IN PRODUCTION

Soils

Low pH and depleted fertility limit the plant to exhibit its production potential (Van Amson, in Jaarverslagen Dept. Landb. Proefstation, Suriname, 1955 – 1957). Poor water management practices too reduce yield.

Cultural practices

Peanut after peanut (low yielding varieties) in absence of fertilizer use and disease control remarkably reduces the average yield.

Farm Size

The average farm size is 2 – 4 hectares. Recent experiments on mechanization did not make any impact owing to small farm size. Because of the soil pattern, the shape of the farm land and the limited man-power the area with peanuts on one farm generally covers less than 1 ha.

Economy

Peanuts are sold in bags to middle-men. The import of peanut is free. Consequently prices on the local market fluctuate strongly. Marketing co-operations are absent.

Social

A marked reduction in the agricultural labour and a migration of the majority of younger people to cities for better jobs compelled the farmers to cut down area under peanuts (Van Amson, 1975).

REVIEW OF RESEARCH

Plant improvement

Improvement of peanuts received considerably more attention than other legumes or oil crops in the country by virtue of its higher oil content and industrial potential.

The work on plant improvement begins with introduction of plant material from other countries. The first such introductions were Rufisque, Barbados and Mauritions made as early as in 1904. The yield trials in 1905 and 1906 revealed Rufisque better over others including the

indegenous in respect of yield (Jaarversl. Inspectie Landb. W. Indie, 1904 – 1907).

A few years later (1911, 12 and 13) curacaosche peanut was also put in trials but fared badly. However, there is no mention in the annual reports of the corresponding periods that any variety was released for cultivation. A mention was made that all the above peanuts were creeping types with long growing periods (4½ – 5 months) (Jaarversl. Dept. Landb., Suriname, 1911 – 1913).

It was late as in 1928 that an introduction from Indonesia known as Katjang Brol – a spanish, bunch type with sort growing season (95 - 100 days) proved markedly superior than the existing strains. It rapidly replaced the indegenous peanuts. Later in 1940 – 41, Valencia was tested against Brol but had to be rejected owing to its susceptibility to *Cercospora* and not an irregular marurity (Jaarversl. Dept. Landb. Econ. Zaken, 1940 – 1941).

In and about 1950, it came to be known that the peanuts grown as "Brol" were a mixture of various types. Schwarz and Hartley (1950) from Indonesia categorized the Surinam "Brol" into 3 seeded peanut and Bush Negro peanut and also reported mixture of Valencia type peanut. Later on Sauer and Widjanarko (Jaarversl. Dept. Landb., Veeteelt en Visserij, Suriname, 1949 – 1954), also from Indonesia confirmed the above findings and reported that Suriname Brol was not the same as Indonesian Brol variety. With these revealitions, the efforts to evolve a variety, which could replace Brol, intensified the first step being the farming of objectives of plant improvement program (1950). The principal objectives were:

1. yielding potential and stability of productivity over a reasonably broad range of ecological conditions;
2. uniform branching-preferably spanish type;
3. earliness (95 – 100 days);
4. large seed;
5. pink seed coat;
6. pods with slight constriction;
7. presence of distinct but short dormant period – not longer than 30 days;
8. disease resistence – mainly against *Cercospora, Sclerotium* rot, *Pseudomonas solanacearum* and rosette virus.

To achieve these objectives, large scale introductions were made from different countries. The most important varieties/strains were:
Schwarz – 21, Gadjah and Matjan from Indonesia (1948); Braz – 53; Roxo 54, Marokko and Indonesia from the Netherlands (1952); Samaru – 38, Kano 38, Kano 50 and Mj-374 from Nigeria (1952); Castle Cary from Ceylon (1952); B33, C12, C73 and NC4 from USA (1952); and CM2, C12 and C27 from R.F. Mexico (1957).

The breeding methods adopted were mainly Pure line selection using individual hill as starting point and partially mutation. Pure lines were developed out of the indegenous and introduced varieties/strains beginning with Schwarz-21 and Gadjah varieties in 1949, subsequently Matjan was also included (Mastenbroek), in Jaarversl. Dept. van L.V.V., 1949 – 1953). The first yield trial was conducted in 1952 to compare 6 lines raised from Schwarz 21 with original Schwarz 21, in which line 21/504 and 21/5012 yielded significantly more than Schwarz 21 (Jaarversl. Dept. van L.V.V., 1949 – 1953). In another trial (1952-2), Matjan was compared with Schwarz-21, Gadjah and Brol, and Matjan yielded significantly higher. Schwarz 21 yielded better than Brol and Gadjah but the differences were non-significant. Brol and Gadjah were at

