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Herbarium Vadense

1896 – 1996

Edited by

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&

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Preface

Systematic research is one of the oldest biological disciplines. This is not surprising as it fulfills a basic need for almost every other research field by presenting names for species with the essential framework of genera, families etc., their relationships and evolution.

At the occasion of the first centennial of the Herbarium Vadense this publication highlights not only the important treasures housed at the Wageningen Agricultural University, but also the various aspects of plant systematic research performed here. The two main research themes of this University are 'agriculture' and 'environment' and the Herbarium Vadense clearly relates to both of these. Its strong links with the study of biodiversity on the one hand and that concerning useful plants, whether cultivated or not, on the other hand show it fits well within our University.

To date, herbaria are met with a growing interest, scientifically as well as politically, since one has come to realize that they represent a very important part of our knowledge concerning the botanical biodiversity of our planet. Not without reason did the important 1992 UN conference on environmental issues in Rio de Janeiro strongly recommend to strengthen the rapidly diminishing systematic knowledge and research activities. This may give some optimism and confidence for the future of the Herbarium Vadense and systematic research in Wageningen in a period during which our University is confronted with decreasing budgets.

I would like to congratulate the Herbarium Vadense and all the personnel of the Department of Plant Taxonomy with this 100th anniversary and the publication of this fine booklet. I express the hope that the institute will profit from the growing interest in their research field and that it may enjoy a healthy and fruitful future.

Wageningen, September 1996

C.M. Karssen
Rector Magnificus, Wageningen Agricultural University

1 Introduction

F.J. Breteler & M.S.M. Sosef

The central theme during the celebrations around the first centennial of the Herbarium Vadense is: '**100 year attention for biodiversity**'. A herbarium can be looked upon as a large storehouse of biodiversity information. At Wageningen the 'attention' paid to the biodiversity is two–fold. First of all there is the attention paid to the collections themselves: the collecting of plants in the field, their careful drying and mounting on paper sheets, their insertion into the main collection, their disinfection, etc. Secondly, there is of course the scientific research yielding biodiversity information and thus making the knowledge stored in herbaria all over the world available to the world outside. Fortunately more and more people begin to realize that herbaria (and zoological collections) play a key role in the conservation of nature. Knowledge is the first prerequisite. When we do not know what species are out there, we do not know what to preserve. We do not know which species are rare or endangered, or valuable in the sense of genetic diversity of economically important plants.

Where in the past the focus of a herbarium and its scientific staff was mainly on exploring and describing the flora of virtually unknown parts of our world, today their activities have shifted towards making available biodiversity information. We hope you can taste some of both the old and new attitude towards a herbarium and systematic research while reading the various contributions in this jubilee volume.

The Herbarium Vadense is housed within the Department of Plant Taxonomy of the Wageningen Agricultural University, The Netherlands. Being part of an agricultural university, it has always had a strong link with agricultural research rather than with the study of wild plants. The important dendrological collections and for example those of useful plants testify to this. But, during the 1950's the emphasis was broadened with a focus on wild, mainly African plants. This study of the wild flora was further strengthened when the study of biology was added to the curriculum of the Wageningen Agricultural University. This dual focus, on useful plants and on the wild flora, is still present and pictures the modern theme of our univer-

sity: 'Agriculture and environment'.

There are 3 main herbaria in The Netherlands: the Rijksherbarium of the Leiden University, the University Herbarium of Utrecht University and the Herbarium Vadense at Wageningen. The situation of these herbaria and the associated systematic research has worsened considerably during the past say 15 years. However, several important reports have appeared, e.g. that concerning a national policy for systematics in The Netherlands (Commissie Nationaal Plan, 1993) and that of the Biological Council of the Royal Netherlands Academy of Arts and Sciences (1995), pointing to the high quality of both collections and research performed and to the danger of losing irreplaceable but highly relevant knowledge on biodiversity. This gives some hope for a better future. Recently, the Research School Biodiversity was founded and there are important initiatives towards closer cooperation between the Dutch herbaria. Still, the Wageningen Department of Plant Taxonomy is facing a severe reduction in scientific staff and all we can do is hope that the turn of the tide will not arrive too late. Large projects like PROSEA (Plant Resources of South–East Asia) and ECOSYN (Synthesis of the Ecological Knowledge of the Trees and Lianas of Upper Guinea), mainly funded by international organisations, prove that the Herbarium Vadense is an indispensable tool for applied plant sciences.

Meanwhile, the Herbarium Vadense has grown to a medium–sized herbarium with its major emphasis on tropical African collections. It comes 4th in line of important herbaria with such collections, after the herbaria at Kew, Meise (Belgium) and Paris. The organizing of the XIVth AETFAT Congress (Association pour l'Etude Taxonomique de la Flore d'Afrique Tropicale / Association for Systematic Research of the Tropical African Flora) in 1994 has contributed much to the fame of our herbarium. Many foreign researchers attending the congress visited the herbarium and were often pleasantly surprised by the high number and high quality of the collections.

For now, we would like to wish you pleasant reading in this volume highlighting the history, the collections, and various aspects of systematic research conducted at the Herbarium Vadense and the Department of Plant Taxonomy.

2 The history of the Herbarium Vadense

J.F. Aleva, J. de Bruijn & L.J.G. van der Maesen

The official opening of the main building of the State Horticultural College, the 'Rijkstuinbouwschool', on October 3, 1896 can be seen as the start of the Herbarium Vadense and also of the associated Botanical Gardens in Wageningen. However, we are sure that prior to this date there were herbarium collections present in Wageningen. The first herbarium collections were kept in the 'Bassecour', the seat of the Agricultural College. In 1876, W.C.H. Staring donated his library and his herbarium to this college, which was founded that same year. He had been a great advocate for the foundation of an agricultural school in Wageningen. C.J.M. Jongkindt Coninck, E. Giltay and D. Lako, governors of the college, also donated their private herbarium collections. Apparently these persons with an agricultural, horticultural or soil science background, recognized the importance of a herbarium for an agricultural school. The new State Horticultural College was part of this Agricultural College.

The main building of the State Horticultural College was designed by the architect J. van Lokhorst (Botman & Tummers, 1990), whose buildings are characteristic for their functional constructions and logical use of building materials. His style has been called a new Neo–Renaissance style as opposed to the imitation of classical styles fashionable during that time, and it is said that he designed the most modern university buildings for that period. At present, the Department of Plant Taxonomy is still housed in this building.

Around 1900 the building was supplied with an electrical clock, placed on the facade (Fig. 1 & 2). This clock is owned by the Municipality of Wageningen since 1928. Locally, the building is still known as 'the building with the clock'.

The building was situated in an area of 4 hectares, designed as an experimental garden by the landscape architect L.A. Springer (Fig. 3) in 1895. Its location is in a corner of the Dreijen estate, along the Rijksstraatweg, now Generaal Foulkesweg. A part of it (1 hectare) was reserved for a small arboretum. This experimental garden would later become the Dreijen Arboretum of the Agricultural University and the original arboretum is still part of the Gardens. Some small greenhouses provided possibilities to cultivate tropical plants. The

Fig. 1. The building of the State Horticultural College in early 1900; later on the Department of Plant Taxonomy was housed in this building.

Fig. 2. Stone tablet on the facade of the building stating 'State Horticultural College'.

development of the Botanic Gardens was strongly linked to that of the Herbarium for many years.

The facts that the herbarium was situated in the gardens, and that Springer, a keen dendrologist who taught garden design at the Agricultural College from 1897 to 1900, has surely contributed to many of the collections of cultivated plants in the Herbarium. In 1936, Springer donated his large dendrological collections to the herbarium.

In 1899, J. Valckenier Suringar, who worked at the Rijksherbarium (State Herbarium) at Leiden, was appointed as lector in dendrology and botany. Already since 1896 he gave courses in the systematics of the tree flora of the Dutch East Indies, the former Dutch colony in South–East Asia (now Indonesia).

In 1906, the Horticultural College was incorporated in the new State College for Agriculture, Horticulture and Forestry (Rijks Hogere Land–, Tuin en Bosbouwschool). In 1918, this college was transformed to the Agricultural University (Landbouwhogeschool). In 1986 it acquired the new name of Wageningen Agricultural University.

Valckenier Suringar was appointed professor in Applied Plant Systematics and Geography in 1918, and he became the first director of the Arboretum.

Valckenier Suringar had a major interest in dendrology and was one of the founders of the Dutch Dendrological Society, which still has its annual meeting in the Herbarium building. Dendrological collections from e.g. S.G.A. Doorenbos, W. Hendriks and L.A. Springer, who occupied important positions within this society, can be found in the Herbarium. Those of G.H. Ruisch, an amanuensis working at the Herbarium, are worth mentioning as well.

Valckenier Suringar made large collections in all plant geographical districts in The Netherlands at the end of the 19th and the beginning of the 20th century. These were mainly used for teaching purposes. Students of Valckenier Suringar went on various excursions in the course of their training. They collected plants for the so–called 'Landlooper'–collection (landlooper means vagabond). On the labels of this collection the name Herbarium Vadense occurs for the first time. Vada is Latin for Wageningen. An important collector under this name was E. de Vries. The 'Landloopers' also collected cultivated plants from many agricultural areas in The Netherlands.