par (Jaarversl. Dept. van L.V.V., 1949 – 1953). Based on these results, a trial was planted at Mijnzorg and Ma Retraite locations in December 1952 to compare Schwarz 21/504, Schwarz 21/5012, original Schwarz 21, Matjan and Brol but the crops suffered from water logging and hence no conclusions were drawn. The above trial was, therefore, repeated in 1953 at Ma Retraite excluding Schwarz 21 and including Gadjah. In general the yields were low, however, Schwarz 21/5012, Gadjah, Matjan and Brol were at par and significantly better than 21/504 (Jaarversl. Dept. van Landb. Veeteelt en Vissery, 1949 – 1953). In another trial in the same year (1953-6-1) with Schwarz 21/5012), Matjan, Brol, C12/2, Spantex, G.F.A., Spanish 18-38 and Roxo 54 at Cultuurtuin, analysis of variance showed significant differences (P=1%) among enteries. Matjan with 24.29 kg/are yielded 4.81 kg more than the second best variety-G.F.A. The respective yields for Schwarz 21 and Brol were 17.84 and 18.85 kg/are.

In a similar trial but with other enteries (1953-6-2), improved Spanish with 18.47 kg/are yielded significantly better than Spanish 205 and Braz 53. Trial no. 1953-6-3 showed Schwarz 21/504 with 26-32 kg/are and Gadjah with 25.05 kg/are also having almost same yielding potential. Similar trials were conducted in 1954 with 10 enteries and in 1956 with 4 enteries but no statistical conclusions were drawn (Jaarversl. Dept. van Land. Veeteelt en Visserij, 1955 – 1957).

In a trial conducted at farmers field in 1951, Matjan yielded on an average, 3 kg/are more than Brol (Ter Horst and Mastenbroek, 1960). The line testing continued intensively till 1959 but none was found better than Matjan. Therefore, Matjan seed was multiplied and distributed among the farmers. Ter Horst and Mastenbroek (1960) while summarizing the results of the trials conducted till 1957 concluded that Matjan, Schwarz 21/504, Schwarz 21/LP5012 and Gadjah yielded constantly more than other enteries; but out of these four, Matjan met most of the requirements except: (a) jumbo sized seed, (b) presence of a dormant period and (c) resistance to *Cercospora,* although it was fairly resistant, and hence Matjan was released.

Bekendam of Wosuna (Jaarversl. Dept. van Landb. Proefstation 1958 – 1963) irradiated seeds of Matjan with or (control), 100, 2500 and 5000 of gamma rays to broaden the genetic variability. Most mutants showed variations in pod size, seed size, pod numbers, plant type and yielding potential. By the end of 1961 i.e. in 8 generations 16 best lines only were retained. In a yield trial with these lines and original Matjan, it was observed that mutants derived from seed treated with 1000 yielded up to 32000 kg/ha i.e. 30 – 40% more than Matjan (Huiswoud, (Jaarversl. Dept. van Landb. proefstation 1958 – 1963). A varietal yield trial conducted for three seasons (1962 – 63) with 3 introdctions from Africa viz. A124b, H3, 271A and Matjan mutant, Matjan and Engour Zang 270A; Matjan with 26.11kg/are stood first followed by A124b in the short rainy season; and 271A with 14.34 kg/are was first followed by 124b in the long rainy season. Two F.A.O. varieties named as Sape Roxo and FAO 11899 beat Matjan by a fair margin in a yield conducted in 1964 (Jaarversl. Dept. Landb. proefstation 1964-1966).
Likewise some more introductions were made and compared with Matjan for yield at CELOS during 1971-72. In both trials, Matjan clearly outyielded other varieties (Annual Rep. Celos, 1971 and 1972).

Mineral Nutrition

Peanut are generally planted on the very fine sandy ridge soils of the Young coastal plains. The maximum yields have been reported on the highest past of these ridges. (Ter Horst, 1961b). Recent experiments on sandy loam soils of Coebiti have given very good results (Wienk, in Annual rep. Celos, 1973). These soils are very acid, pH (H_2O) ranging from 5.3 – 6.2, highly leached, excessively permeable and of low natural fertility (Van Amson, in Jaarversl. Dept. van Landb. Proefstation, 1958 – 1963).