The first herbarium collections from the tropics also comprised

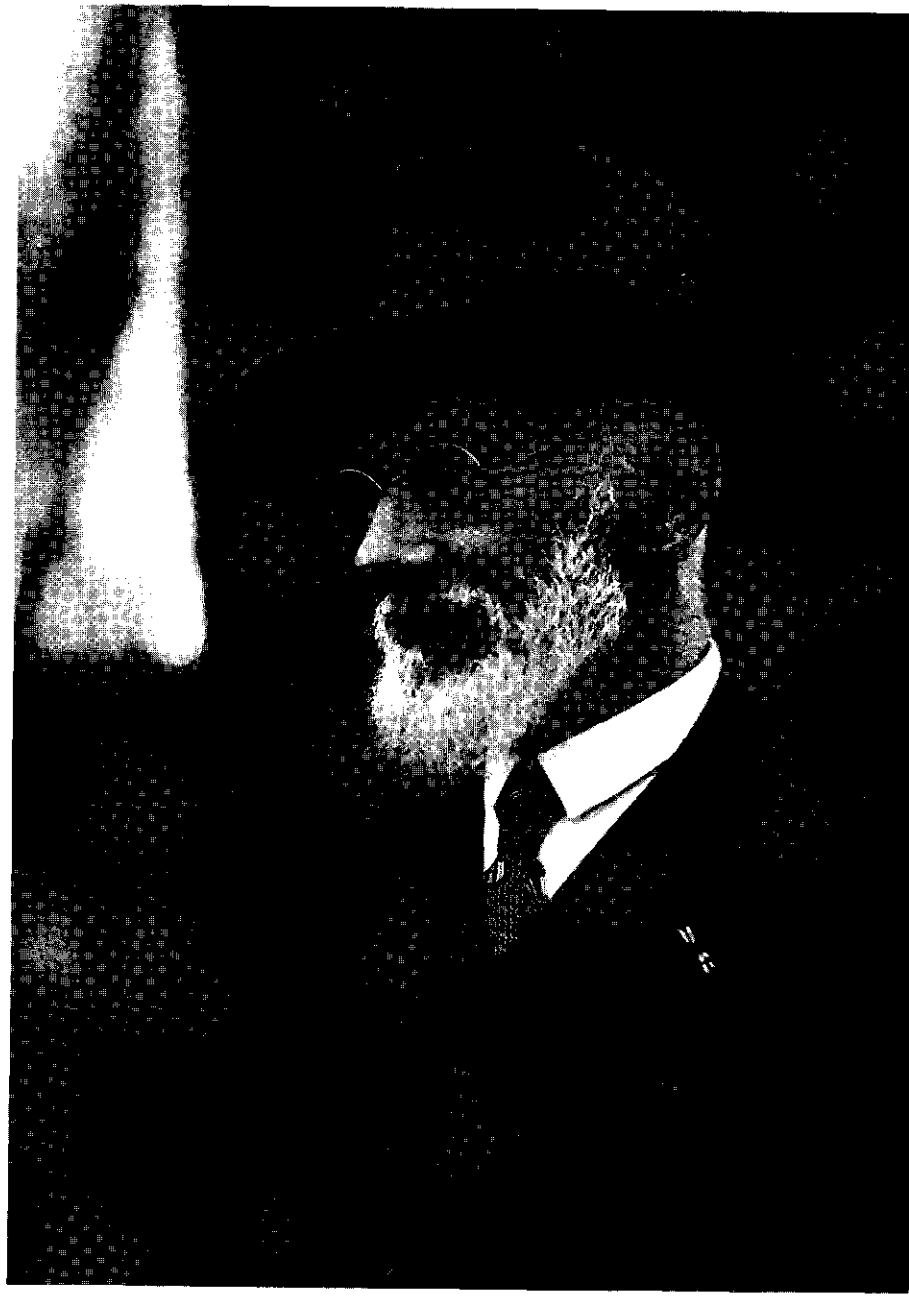

Fig. 3. L.A. Springer.

small reference collections for teaching. Important collections were those of S.H. Koorders from Asia, G.A. Zenker and A. Stolz from Africa, and the collection J.W. Gonggrijp from South America.

Valckenier Suringar had a large personal herbarium which he brought to Wageningen. The major part of his herbarium originates from around 1850 when his father W.F.R. Suringar, who worked at Leiden, purchased herbarium collections from various sources all over Europe. Part of these collections remained his personal property until he donated his herbarium to the Herbarium Vadense in 1928. This donation required an extension to the old building. Three collection rooms and a new lecture hall were built. One of the new collection rooms was intended for the entomology collections of the University.

The herbarium then comprised a Herbarium Generale, a Herbarium Dendrologicum, a Herbarium Officinale and a Herbarium Tropicum. The Herbarium Generale encompassed a collection of about 60,000 specimens of plants originating from southern and central Europe, northern Africa, Asia Minor, Persia and Syria. Some important collections are those of Boissier, Bourgeau, De Heldreich, Kotschy, and the Herbarium Siculum, a collection of 900 specimens collected in Sicily. The Herbarium Dendrologicum consisted mainly of the dendrological collections of Valckenier Suringar, Baas Becking and Baenitz. The Herbarium Officinale contained 2000 specimens of medicinal plants. The main part of the Herbarium Tropicum was formed by duplicates from the Herbarium at Bogor and collections from the experimental agricultural station at Bogor, Indonesia.

After the retirement of Prof. Valckenier Suringar, Dr. J. Jeswiet was appointed director of the Arboretum and Professor of Plant Systematics, Dendrology and Plant Geography on August 16, 1925. He contributed several collections from the Dutch East Indies and Papua New Guinea (Port Moresby) obtained during his research period in Pasuruan (Java) as a sugar cane breeder. He was discharged in 1946 because he had collaborated with the occupation authorities during the second world war.

In the 1930's and 1940's the first collections from plant-sociological researchers were incorporated in the Herbarium Vadense and these contributions continued during the 1950's and early 1960's. Well–known collections are those of W. Beeftink, J.H.A. Boerboom, W. Diemont, H. Doing, F.M. Maas, V. Westhoff and I.S. Zonneveld.

In 1932 the flowering of the large aroid *Amorphophallus titanum*

in the tropical greenhouse (Fig. 17) attracted worldwide publicity. The size the flower reached at Wageningen is still an unbeaten record.

During World War II, in autumn 1944 and early 1945, the building has been severely damaged by grenades. Most windows were shattered to pieces. A large part of the herbarium collection was stored in the attics, packed in large parcels of plants in folio folders. The attics leaked and quite a few parcels and boxes were damaged by rain and could not be salvaged. Some of the historical collections, therefore, are no longer as complete as they were before the war. The collection of cryptogams and a small spirit collection have been lost completely. The collection of living tropical plants was lost as well, as during the last winter of the war there was no coal to heat the greenhouses and the inhabitants of Wageningen had been forcefully evacuated in October 1944. Their return to Wageningen was not before June 1945. A part of the library books were found back outside in the garden. The first volume of the Index Kewensis still has a hole from a grenade shell as a silent witness of the severe shelling in the front line.

The staff returned in autumn 1945 to repaire the damage as good as possible, and to restore the botanic gardens into their former attractive state. Dr. H.J. Venema, staff member since 1929, and Dr. J.G.B. Beumée, lector in Tropical Botany, were instrumental in this process.

In 1947 Venema (Fig. 4) was appointed Professor of Plant Systematics, and Director of the Arboretum and the Biological Research Station at Wijster, a post he held until 1969. Under his directorship the old Belmonte estate, heavily damaged in the war and donated to the 'Geldersch Landschap' after World War II, was acquired around 1953 by the university as an extension of the Dreijen Arboretum. These two gardens comprise the Wageningen Botanical Gardens as they are today.

Venema had good contacts with many Dutch scientists and he acquired the important *Rubus*–collection of Dr. W. Beijerinck. A reference collection of phanerogames and cryptogames of the Drente plant geographical district was extracted from the Herbarium Vadense for teaching and research objectives at the Station in Wijster, mainly by Dr. J.J. Barkman. In 1953, the Station became part of the Department of Plant Taxonomy but was separated again in 1967 when vegetation science was credited a separate department.

Dr. Beumée acted as curator of the collections of the Herbarium

Fig. 4. Prof. Venema (right), Drs. Hensen (left) and a guest from the United States (Dr. F.G. Meyer) in the Wageningen Botanical Gardens.

Vadense until 1953 when he retired. Dr. H.C.D. de Wit, who had been a plant systematist first in Buitenzorg (Bogor), Dutch East Indies, and lecturer in Leiden, was appointed lecturer in Systematics of Tropical Plants in Wageningen in 1953. He became full Professor in 1959. His chair was named Plant Systematics and Plant Geography, in particular of the Tropics and Subtropics. He directed the Department from 1969 to 1980.

In 1955, De Wit came to a gentleman's agreement with the Rijksherbarium in Leiden and the University Herbarium in Utrecht that from then on Wageningen would concentrate its activities on the flora of Africa and on cultivated plants. Leiden would concentrate on Asia and the Dutch flora, and Utrecht mainly on tropical America.

Up to this period the herbarium collections had mainly been used for teaching, but now collections were also made for research purposes. De Wit travelled through Africa to pave the way for his Dutch staff members and his students. F.J. Breteler, A.J.M. Leeuwenberg, A.G. Voorhoeve, J.J.F.E. de Wilde and later on J.J. Bos made large collections in West and Central Tropical Africa, and South Africa. The collection grew with about 400,000 specimens.

Large collections were made in Côte d'Ivoire, Ethiopia, Cameroun, South Africa and Moçambique. In the beginning of the 1960's an exchange programme for duplicates was started, and the herbarium acquired collections from other parts of Africa such as Kenya, Tanzania, Nigeria, Madagascar and South Africa. From the herbarium in Meise (Belgium), large duplicate collections from Zaire, Ruanda and Burundi were received in exchange.

In this period K.J.W. Hensen (Fig. 4) made a great contribution to the Herbarium with collections of perennial and woody ornamental plants, in the course of his research on various ornamental species.

In 1958 and 1959 respectively, J. de Bruijn and J.W. van Steenbergen were appointed part–time to take care of the herbarium collections. De Wit managed to convert the posts to full time: the technical staff of the Herbarium was created. De Bruijn remained collection manager until 1990 when he was succeeded by van Steenbergen, until then his assistant.

In 1961/62 the Department of Entomology left the building and their collection room became available for the herbarium. At the same time the wooden herbarium–racks, constructed by the department carpenter H. Straatman, were replaced by steel racks to create more room for the carton herbarium boxes. However, the explosive growth of the herbarium and the growth of the department staff did stretch the capacity of the old building and ultimately everywhere in halls and staircases boxes with herbarium sheets could be observed. To provide more office space, a wooden barrack was built behind the main building in 1964. The barrack was named 'Uhuru' after the war–cry of the Kenian Mau Mau, which means freedom. In 1972 the barrack was doubled to house herbarium collections as well. This was still insufficient and for other herbarium collections space had to be found in the basement of the 'Transitorium', a university building at 5 minutes walk from the main herbarium building. This basement was far from ideal to house a herbarium collection which may be illustrated by two occasions of heavy rainfall which flooded the basement floor.

In 1966/67 the Ethiopia–project started, a cooperative effort between the Department of Plant Taxonomy and the Department of Tropical Crops of the Wageningen Agricultural University, and the Alemaya College of Agriculture of the Addis Abeba University. For

a number of years collections of cultivated crops and their related wild species were made in Ethiopia and brought to the Herbarium Vadense. Seeds and fruit were planted at the Department of Plant Breeding and the Institute for Horticultural Crops. Important collectors in Ethiopia were P.C.M. Jansen, C.J.P. Seegeler, E. Westphal, J.J.F.E. de Wilde, and W.J.J.O. de Wilde and B.E.F. de Wilde–Duyfjes.

Meanwhile, the technical staff of the Herbarium had grown to six persons, but this was still insufficient to maintain an acceptable degree of collection management and reduce the arrears. In 1968, Arbeidszorg in Ede, an organization that provided work for the disabled, was asked whether it was possible to assist in mounting specimens for the Herbarium. Their reaction was positive and they received African duplicate material, and afterwards some 50,000 sheets of the Suringar Herbarium that had remained unmounted and hence were still not accessible. This valuable material was carefully prepared by T. Smaling before it was sent to Ede. Since then they have mounted many thousands more. To date, PERMAR (formerly Arbeidszorg) mounts 6000 specimens annually, mainly duplicates received yearly from sister herbaria, and their work cannot be missed any more. The PERMAR has also appointed two persons to work in the herbarium in Wageningen to mount plants and assist the staff with its daily work.

A growing concern was the conservation of the specimens. In 1958 disinfection took place in two large containers providing space for 60 cardboard boxes of herbarium specimens that could be treated with tetrachloride carbon. To dry plants three gas–fuelled drying–ovens were used in a room with only a small window for ventilation. At the beginning of the 1960's the Kew Herbarium advised Wageningen to use lauryl pentachlore phenate to prevent insect damage. New collections were immersed into a solution of lauryl pentachlore phenate in turpentine. The situation improved when the coal–fuelled central heating system was replaced by an oil–fuelled system. In the room formerly used for storage of cokes, two gas chambers and an installation for the lauryl–treatment were built. In the gas chambers the (now prohibited) nerve gas methylbromide was used. The ampoules carrying this gas were acquired from an US Army dump in Germany. Next to this room an electric drying–oven with six compartments was placed. However, despite the availability of a small elevator, the transportation of the boxes with herbarium specimens to the cellar and to the gas chambers, remained a very

labour–intensive affair for many years. It was J. Gilde, herbarium technician, who carried out the disinfection work very meticulously in his own inimitable way for many years.

In September 1970 the study of biology was added to the curriculum of the university. This meant a considerable increase in the work of the departement and herbarium staff. First– and second–year students had to learn how to make herbarium collections. This activity soon ceased for first–year students, because during the excursions they mostly visited nature reserves in The Netherlands, and collecting in these areas was soon prohibited. But the second–year biology students made and still make an annual excursion to the eastern Pyrenees in France. In this manner the Herbarium acquired a large collection from this region, even admired by Prof. A. Baudière from the University of Toulouse.

In 1977 the directorship and management of the Gardens was separated from the Departement of Plant Taxonomy and the Herbarium. The staff, however, remained stationed in the building and the co–operation between garden staff and herbarium staff is still frequent. Many collections from the Botanical Gardens continue to find their way to the herbarium and are also distributed as duplicates to other herbaria, especially to the US Arboretum in Washington D.C. The first director, D.O. Wijnands, appointed in 1978, was very much interested in the history of botany. His unexpected and sudden death in 1993 came as a shock. He was succeeded by Dr. J.J. Bos, also a staff member of the Department of Plant Taxonomy.

In 1981 De Wit retired and was succeeded in 1984 by Prof. L.J.G. van der Maesen.

The painful situation of herbarium collections stored in buildings with a high fire risk remained until 1985. De Wit had tried to get permission to build a new herbarium building and greenhouses near the Belmonte Arboretum. However, the roof of the designed building was higher than the treetops, rendering the buildings too prominent along the picturesque hillside, and hence permission was denied by the Province of Gelderland. In 1981 a committee consisting of Breteler, de Bruijn and de Wilde was formed to see whether it was possible to build an efficient but simple herbarium building. The Board of Directors of the University finally decided to replace the old barrack by a modern herbarium building, but then discussion started as to where that building would arise. One of the plans en-

Fig. 5. Prof. van der Maesen (left) and Prof. de Wit (right) standing before the memorial stone for the new herbarium building just placed by the latter.

compassed a small bridge across the narrow valley formed by the Holle Weg to connect the new building with the Belmonte Arboretum. But, standing in the middle of the crossing Generaal Foulkesweg and Arboretumlaan, overlooking the Gardens, the State Architect decided that the new building would be an extension of the old 1896 building, and the new tropical greenhouse would be a dominant feature along the Arboretumlaan. The new greenhouse, replacing the small worn–out 1896 facilities, provided a much–needed relief for the now large living collection. It was officially opened by Dr.Ir. P.K. Schenk, Director of Agricultural Education of the Ministry of Agriculture and Fisheries on October 5, 1984. The new building (Fig. 6) was designed by W.F. de Vries of the architectural bureau Dingemans and De Vries and on August 31, 1984 Prof. H.C.D. de Wit laid the first stone (Fig. 5). On May 22, 1985 the building was officially opened by Drs. A. Ploeg, undersecretary for Agriculture. Three floors of 327m^2, each equipped with modern compactors (Fig. 7), now provide ample space to the collections. Along the north wall working tables enable the handling of specimens by staff and visitors. The old gas chambers were replaced by large freezing compartments on each floor. This enables the annual disinfection of the entire collection very efficient-

Fig. 6. The new building of the Herbarium Vadense attached to the old building in the rear.

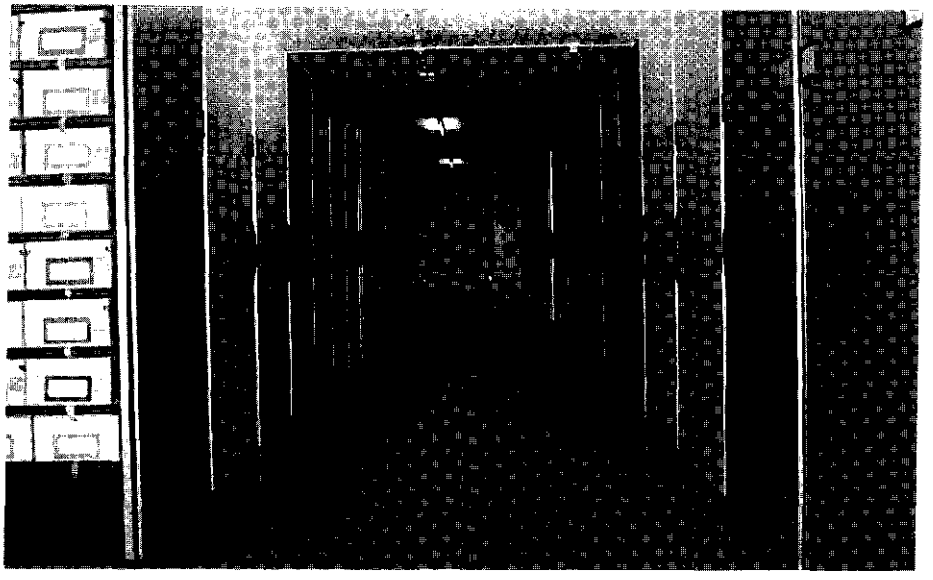

Fig. 7. The new compactor system housing some 600,000 plant specimens; the entrance to the refrigerator room in the rear. Three floors are similarly equipped.

ly, the responsibility of which is presently carried by T. Smaling and J. van Garderen. A separate room contains the large spirit–preserved collection of flowers and fruits, curated by J. van Veldhuizen. Another room stores the wood and dry fruit samples, curated by K. van Setten. The ornamental glass screens, present on each floor, were designed by Jan Roède, an artist from The Hague.

To the south and west of the herbarium, offices and utility rooms are situated. The renovation of the old building was completed in 1986. The old herbarium rooms found other uses as cytotaxonomic and chemotaxonomic laboratory, library and meeting room. The library collection is specialized on the flora of Africa and the taxonomy of cultivated plants, and now counts about 6600 books, 540 scientific journals, and 18,000 reprints.

In 1988 the Herbarium of the Royal Tropical Institute at Amsterdam, containing vouchers of many useful and cultivated plants from Indonesia, Africa and the West Indies, was given to the Herbarium Vadense on long lease.

In 1984 the collections of the Biology Faculty of the Groningen University were divided continent–wise over the other Dutch herbaria as they ceased to perform systematic research, and the African vouchers were donated to the Herbarium Vadense. Many valuable type specimens, often duplicates of specimens destroyed in Berlin, have been recognized by J.J. Bos and J. van Veldhuizen.

In May 1993 J.F. Aleva was appointed herbarium manager and became responsible for the management of the collections, in succession to J.W. van Steenbergen. He made a start with the computerization of the collections. Collection data of new accessions are now put into an electronic database and data of old collections are gradually inserted. In the future loan and exchange activities will also benefit from this computerized system.

In August 1994 the Department hosted the XIVth AETFAT Congress (Association pour l'Etude Taxonomique de la Flore d'Afrique Tropicale), bringing together about 220 taxonomists and other botanists devoted to the study of African plants.

The Herbarium Vadense now contains about 560,000 specimens mounted on 920,000 sheets. About 60% of these collections originate from tropical Africa. The collections from Europe and the Mediterranean area amount to about 23% of the total. Other specimens originate from Australia (1%), Asia (7%), North America (2%) and Central and South America (6%). Almost 15% of the

entire collection represents cultivated plants.

At the moment the Herbarium Vadense exchanges duplicates with some 110 herbaria in Europe, Africa and the United States. Almost 76,000 specimens are ready for exchange.

The many expeditions to African and some other countries, and the living collections acquired on these travels, provided ample opportunity to build up a large collection of colour slides used for teaching and publications. Prof. de Wit has been the main contributor to this collection, that now holds about 70,000 slides. Data on recent accessions are being digitized.

For taxonomical publications line drawings are indispensable. At Wageningen we attempt to illustrate all monographs and revisions with line drawings in India ink, in particular of species new to science. Several artists, Mrs. I. Zewald, Miss Yuen Tan, Mrs. W. Wessel–Brand and Messrs. G. Langendijk and J.M. de Vries have contributed many illustrations to our publications, depicting habitus and details of the distinguishing characters of the plant species.

In 1995 discussions started to try to lessen the burden in these financially difficult times and these talks will probably lead to the formation of a federation of the herbaria of Leiden, Utrecht and Wageningen, the three main herbaria in the Netherlands. In 1996 these three herbaria received a grant from NWO for a two–year project to digitize the accession data of their type specimens. In the Herbarium Vadense, the type specimens are recognizable by special folders with a dark green margin. The folders of standard specimens of cultivars have a distinctive light green margin.

The collections of the Herbarium Vadense still grow in importance. Not only by the growing of the number of specimens, but also because one is starting to realize that its collections provide the foundation for biodiversity research on the flora of Africa as well as for the publication of Floras for various regions and countries in Africa.

The historical data presented above have been mainly derived from various literature sources, departmental and other archives, and personal recollections. References can be found a.o. in Aleva & Wessel–Brand (1996), Beumée (1942 a & b), de Bruijn (1980), Gast & de Ruiter (1993), van der Haar (1993 a & b), Jeswiet (1935), van der Maesen (1993), and van Steenis–Kruseman (1950).