The first fertilizer experiments dates back to 1913 (Drent, 1913) in which patenkali, bone meal and lime were compared but the experiment was spoiled due to bad weather. the systemic research work on mineral nutrition began in 1951 with an orientation experiment at Peperhol (Ostendorf, in Jaarversl. Dept. van L.V.V., 1949 – 1953). The treatment consisting of 333 kg double super phosphate, 267 kg potassium sulphate, 13.3 kg/ha each of $CuSO_4$, Mn SO_4 and Zn SO_4 gave highest yield (12.4 kg/are) followed by 133 kg/ha potassium sulphate treatment with 10.1 kg/are. It was, therefore, informed that crop responded positively to the application of fertilizers mainly P and K and pastially to trace elements. Ostendorf (in Jaarversl. Dept. van L.V.V., 1949 – 1953) confirmed his earlier findings and reported that artificial inoculation had no influene either on the yield or quality. Verhoog (Jaarversl. Dept. van L.V.V., 1955-1957), in a permanent fertilizer cum rotation experiment conducted from 1952 to 1956 obtained significantly higher yields with 20,000 kg/ha FYM. Among the remaining treatments fertilizers combination in 5:10:10 yielded more but the differences were non significant. Smit and Mc.Gillavry (Jaarversl. Dept. van L.V.V., 1955 – 1957), reported K's effect more pronounced than P and N.

Ter Horst (1961b) from a Variety x Fertilizer experiment conducted at Tambaredjo (Saramacca) reported 44.5% increase in yield with 200kg of 5:10:10 fertilizer plus 50kg/ha kieseriet. He obtained similar results at Lelydorpplan (Ter Horst, 1961b) and Catharina Sophia (1958-60) but the increase was 17% only. Addition of lime @ 500 kg and 1000 kg/ha along with 200 kg of 5·10:10 fertilizer plus 50 kg Kieseriet increased yields by 34 and 47% respectively. Further experiments at Dirkshoop (Van Amson and Ter Horst, in Jaarversl. Dept. van Landb. Proefstation, 1958 – 1963). Dam Malang, Peperhol and Tijgerkreek (Ter Horst, in Jaarversl. Dept. van Land. Proefstation, 1958 – 1963) exhibited response up to 2000 kg/ha lime but maximum increase in yield was from first 500 kg.

In a demonstration trial at Saramacca-0 with zero, 200 kg of 5:10:10 fertilizer + 50 kg Kieseriet, and 1000 kg/ha lime, the yields were 8.9, 17.8 and 18.5 kg/ha respectively (Ter Horst, 1961b). These studies indicated a relationship between soil fertillity and soil pH.

Van Amson en Ter Horst (Jaarversl. Dept. van Land. Proefstation 1958 – 1963), measured pH of some selected peanut fields and found that lowest yields corresponded the lowest pH and vice versa. The main reason ascribed was low fertility status of low pH soils. On the basis of pH values, young coastal plains were divided in two fertility classes by an imaginary line running across in east-west direction, north of which soil pH (H_2O) ranged between 5.8 – 6.00 and in south from 5.2 to 5.4. It was, therefore, recommended that north of this line 500 kg and in south 1000 kg/ha ground calcic lime stone or shells be added with 200 kg of 5:10:10 fertillizer plus 50 kg of magnesium sulphate plus micronutrients mixture containing Zn and Mo. (Ter Horst, 1961).

As yet the research was concentrated on the traditional peanut growing areas. Results of liming experiments conducted in the interior also indicated response to liming.

Studies on time of application of phosphatic and potassium fertilizers (Wienk, 1974) indicated basal application better over splitting.

Management

Plant population

An optimum plant density and uniform stands are important yield contributing factors. In a experiment at Mijnzorg during 1948-49 on plant density, best results were obtained with 1111 plants/are (Jaarversl. Dept. van Landb. Econ. Zaken, 1940 — 1941), Mastenbroek and Smit (Jaarversl. Dept. van Landb. Veeteelt en Visserij 1949 — 1954) reported significantly higher yields in closer spacings (20 x 20 and 20 x 30 cm) over the wider spacing of 20 x 40 cm. Smit (Jaarversl. Dept. van Landb. Veeteelt en Visserij 1949 — 1954), obtained similar results at Sidoredjo (Saramacca). The spacing of 20 x 20 cm (2500 plants/are) yielded significantly more than 30 x 20 (1667), 40 x 20 (1250) and 60 x 12 (1389) spacings. Ter Horst (1959) reported that the population of 1009/are and above gave significantly higher yields than lower densities. The differences among 1009, 1667, 221 and 3330 plants/are were non-significant. The shelling percentage and 1000 kernel weight were comparatively higher in closer spacings.

In an experiment conducted at CELOS (Annual Rep. Celos, 1969), maximum LAI values recorded 79 days after sowing were 2.26, 3.07 and 4.22 ± 0.082 for 20 x 30 x 30 and 40 x 40 cm spacings respectively. The corresponding ripe pod yields were 3.99, 3.21 and 3.09 ± 0.311 t/ha. The net assimilation rate was comparatively higher in wide spacing.