3 The collections of the Herbarium Vadense

3.1 Introduction

F.J. Breteler & M.S.M. Sosef

In this chapter the collections of the Herbarium Vadense are briefly dealt with. They are classified to their origin, country as well as collector. This is done in six separate parts by six different authors. The total collection amounts to 560,000 specimens. Europe and the Mediterranean region accounts for 23% of the total collection, tropical Africa for 60% and other tropical regions for c. 13.5%. Although all collections are 'historical', special attention is given to the 18th and early 19th century collections. Herbarium material from cultivated plants is also separately dealt with. They are mainly collected in the Netherlands, but may originate from other countries. A part of it has been collected to voucher for all kinds of plant research. Accounts on the special collections, wood samples and spirit collections conclude this chapter.

The exchange of material is very important for a herbarium, not only to enrich the collection but also to reduce the risk of loss, e.g. by such events as war, fire, and so on. The Herbarium Vadense has an important exchange programme. It is mainly based on specimens from tropical Africa as shown in table 1.

The exchange of African specimens started in 1960. From the very beginning it aimed at the exchange of identified material. This was not so easy to accomplish because the relevant literature was poorly represented at the library and well-identified herbarium specimens from Africa that could be used for comparison were rather scarce. During this crucial period Dr. Jane Amshoff demonstrated her great skills and her experience in the identification of African plants. Although her previous experience was mainly with South American plants, she quickly gained an enormous knowledge of African plants as well and of the relevant literature. Her favourite families were Gramineae and Leguminosae. She disliked the orchid family which she rather did not want to identify. In the 1960's and early 1970's she regularly went to the principal African herbaria like the British Museum (BM), Kew (K), Meise (BR), Paris (P) with a small suitcase filled with African plants to compare her identifica-

country	town	herbarium	spec. sent	spec. rec'd	balance per 5/1996
Africa					
Angola	Huambo [Nova Lisboa]	LUA	335	347	–12
"	Luanda	LUAI	274	-	274
Cameroun	Yaounde	YA	266	3	263
Congo	Brazzaville	IRSC	212	126	86
Côte d'Ivoire	Abidjan	UCI	779	84	695
Ghana	Legon	GC	2287	2406	–119
Kenya	Nairobi	EA	5099	4988	111
Moçambique	Maputo	LMA	2139	-	2139
Nigeria	Ibadan	FHI	5578	3769	1809
Sénégal	Dakar	IFAN	517	305	212
Sierra Leone	Freetown	SL	944	2658	–1714
Somalia	Mogadishu	MOGA	880	854	26
South Africa	Pretoria	PRE	11.733	9473	2260
Tanzania	Dar es Salaam	DSM	1224	1257	–33
Zimbabwe	Harare	SRGH	2971	1484	1487
America					
USA	Berkely	UC	3251	2050	1201
"	New York	NY	1801	1931	–130
"	Saint Louis	MO	29.249	39.091	–9842
"	Washington DC	NA	1414	1646	–232
"	"	US	2570	1201	1369
Europe					
Belgium	Gent	GENT	2576	2289	287
"	Liège	LG	2573	2673	–100
"	Meise	BR	29.039	31.201	–2162
Denmark	Aarhus	AAU	1083	3	1080
"	Copenhagen	C	7743	5988	1755
France	Paris	P	25.117	12.050	13.067
Germany	Berlin	B	8032	4683	3349
"	Hamburg	HBG	3103	876	2227
"	München	M	5383	5017	366
Italy	Firenze	FI	923	297	626
Portugal	Coimbra	COI	752	201	551
"	Lisboa	LISC	6311	3372	2939
Spain	Madrid	MA	3002	1861	1141
Sweden	Lund	LD	2370	1593	777
"	Stockholm	S	1771	556	1215
"	Uppsala	UPS	3690	2495	1195
Switzerland	Geneve	G	1007	456	551
"	Zurich	Z	2801	2261	540
Un. Kingdom	Kew	K	24.316	9569	14.747

Table 1. Exchange per May 1996 of mainly African herbarium specimens between the Herbarium Vadense and institutes in Africa and elsewhere. Only the more important exchanges are listed.

Fig. 8. Miss G.J.H. Amshoff (1913–1985).

fications with type material. The majority of our own African collections has thus gone through her hands. Her work is still a good basis for present day and future identification activities.

The number of specimens exchanged with institutions in Africa is comparatively low, 33,500 specimens sent, 24,500 received. The main exchange is with institutions in Europe and the U.S.A. which have either a stock of duplicates [e.g. BR] or which also have an active collecting programme on the African continent [e.g. MO].

In general the balance with most institutions is in our favour, sometimes to a large extent, but with two of our principal institutes for exchange, BR and MO, the Herbarium Vadense is in debt.

At present the Herbarium Vadense has a stock of 76,000 duplicates for exchange of which almost 90% is of tropical African origin.

Fig. 9. Herbarium specimen of *Monopetalanthus coriaceus* Morel ex Aubrév. from Gabon with label containing field notes.

3.2 Historical collections

M.S.M. Sosef & J. de Bruijn

3.2.1 The Clifford Herbarium

An important treasure kept at the Herbarium Vadense is a set of about 250 specimens from the herbarium of George Clifford (1685–1760). They represent the oldest and at the same time the most important historical collections in scientific sense kept in Wageningen.

Clifford was a wealthy banker. His father bought the estate called De Hartekamp, situated south of the city of Haarlem. When George Clifford inherited the estate in 1727, he enlarged it with a menagerie, orangery and four houses for tropical plants. By then, the garden, the herbarium and the library of Clifford were among the finest private collections in Holland. It was the famous Herman Boerhaave (1668-1738), professor of medicine, botany and chemistry at Leiden University, who inspired Cliffords passion for collecting and growing plants, and he also was Cliffords main supplier of plants. Clifford maintained good connections with those botanically interested persons at Leiden (A. van Royen, who took over Boerhaave's botanical position in 1730, and J.F. Gronovius, at one time Curator of the University) and Amsterdam (Burman), and through these with other botanists abroad (e.g. von Haller from Switzerland and Siegesbeck who sent him Russian plants; Wijnands & Heniger, 1991). Because of these good connections Clifford obtained many herbarium specimens and seeds. It was probably through these connections that he became acquainted with the young Carolus Linnaeus, who visited Holland in 1735. He employed Linnaeus to compose a book on his garden and herbarium collection. This work, the well–known Hortus Cliffortianus, appeared in 1737 and proved to have a major influence in Linnaeus' early concept of many plant species (Stearn, 1957). Linnaeus left Holland in 1738, and went back to Sweden where he would gain much fame, culminating in the publication of his Species Plantarum in 1753. The Hortus Cliffortianus probably was Linnaeus' principle source for his Species Plantarum and he probably had the book open on his desk while writing it (Stearn, 1957: 57). This renders the herbarium of Clifford highly

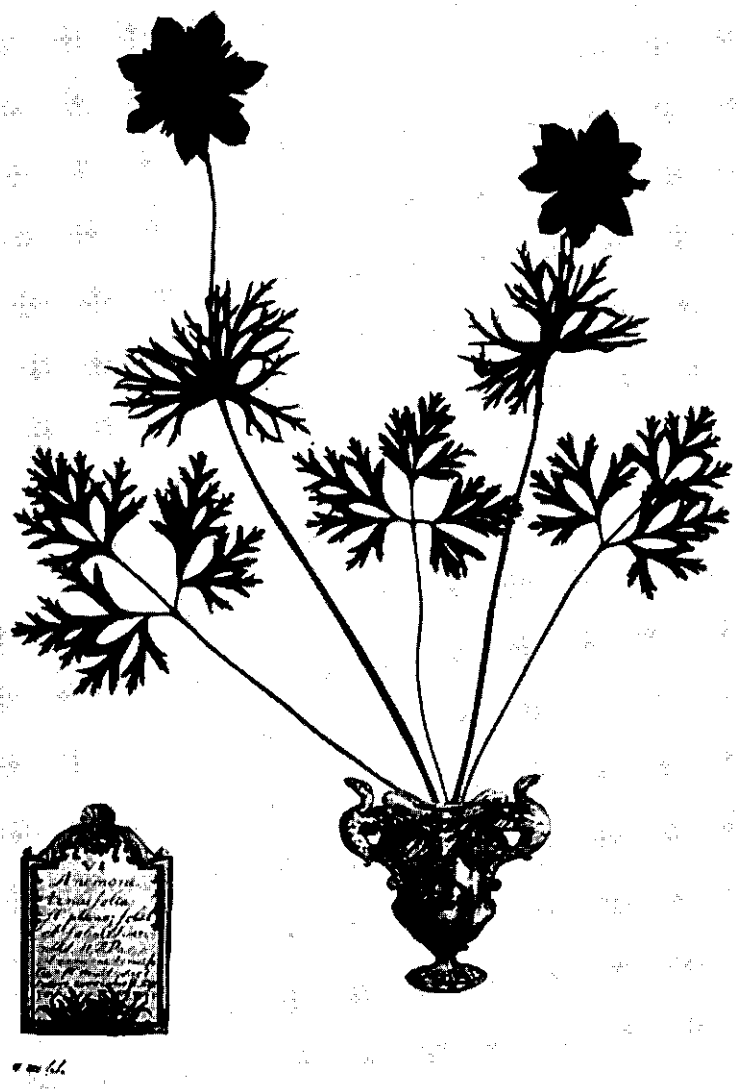

Fig. 10. Specimen of *Anemone* from the Clifford herbarium with engraved urn and label.

important in the light of the typification of Linnaean plant names (Cannon et al., 1983).

The main body of Clifford's Herbarium was acquired by Joseph Banks in 1791 who passed it on to the British Museum of Natural History, where it is still kept. Via the exchange of herbarium specimens, individual Clifford specimens can be found in various other herbaria, including Linnaeus' own and e.g. scattered through the historical collections at the Leiden Rijksherbarium. Some 250 sheets of Clifford's herbarium are present at Wageningen. It is not known how they arrived here, but it seems likely that the first director of the Wageningen herbarium, dr. J. Valckenier Suringar (1864–1932), obtained them as a gift from his father in 1899, prof. W.F.R. Suringar, who at that time was director of the Herbarium at Leiden (van der Haar, 1993).

Most of the Clifford specimens at the Herbarium Vadense show plants which seem to grow out of an engraved urn (Fig. 10), like is the case with most sheets in Clifford's herbarium kept at the British Museum. Such urns were commonly used during the 18th century in Holland and can be used to identify Dutch herbaria because the various botanists often used different kinds of urns. The Clifford specimens often carry additional engraved labels (cartouches) and/or ribbons (Fig. 10).

The specimens at the Herbarium Vadense were found in 3 large, leather–bound books with numbered pages, manufactured especially to carry such herbarium sheets. The books are, however, of a much later date, and may originate from the time the specimens moved to Wageningen. The books themselves will be handed over to the Special Collection unit of the Wageningen Agricultural University Library, the specimens will remain at the Herbarium.

The rag paper on which the specimens are mounted often shows a watermark of a Strassburg lily in a crowned shield with letters appended such as LVG and WR. This paper was produced by Dutch and French paper mills, such as those of Lubertus van Gerreving and Jean Villedary (Churchill, 1935).

The predominant handwriting can be attributed to Clifford himself. Occasionally the writings of other botanists can be encountered but none of these have been identified with certainty.

The numbers written down on or below the labels refer to the Index alter plantarum ..., published in 1719 by Boerhaave, and suggest the Clifford herbarium was originally arranged according to this work.

The Clifford collections kept at the Herbarium Vadense will be stored separately and in an alphabetical arrangement. They are now available for further study. A catalogue is in preparation and will be published elsewhere.

3.2.2 The Staring Herbarium

A second historical collection present at the Herbarium Vadense is that acquired by the Dutch agronomist and poet A.C.W. Staring (1767–1840) during his stay in Göttingen in the years 1787–1789 (Demoed, 1990; Evers, 1995). After finishing his study in law in Harderwijk, Staring went to Göttingen to study agricultural economy, botany and mineralogy, which were his actual interests.

The collection amounts some 175 sheets and is stored separately, but occasionally individual sheets are encountered among the main herbarium collections at Wageningen. Most sheets record that the collection was bought by Staring in Göttingen in 1787. Among the plants are native species but also cultivated and exotic ones (e.g. from Canada, America, the Mediterranean region, and the Middle East), which suggests that they may have originated from the Göttingen University botanical garden. At that time, the famous John Murray (1740–1791), a pupil of Linnaeus and A. von Haller, and professor of medicine and botany (Wagenitz, 1982), was appointed as supervisor of this garden. The garden was quite famous at that time and had good connections with many esteemed botanists (Hoffmann, 1793). In letters to his mother, Staring mentions that he had special permission of Murray to collect plants from the garden for his own herbarium. Indeed the Staring collection may comprise two different elements: a collection bought by Staring and specimens collected by himself. The majority of the plants are mounted on paper carrying a watermark consisting of a fairly simple crown with a large letter W below it and the letters HGR as a countermark. A few specimens, however, are mounted on a greyish paper without watermarks on which often just 'coll. Staring' is mentioned. The latter may well represent Starings own collections.

Staring's son, W.C.H. Staring (1808–1877), occupied an important position at the State Agricultural School, which later became the Agricultural University. Van der Haar (1993) mentions that W.C.H. Staring donated his private book collections, among which the herbarium of his father may well have been present, to the State Agricultural School in 1876.

3.2.3 Other historical collections

The Herbarium Vadense holds some 250-300 other historical collections apparently from various origins. By comparison of the watermarks of the paper it must be concluded that the material originates from the late 18th or early 19th century (Churchill, 1935). Some of these watermarks can be related to the paper mills of for example H. Koldewyn (1808), M. Schouten & C. (1783–1803), J. Kool & C. (1821), Adriaan Rogge (1704–1803) and Kloppenburg (1791–1813). Among these collections are 4 sheets with vases which belonged to the well–known Dutch botanist David de Gorter (1717–1783; van Ooststroom, 1941), who published the first flora of the Netherlands.

It is unknown how these collections ended up in Wageningen, but it is likely that they also came with W.C.H. Staring. A few collections bear an indication of the collection locality. These localities are often near Vorden or Gorssel. W.C.H. Staring was land–agent of De Wildeborch near Vorden after he studied biology and geology at Leiden University.

3.3 Europe and the Mediterranean region

R.H.M.J. Lemmens

3.3.1 Introduction

Although at present systematic research at the Department of Plant Taxonomy at Wageningen is mainly focused on tropical regions, the Herbarium Vadense houses a considerable collection of European and Mediterranean plants. The plant specimens are now mainly consulted for educational purposes and serve as an important reference collection for the Botanical Gardens. The estimated number of specimens in the Herbarium Vadense from Europe (excluding the Netherlands) is 115,000, from Africa north of the Sahara almost 16,000, and from the Netherlands 10,000. An important part of the European and Mediterranean collections originates from the herbarium of Dr. J. Valckenier Suringar, which is discussed directly below, followed by more recent collections.

3.3.2 The herbarium of Valckenier Suringar

Dr. J. Valckenier Suringar came to Wageningen in 1899 and was appointed as lecturer. From 1918 until 1925, he was Professor in Plant Systematics. In 1928 he donated his herbarium to the University.

His herbarium was called the 'Herbarium Generale' for a long time and it was much used for education in Valckenier Suringar's period as Professor in Plant Systematics. It comprises about 60,000 specimens, which belonged originally to approximately 180 separate collections, inherited by Valckenier Suringar from his father, W.F.R. Suringar. These collections have been bought by Suringar sr. from various collectors in the period of approximately 1830 to 1870, and concern particularly dried plant specimens from the Mediterranean region: Algeria, Spain, southern France, Italy, Greece, Asia Minor, Persia and Syria, but also from the Netherlands, Central Europe and some from the United Kingdom. Several of the Mediterranean collections are rich in type specimens.

Important collections present in the Herbarium Generale are mentioned below, without the intention to give an elaborate enumeration. Where known, regions and years of collection are summarized.

- B. Balansa (1825–1892): 'plantes d'Orient' (1854–1855); some type specimens.
- P.C. Billot (1796–1863): Germany, France.
- P.E. Boissier (1810–1885): Arabia, Syria, Granada (1845–1846); many type specimens.
- E. Bourgeau (1813–1877): Algeria.
- L. Hansen: Germany (1830–1840).
- Baron Fr. von Hausmann (1810–1878): Austria (1851–1855).
- H.C. Haussknecht (1838–1903): Turkey (1856–1867); several type specimens.
- Th. von Heldreich (1822–1902): Greece.
- C.F. Hochstetter (1787–1860): e.g. Caucasus.
- R.F. Hohenacker (1798–1874): Georgia, Caucasus, Armenia (1830-1841); few type specimens.
- A. Huet du Pavillon (1829–1907): Asia Minor, Armenia (1853): many type specimens.
- A. Jordan (1814–1897): France.
- K.G.Th. Kotschy (1813–1866): Asia Minor, Persia, Syria, Egypt,

Nubia, Kurdistan (1836–1862); many type specimens.
- J. von Kováts (1815–1873): surroundings of Vienna.
- J.L. Kralik (1813–1892): France, Corsica, Switzerland, Italy, Arabia, Syria, Egypt (1847–1849).
- A.L.S. Lejeune (1779–1858): Belgium; some type specimens of *Rubus*.
- C.J. Lindeberg (1815–1900): Sweden, Norway.
- C. Martin (1833–1870): surroundings of Lyon, France (1843–1851); some type specimens.
- F.W. Noë (?–1858): Asia Minor (1849–1852).
- Th.G. Orphanides (1817–1886): Greece (1850–1854); many type specimens.
- C. Salle (?–1852): Algeria (1848).
- G.H.W. Schimper (1804–1878): Algeria, Egypt, Abyssinia (1832–1837).
- F.W. Schultz (1804–1876): Germany, France.
- F.W. Sieber (1779–1844): Corsica, Hungary, Austria.
- M. Tommasini (1794–1879): surroundings of Triest (Italy).
- H.M. Willkomm (1821–1895): Spain (1850).
- Ph.W. Wirtgen (1806–1870): Germany (1857–1866); several type specimens.

Part of the herbarium of R.B. van den Bosch (1810–1862) was also incorporated in that of Valckenier Suringar; other parts have been included in the Rijksherbarium in Leiden. Those that came to Wageningen included collections of P.E.E. Sintenis (1847–1907; Persia, 1900–1901), A. von Regel (1845–1908; Turkestan, 1884) and H. Ross (1862–1942; Sicily, 1898–1900), among others.

A herbarium of about 2000 specimens of medicinal plants ('Herbarium Officinale') was also included in the legacy of Valckenier Suringar. It included collections of R.F. Hohenacker, K.G.Th. Kotschy (Nubia, 1839), G.H.W. Schimper (Arabia, 1837) and W.F.R. Suringar (1832–1896; The Netherlands, 1830–1860, with a.o. plants collected by H.C. van Hall).

Valckenier Suringar became interested in botany in 1891, and from that time on he made plant collections himself. He was an eager collector of plants, despite of his indifferent health. He collected during excursions, alone or with students, but also during holidays. He once wrote: 'I cannot keep my hands off the plants when they are there; I am only settling down in places where few plants are

available'. He collected in many areas in the Netherlands, particularly in the periods 1891 to 1897 and 1910 to 1920. His herbarium of the Dutch flora, which was used intensively for educational purposes, is rather complete and includes approximately 1200 species. During trips abroad, Valckenier Suringar also collected plants in European countries such as Germany (e.g. in 1895 almost 350 collections near the river Rhine), Switzerland (e.g. in 1919, 1924), France (e.g. in 1922, 1923), Belgium (e.g. in 1920) and the United Kingdom (e.g. in 1920). From 1900 onwards, he became much interested in dendrology, which resulted in fewer collections of wild plants. Many specimens originate from the surroundings of Wageningen, but Valckenier Suringar also collected extensively in the western parts of the Netherlands in the period before he came to Wageningen.

On his labels Valckenier Suringar noted the place and date of collection, sometimes accompanied by some ecological and floristic notes. He participated several times in the excursions of the Royal Dutch Botanical Society, and collected plants at these occasions. He took his students into the field and taught them how to collect plant specimens, which resulted in the collection 'Landloopers' (see chapter 2). For more detailed information on Valckenier Suringar's collections I would like to refer to Beumée (1942).

Part of the Herbarium Generale was destroyed in 1945, at the end of the Second World War, when there were some direct hits in the upper floor of the Department building.

Dr. F.M. Muller (Fig. 11) checked and updated the identifications and nomenclature of the Herbarium Generale in the 1970's and the beginning of the 1980's and identified unnamed specimens.

3.3.3 Collections from The Netherlands

Specimens from the 19th Century collected in The Netherlands and present in the Herbarium Vadense mainly belong to the collections of W.C.H. Staring (collected in c. 1833–1850), C.M. van der Sande Lacoste (c. 1838–1859) and H.J. Kok–Ankersmit (c. 1851–1879). Collectors who contributed substantially to the Herbarium Vadense are the plant community researchers H. Doing (c. 1958–1961), S. Segal and V. Westhoff (c. 1952–1955). Examples of others who added more or less extensive collections are Koorneef (collected around 1895–1929), M. Bremer (c. 1903–1909), L.H.