Tillage

An experiment was conducted to compare rotorating, ploughing and minimum tillage (Van der Sar, in Annual Rep. Celos, 1974 in whiph ploughing gave the best yields followed very closely by rotorator. The yield in minimum tillage treatment was very low.

Weed Control

For results of weed control experiments, see Dumas and Ausan (1978).

Harvesting and Stripping

Most of the peanut crop is harvested by hand. This consists of pulling and inverting the plants to facilitate drying of pods (Ter Horst, 1961a). The real problem with the small farmers is that they cannot afford big tractors. A project on designing and testing of peanut diggers is already in progress.

Stripping operation is also labour intensive but two peanut strippers heavy and low duty designed and developed at CELOS (Van der Sar, (in Annual Rep. Celos, 1974)

Diseases

All the five major diseases common in tropical regions have been observed in Suriname as well in varying intensities but *Cercospora, Puccinia arachidis, Sclerotium rolfsii* and rosette virus

are more serious.

Cercospora

The causal organisms are *C. arachidis* – *Cola Hosi* and *C. personata* Ellis and Everh. These organisms are dark brown to black spots surrounded by a yellowish ring and are found on both sides of the leaves. It appears through-out the year but is more severe in the short rainy season especially and of November to half December.

Control:

Control through host plant resistance was considered to be most practical method and hence was laid as a criteria for selection of a variety. Matjan was reported to be fairly resistance against *Cercospora* compared to other varieties (Mastenbroek, Jaarversl. Dept. van Landb. Veeteelt en Visserij, 1949 – 1954). The trials conducted in 1957 on screening of material with respect to their resistance to *Cercospora* revealed C-12, C37 and CM12 recieved from R.F.Mexico comparatively more resistant than Matjan. (Jaarversl. Dept. van Landb., Veeteelt en Visserij, 1955-1957).

The work on chemical control begin with Perenoxe (1%) @ 600 l/ha, which showed some preventive effect (Jaarversl. Dept. van Landb. Veeteelt en Visserij, 1949 – 1954). In 1953, two experiments – one with seven fungicides and another with Perenoxe (1%) were conducted but failed due to bad weather. Suchtelen and Del Prado conducted several experiments till 1957 with copper and sulphur fungicides and oils but the results were disappointing and erratic. In 1959, organic fungicides riz. Brestan (Triphenyltin acetate) gave the best results (Ter Horst, 1961a). In Subsequent experiments (CT 60-67, VP 238, VP 239 and VP 240) its dose and spraying shedules were worked out. The results indicated 1.5 – 2 gms Brestan per litre of water every 10 day beginning from 8th week gave good control.

Puccinia arachidis

This pathogen was reported in this area as early as 1911. The organism is found mainly on the lower surface of leaves, where it seems just, as necrotic flecks and later as yellowish spots on the upper surface. While these necrotic spots do not enlarge much, the infected leaves soon show burning and finally result in defoliation.

Control: Brestan 1.8.2.10 gms/litre gives good control. The number of sprayings depends upon the intensity of disease but 2-3 sprays are generally recommended (Ter Horst, 1961a).

Sclerotium rolfsii

The leaves of the affected plants first wilt and then turn brown, finally the plant dies.

Variety Matjan is resistent to this disease and hence negligible percentage of plants are found affected (Ter Horst & Mastenbroek, 1960).

Rosette Virus

It is characterized by a condensation of the whole plants. Petioles and internodes are shortened, giving the plant a typical rosette appearance.

Variety Matjan is resistant to rosette virus as well (Ter Horst & Mastenbroek, 1960)

Aflatoxin

A study was carried out to study the damage done by *Aspergillus flavus*. Poor treatment of the crop after harvest is of fundamental importance. Based upon the results of this study the farmers could be advised. Stripping and a dry treatment of the nuts are essential (Veltkamp and Samlal, 1976).

Insect pest

The peanut is attacked by several pests but most common are *Spodoptora frugiperda* and Caterpillar *Stegesta Basquella*. Effective control has been obtained with Dieldrin @ 3 litres/ha or Ditherane @ 3 gms/litre of water.

In the interiors ants also damage peanuts seriously. Aldrin 2% dust @ 1 kg per 100 Sq.m. of surface area of nest (Van Dinther, 1958) or mirex (Van Brussel and Van Vreden (in Jaarversl. Dept. van Landb. Proefstation, 1964 – 1966), give excellent control.

REFERENCES

Annual Report 1969, CELOS Bull. No. 9

Annual Report 1971. CELOS Bull. No. 16

Annual Report 1972. CELOS Bull. No. 18

Annual Report 1973. CELOS Bull. No. 28

Annual Report 1974. CELOS Bull. No. 31

Dumas R.E. and Ausan S. 1978. Research results and practical experiences regarding weed control in peanuts in Suriname-Proc. CFCS Vol. XV : 272 – 287.

Jaarverslagen 1904-7. Inspectie van de Landbouw in West Indie.

Jaarverslagen 1911-13. Dept. van Landbouw in Suriname.

Jaarverslagen 1928-30. Dept. van Landbouw Proefstation, Suriname

Jaarverslagen 1931-32. Dept. van Landbouw Proefstation, Suriname.

Jaarverslagen 1949-54. Dept. van Landbouw, Veeteelt en Visserij, Suriname

Jaarverslagen 1955-57. Dept. van Landbouw, Veeteelt en Visserij, Suriname.

Jaarverslagen 1958-63. Dept. van Landbouw Proefstation, Suriname.

Jaarverslagen 1964-66. Dept. van Landbouw Proefstation, Suriname.

Jaarverslagen 1967-69. Dept. van Landbouw Proefstation, Suriname.

Jaarverslagen 1974. Dept. van Landbouw Proefstation, Suriname.

Jaarverslagen 1975. Dept. van Landbouw Proefstation, Suriname.

Ostendorf, F.W. 1957. Our climate 8. Wet and dry periods. De Surinaamse Landbouw 5: 168-78

Sauer, G. and S. Widjanarko 1953. Historische Ontwikkeling van de *Arachis* Cultuur Landbouw 25:255-64

Schwarz, M.B. and C. Hartley, 1950. De selectie van Schwarz 21, een tegen slijmziekte resistente lijn van *Arachis hypogaea.* Landbouw 22: 223-44.

South, F.W. 1911. Fungus disease of groundnut in the West Indies. West Indian Bull. No. 11: pl. 153-60

Ter Horst, K. 1958. Weed Control in Leguminous crops. De Surinaamse Landbouw 6:65-71.

Ter Horst, K. 1959a. Oil is of no use against the *Cercospora* leaf spot disease of peanut. De Surinaamse Landbouw 7: 115-17.

Ter Horst, K. 1959b. The optimal spacing for spanish type peanut. De Surinaamse Landbouw 7:121-28.

Ter Horst, K. 1961a. Some experiments on the control of *Cercospora* leaf spot disease of ground nut. De Surinaamse Landbouw 9: 103-11.

Ter Horst, K. 1961b. Onderzoek naar de Bemesting van pinda in Suriname. Landbouwproefst. Meded. No. 27.

Ter Horst, and J.J. Mastenbroek, 1960 . Selection of pulses in Suriname. II *Arachis hypogaea.* Ground-nut. De Surinaamse Landbouw 8: 134-50.

Van Amson, F.W., 1961. Soil profiles of a hydromorphic sequence in a typical ridge sand. Agric. Expt. Station Bull. No. 78.

Van Amson, F.W., 1975. Agricultural potentials in relation to changing social patterns. De Surinaamse Landbouw 23:44-50.

Van Amson, F.W.; A.M. Sang A Jang; W.L. Asin; K.J. Lenselink, 1974. Bodemkundig en Agro-hydrologisch onderzoek. Gegevens het betreffende de kartering van de proeftuin, Coebiti. Landbouwproefstation Intern Rapport No. 234.

Van de Voorde, P.K.J., 1957. Soil conditions of the ridge land scape and the old coastal planes in Suriname. Landouwproefstation Bull. No. 74.

Van Dinther, J.B.M., 1958. Leaf cutting ants in Suriname and their control. De Surin. Landb. 6:18-27

Van Drent, E., 1913. Bijlage behorende bij het verslag van de Landbouwleraar: verslag over het jaar 1913. Reptr. van den Landbouw in Suriname 48 en D.

Voets, B.A.D., 1959a. Meteorological records of Surinam 1958. De Surinaamse Landbouw 7:51-55.

-- 1959b. Meteorological records of Surinam 1959. De Surinaamse Landbouw 7:151-63.

-- 1950. Meteorological records of Surinam 1960. De Surinaamse Landbouw 8:57-63.

Veltkamp, H.J. and R. Samlal, 1976. De teelt van Pinda en het voorkomen van met Aflatoxinen besmette pinda bij kleinlandbouwers in het distr. Saramacca–Rapport No.23.(unpublished)

Wienk J. 1978. Ground-nut experiment at Coebiti in the period 1972-1975; A summary of results. Proceedings of the C FCS vol. XV : 218-235.