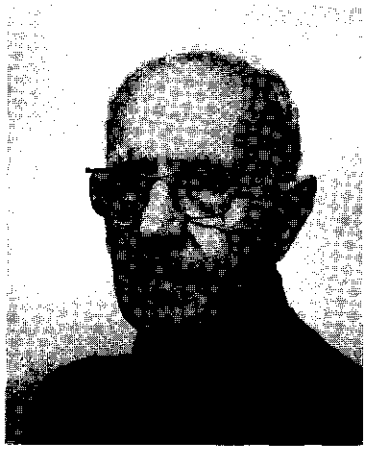

Fig. 11. Dr. F.M. Muller.

Baas Becking (c. 1902–1919), P. Meys (c. 1913–1922), E. de Vries (c. 1916–1923), J.C. Vegilin van Claerbergen (c. 1927–1937, c. 200 specimens), J. Jeswiet (c. 1927–1939), C.G.S. Braat (c. 1931– 1939), B. Geertsema (c. 1931–1950, 120 specimens), A.L. Brandhorst (c. 1928–1954), T.C. Winkler (c. 1935), G. Sissingh (c. 1939–1940), J.H.A. Boerboom (c. 1954–1959), J. de Bruijn (c. 1958–1980, c. 470 specimens), F.J.Ch. van Prehn Wiese (c. 1960–1970, c. 300 specimens), J. Bakker (c. 1960–1961, 114 specimens), A. Touw (c. 1962) and E. Meijer Drees (c. 1958–1961).

A limited number of specimens has been collected during students' excursions in the Netherlands. A hand collection of indigenous Dutch plants is kept separately and is available for educational purposes.

Important specialistic collections are those of W. Beijerinck (collected in c. 1934–1951) and R.J. Bijlsma (1974–1993) of the genus *Rubus*, whereas the herbarium of P. Vermeulen comprises a large and much consulted collection of orchids. It consists of numerous specimens collected in the Netherlands and other European countries, and is often furnished with labels with detailed descriptions and analyses of flowers.

In general, many specimens collected in the Netherlands were obtained before 1920, and the very limited number of recent collections of many species is sometimes considered as a lacuna, particularly for educational purposes. However, collecting plants in a country with sparse natural areas and many rare species is disputed nowadays.

When the study of biology was founded at Wageningen Agricultural University in 1970 and the collections of wild plants from the Netherlands became more important for educational purposes, the nomenclature was partly updated by J. de Bruijn, K. van Setten and D.O. Wijnands.

3.3.4 Recent collections from other European and Mediterranean countries

From 1972 onward, an annual excursion of biology students to the eastern Pyrenees (Fig. 12) is organized jointly by the Department of Plant Taxonomy and the Department of Entomology Section Animal Taxonomy of the Wageningen Agricultural University, and the Universities of Perpignan and Toulouse. The students study the flora and fauna in the diverse biological communities between the Mediterranean coast and the high peaks of the Pyrenees, and are taught how to make proper herbarium collections (collecting, identifying, documenting, drying). In almost 25 years this has grown into a large collection of herbarium specimens. It consists of approximately 2900 collections representing 1200 taxa. This collection is kept separate from the general collection of the Herbarium Vadense, to enable students and staff to study the plants occurring in the eastern Pyrenees in preparation for the excursion. The vast majority of the species that can be found in the excursion area and during the excursion period (June–July) is represented.

Other recent collections from Europe and the Mediterranean are generally not numerous in specimens. The following recital is a selection of the more extensive collections.

E. Meijer Drees collected plants during his many trips (c. 3000 specimens), S. Segal mainly in southern France (c. 1300 specimens), J.H.A. Boerboom in southern Spain (1974–1984), J.J.F.E. de Wilde et al. in Morocco (1961, 1992, about 1500 specimens), J.W.A. Jansen in Tunisia (675 specimens), G. Kunkel in the Canary Islands (490 specimens), J.H. Vredebregt and L.J.G. van der Maesen in the Canary Islands (550 specimens, 1968), E. Hennipman et al. in Turkey (c. 1500 specimens), H.C.D. de Wit in Spain (c. 400 specimens) and L.J.G. van der Maesen in Tunisia (1966, c. 200 specimens), Turkey (1971; c. 400 specimens) and Iraq/Iran (1972–1974; c. 400 specimens); see also de Bruijn (1980).

Fig. 12. Excursion in the Pyrenees; J. de Bruijn, head of the technical staff of the Herbarium Vadense from 1958 to 1990, in the centre (with hat).

Acknowledgements

I am grateful to J. de Bruijn for his valuable information about the collections and their history.

3.4 Tropical Africa, especially Gabon

F.J. Breteler

3.4.1 Introduction

The very first collections from tropical Africa that were incorporated in the Herbarium Vadense comprised two sets of duplicates. Both came from former German colonies, one from the Nyassa Hochland in Tanzania (coll. A. Stolz 1909–1912), the other from Cameroun (Zenker 1913–1914). Both collections contained less than a thousand species in about the same number of specimens. The Zenker duplicate set concerns the so–called pencil numbers.

For a long period, until 1955, these small collections formed the

main body of the African collection at Wageningen. This situation changed when Dr. H.C.D. de Wit was appointed lecturer at Wageningen University to teach the taxonomy of tropical plants. Rather soon he decided to focus his research on Africa, a continent that, in many ways, was rather neglected in the Netherlands, certainly in taxonomic sense. A few years earlier, the Wageningen University had established its 'Centre Néerlandais' near Abidjan in Côte d'Ivoire, to facilitate research in tropical agriculture in a wide sense.

At present, 43 years later, the Herbarium Vadense contains almost 350,000 specimens from tropical Africa, 62% of its total collection. This has been achieved by two main activities, firstly by an active collecting programme of Dutch botanists in Africa and, secondly, by a worldwide exchange programme of duplicates between the Herbarium Vadense and many other herbaria all over the world. The collecting activities are briefly dealt with in the following paragraph.

A point of interest that should be mentioned is the specialization of the Herbarium Vadense within the African context, namely towards the tropical rain forest. This is largely due to the subjects of taxonomic research that where chosen by the staff members, but also because the forest needed more attention on account of a higher species diversity than the drier areas. The situation of high species diversity in combination with being poorly explored is certainly valid for the forests of Gabon and were, and still are, the reasons to focus the explorative activities of the Herbarium Vadense on this country.

In 1984, the Herbarium Vadense was greatly enriched by the incorporation of the African collections from the Groningen Herbarium (GRO). This collection, originally distributed from Berlin, of c. 11,500 specimens contained a wealth of type material. This has, at least for a large part, been dealt with in two publications (Bos & van Veldhuizen, 1991, 1995) in which 1008 types in 111 families have been located.

3.4.2 The botanical explorations by Dutch botanists

De Wit undertook his first explorative travels in 1955, followed by several others in subsequent years. In 1956, J.J.F.E. de Wilde was the first student to be sent to the Centre Néerlandais to collect in Côte d'Ivoire. He was followed by Dr. A.J.M. Leeuwenberg who was the first to collect in a modern way, i.e. with as many duplicates as possible in order to set up an exchange programme with other

Fig. 13. Collecting expedition on Mount Cameroun, 1962, with Letouzey (centre, with hat), Leeuwenberg (right, with hat), and de Wilde (foreground left).

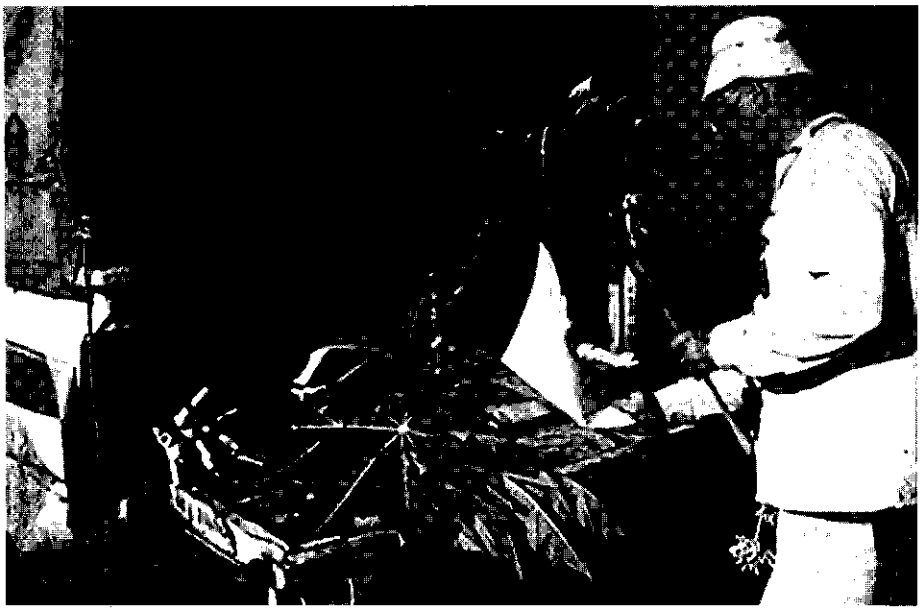

Fig. 14. J. de Bruijn preparing a papaya plant in Gabon for pressing.

institutes in and outside Africa. Collecting programmes in other countries like Liberia and Cameroun (Fig. 13) started a few years later (See Letouzey, 1980 for an account of Dutch activities in Cameroun.). This was followed later on by an active programme in countries like Ethiopia and Nigeria and, much later, also in Moçambique.

In 1980, de Bruijn (Fig. 14) published an extensive account of 25 years of botanical exploration by Wageningen staff members and students in tropical Africa under the direction of Prof. de Wit. Now, 16 years later, at the centennial of the Herbarium Vadense, it is appropriate to see where we stand now in the context of exploration.

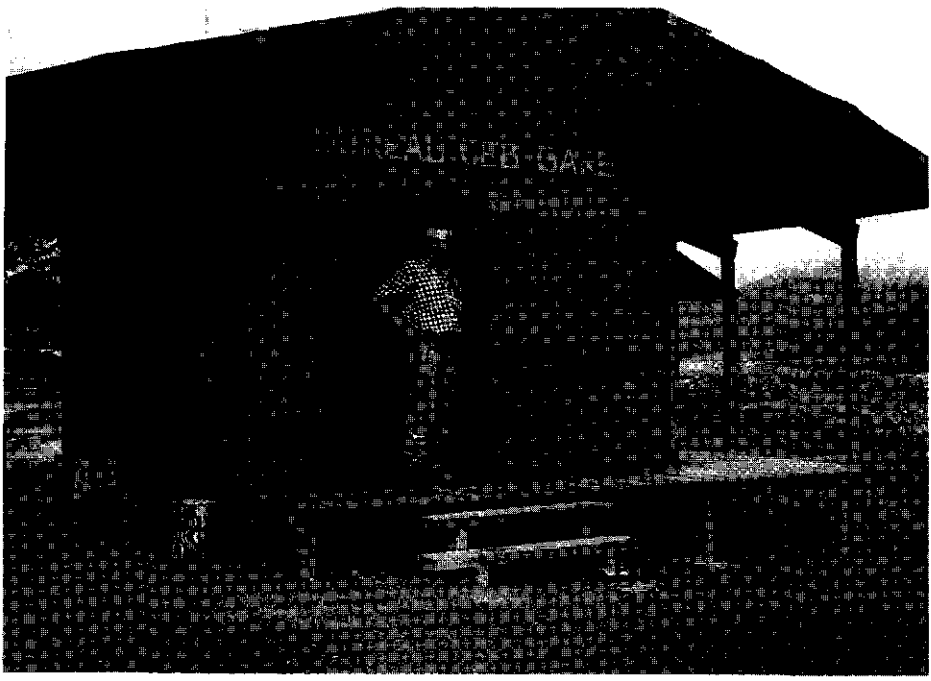

Fig. 15. F.J. Breteler at the railway bureau of a forest exploitation company at Lastoursville, Gabon.

country	1980	1996
Cameroun	22.329	26.099
Congo	-	78
Côte d'Ivoire	22.613	25.488
Ethiopia	31.726	31.726
Gabon	2.167	20.647
Ghana	567	2.134
Kenya	2.429	3.390 *
Liberia	7.139	7.227
Malagasy	240	1.487
Malawi	-	504
Moçambique	-	6.425 *
Nigeria	7.108	7.108
Tanzania	1.203	3.486
Zambia	-	222
Zimbabwe	-	220
	97.521	136.241

Table 2. Comparison of the number of specimens collected by Herbarium Vadense staff and students in the more important countries of Africa in 1980 and 1996; * The figures for these countries from 1992 (van der Maesen, 1993) are higher than given here in 1996. It is supposed that the 1992 figures also include some duplicates.

Table 2 shows that in West and Central Africa there is no or very little increase from countries like Liberia and Nigeria, a slight increase from Côte d'Ivoire and Cameroun, and a comparatively substantial increase from Ghana, but especially so from Gabon, with a number that is almost tenfold when compared with 1980. Congo figures for the first time. In eastern Africa Ethiopia does not show any increase and there is only a slight increase from Kenya, Tanzania and Uganda, countries that are covered by the Flora of Tropical East Africa. The increase from Tanzania is mainly due to a fine fern collection of c. 2000 numbers by R.R. Schippers (Schippers, 1993). From the countries of the Flora Zambesiaca area Malawi makes its first appearance as well as Zambia and Zimbabwe, but the main increase from this area is from Moçambique. Malagasy shows a substantial increase but its total is still comparatively low. In Table 3 the contributions are given in detail.

country	collector(s)	year/period	number
Cameroun	H.J. Beentje	1980–1981	211
	F.J. Breteler	1990–1994	73
	A.P.M. de Kruif	1982–1983	363
	A.P.M. van der Zon	1981–1986	2691
	J.J. Wieringa	1994	426
			3770
Congo	J.J.F.E de Wilde & L.J.G. van der Maesen	1993	78
			78
Côte d'Ivoire	P. Albers	1989–1990	122
	R. Barink	1981	90
	B. Bleijendaal-Spierings	1983	855
	F.J. Breteler	1995	54
	A.P.M. de Kruif	1979, 1981	725
	A. de Rouw	1983–1989	753
	A.J.M. Leeuwenberg	1981	177
	L.J.G. van der Maesen	1986	58
	H. Zwetsloot	1980	41
			2875
Gabon	M.P.T. Alers & A. Blom	1986	208
	J.C. Arends, A.M. Louis & J.J.F.E. de Wilde	1992–1993	414
	J.J. Bos, F.M. v.d. Laan & Th. Nzabi	1985	323
	F.J. Breteler et al.	1980–1996	4248
	J.J.F.E. de Wilde et al. (WALK–B)	1983	938
	J.J.F.E. de Wilde et al.	1986–1995	2325
	R.M.A.P. Haegens	1993–1994	271
	A.J.M. Leeuwenberg	1982	173
	A.J.M. Leeuwenberg & J.G.M. Persoon	1985	232
	A.M. Louis, F.J. Breteler & J. de Bruijn	1983	1254
	J.M. Reitsma et al.	1985–1991	3204
	J. Schoenmaker	1991	405
	M.A. van Bergen	1995–1996	409
	X.M. van der Burgt	1993–1994	116
	L.J.G. van der Maesen	1986	37
	L.J.G. van der Maesen & J. de Bruijn	1988	604
	M.H. van den Houten	1995–1996	80
	F.I. van Nek	1990–1991	678

	J. von Asmuth & J. Vosmeer	1992–1993	228
	J.J. Wieringa et al.	1989–1994	2333
			18.480
Ghana	F.J. Breteler	1995–1996	13
	C.C.H. Jongkind	1993–1996	1554
			1567
Kenya	L. Lap	1981–1982	216
	R.J. Quené & J. van de Wege	1989	67
	J.M. Reitsma	1979–1980	573
	F.M. van der Laan	1986	105
			961
Liberia	A.G. Voorhoeve	1981	88
Malagasy	A.J.M. Leeuwenberg	1982–1995	653
	M.A. van Bergen	1992	89
	F.I. van Nek	1993	405
			1147
Malawi	F.J. Breteler	1991	44
	A.P.M. de Kruif	1983	189
	J.J.F.E. de Wilde	1991	223
	A.J.M. Leeuwenberg	1991	19
	M.S.M. Sosef	1991	29
			504
Moçambique	J. de Koning	1978–1989	3136
	L. Groenendijk	1982–1990	1857
	P.C.M. Jansen	1980–1984	1129
	P.C.M. Jansen, J. de Koning & J.J.F.E. de Wilde	1981	303
			6425
Tanzania	F.J. Breteler	1992	198
	R.R. Schippers	1966–1987	2000
	F.M. van der Laan	1986	85
			2283
Zambia	F.J. Breteler	1992	222
Zimbabwe	A.P.M. de Kruif	1983	220

Table 3. Collections by Dutch botanists in Africa in the years 1980-1996.

3.4.3 The Gabon programme

In 1976, Floret published an account of the Gabon collections at Paris. He estimated that the total amount of collections made by French collectors did not exceed a number of 26,000, of which c. 15,000 by only 3 collectors: Klaine, Le Testu, and N. Hallé.

As shown in table 2 the Herbarium Vadense collections from Gabon have increased from 2167 in 1980 to 20,647 numbers now. Together with duplicates of collections from other sources the Gabon collections at Wageningen now total about 39,500, c. 7% of the entire collection and almost 12% of the collections from tropical Africa. Because the present programme of cooperation between the Herbarium Vadense and the Herbier National du Gabon it still very lively, it is expected that this percentage will grow steadily.

When the collections from Dutch and French sources are taken together the total amount, including some collections by other botanists, does certainly not exceed 60,000. This is a rather low number when the botanical wealth of the Gabon forest is taken into account. Some illustrations of this wealth have been given in previous publications (Breteler 1989, 1990, 1992) and is further illustrated in the series 'Novitates Gabonenses'. This comprises publications by Wageningen staff members. A complete list of this series is given elsewhere in this memorial volume.

In a recent study (Breteler, unpublished) an estimation in species numbers was made of the woody flora of the Central African closed forest area. The study was limited to trees of at least 10 cm diameter at breast height or at least obtaining a height of 10 m. For an important taxonomic group like the Leguminosae–Caesalpinioideae the study revealed the following figures as regards to total number of species and number of endemics for the main countries of the area, viz. Cameroun, Gabon, and Zaire; from Congo no figures were available.

	Cameroun	Gabon	Zaire	total
number of species	100	134	90	189
number of endemics	20	38	30	88

Table 4. Comparison between total number of species and number of endemics of the woody caesalpinioid flora (> 10 cm DBH) in closed tropical rain forest in three Central African countries.

Of the total of 189 species of Caesalpinioideae 36 occurred in all 3 countries, 41 in Cameroun and Gabon, 20 in Gabon and Zaire and 4 in Cameroun and Zaire, but not in Gabon. The study also revealed that when the total number of woody forest species of Central Africa has to be estimated, the number of Gabon species has to be multiplied by c. 1.4. This illustrates Gabon's high species diversity which is further stressed when its relative surface of closed forest and state of exploration are taken into account, as shown in table 5.

country	appr. surface of closed forest	state of exploration*
Cameroun	12.5 %	3
R.C.A.	1.2 %	3
Guinee Equatoriale	1.8 %	1
Gabon	12.5 %	2
Congo	12 %	1–2
Zaire	60 %	3

Table 5. State of exploration of Central African countries.
* 5 = very well; 4 = good; 3 = mediocre; 2 = insufficient; 1 = highly insufficient.

This high species diversity and poor state of exploration played an important role in the decision to concentrate the exploration activities of the Herbarium Vadense on the Gabonese forests. A map showing the state of botanical exploration of Gabon in 1988 was published 6 years ago (Breteler, 1990). This map is reproduced here with an updated one to show the changes that have taken place in the 8 years interval and with at least 10,000 more collections (Fig. 16a, b).

The main changes since 1988 are found in the squares B9, C9, D4, F5, G9, and I3 with some minor ones elsewhere. A substantial improvement, but almost half of Gabon's surface is still 'covered' by blanc squares.

The activities undertaken to protect the tropical rain forest in such an important area of Africa have to be supported by an active exploration programme together with a sound taxonomical research programme. The fruitful cooperation between the herbaria of Libreville and Wageningen is a big asset to reach this goal.

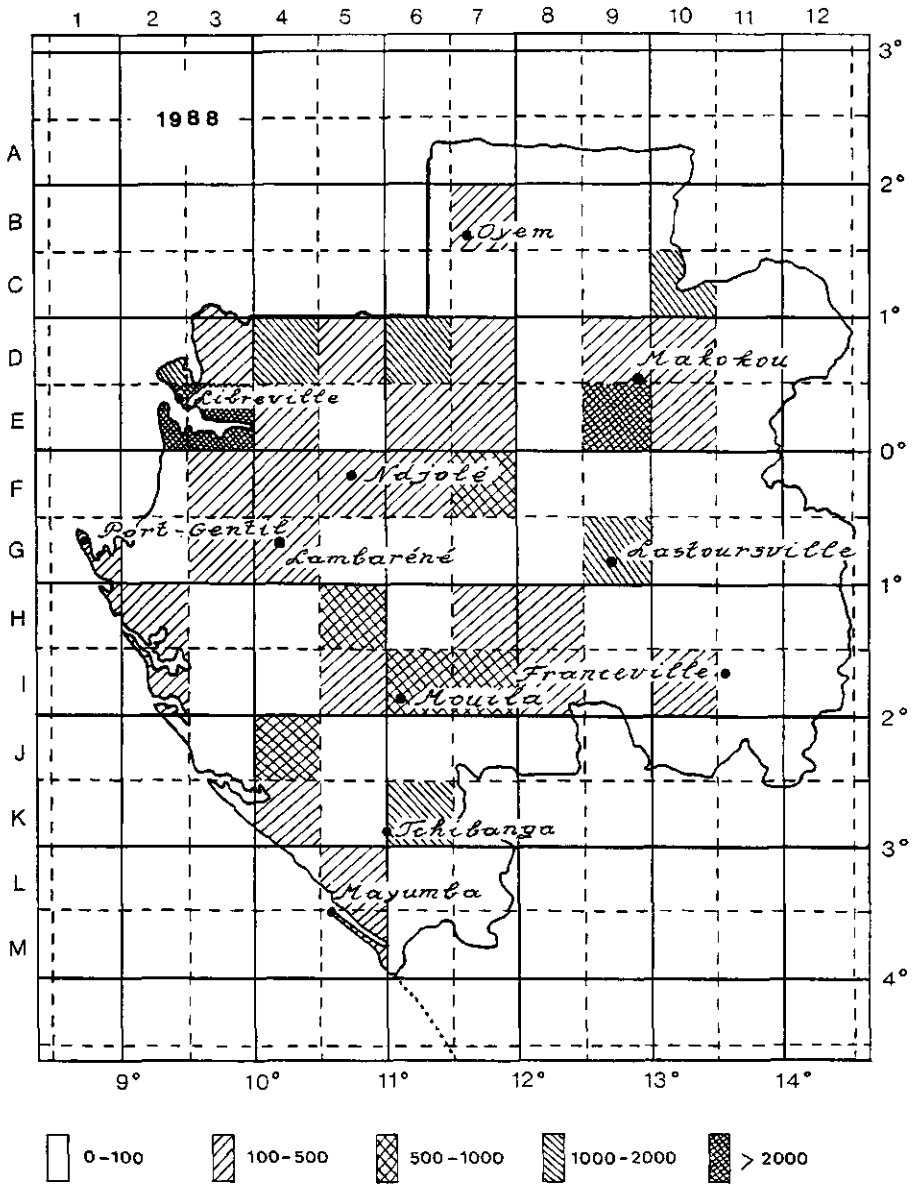

Fig. 16a. Collection density in Gabon; situation as in 1988.

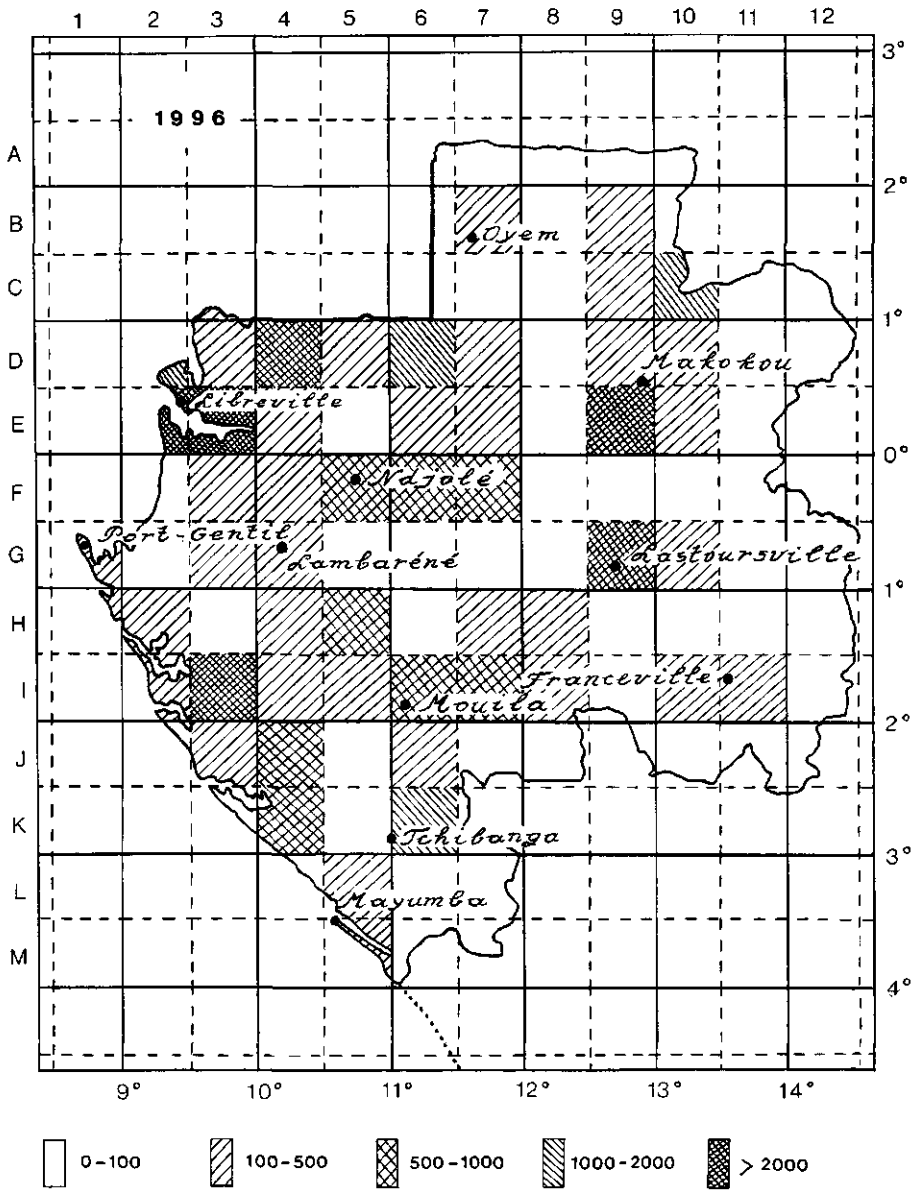

Fig. 16b. Collection density in Gabon; situation as in 1996.

3.5 Tropical regions in Asia, Australia and America

J.J.F.E. de Wilde

3.5.1 Introduction

The more ancient collections dealt with in this contribution were originally incorporated in what was called the 'Herbarium Tropicum' of the Agricultural University (Landbouwhogeschool). This contained the plants growing in tropical parts of the world, and they were kept separate from respectively the General Herbarium, the Dendrological Herbarium and the Herbarium Officinale. Around 1935 it included predominantly duplicates from the Herbarium Bogoriense and the Experimental Station for Forestry at Bogor (Buitenzorg), Indonesia, and from the Herbarium of the Surinam Forest Service at Paramaribo, Surinam. At the time Wageningen was the centre for the education of forestry officers destined for duties in the Dutch overseas colonies. Obviously some preserved plant collections were deemed useful for the introduction of the students into tropical plant taxonomy. Until World War II the Herbarium Tropicum remained very modest, and the majority of the specimens it contained was collected by foresters educated at Wageningen. After the war, and in particular after the appointment at Wageningen in 1953 of H.C.D. de Wit as a lecturer in Plant Taxonomy and Plant Geography of the Tropics and Subtropics, the collections of specimens that originated from these parts of the world show a distinct increase favoured by a policy of active collecting, exchange and purchase. In consultation with colleagues in Leiden and Utrecht it was agreed that in Wageningen emphasis was to be put on the study of the flora of tropical Africa. As a consequence original collections from S.E. Asia, though few in number, were in principle sent to Leiden. Likewise materials from tropical America or duplicates thereof were sent to Utrecht.

Presently the total number of specimens in the Herbarium Vadense is estimated at about 560,000. Of these some 43,500 originate from Asia and Australia and an estimated 32,000 specimens from Central and South America.

3.5.2 Tropical Asia and Australia

Prior to World War II the taxonomic study of plants leading to monographs or contributions to Flora's was almost not practised at Wageningen. There was no distinct preference nor specific geographic specialization, and the herbarium was merely used as a reference collection for students. Accordingly the collection consisted predominantly of duplicates of which the originals were housed in Bogor (Buitenzorg) or in Leiden. Scholars, such as J.G.B. Beumée, a forest officer who in 1922 took a doctors' degree at Wageningen Agricultural University on a subject entitled: 'Onderzoekingen van de korte flora der djatiplantsoenen' deposited their collections at Bogor and duplicates were often sent to Leiden. An exception is made for Jeswiet and for a part of the collections by Endert and Thorenaar.

Born in 1879 in Amsterdam, Jacob Jeswiet (Fig. 17) was educated as a botanist at his native town and took a doctors' degree in the University of Zürich. From 1912–1925 he was Chief of the Department of Genetics of the Sugar Experiment Station at Pasoeroean in Indonesia. In 1925 he was appointed Professor of Taxonomy and Plant Geography and director of the Arboretum at Wageningen. His dismissal in 1946 was a result of misdemeanour during the years of German occupation. During his stay in Indonesia he collected on Java, Madoera, Sumatra, Krakatou, Pulau Weh, and Bali (for detailed information see van Steenis–Kruseman, 1950). From May–September 1928 he joined an American expedition to New Guinea and Papua in search for wild progenitors to be used in sugarcane breeding. According to Van Steenis–Kruseman (1950) the Herbarium Vadense holds numbers 36–293 from this New Guinea collection. Numbers 1–35 were collected in Australia (Sydney and Canberra). Following the collection made in New Guinea the numbers 294–389 were again collected in Australia (Sydney, Botany Bay, 22–24 September 1928). Furthermore a few numbers collected by Jeswiet from 1912–'17 on Java and Sumatra, followed by a collection of 2002 numbers gathered on these same islands between August 1918 and 1925, are in Wageningen. In a letter to Professor Jeswiet, dated 23 May 1927, the director of the Forest Research Institute at Buitenzorg (Java) sent word that two boxes containing herbarium material and dried fruits, intended for the collections of the Landbouwhogeschool, were shipped to Wageningen. The material was collected by and under the supervision of Messrs Endert and

Fig. 17. Prof. Jeswiet (centre) next to the huge flower of *Amorphophallus titanum* on May 8, 1935; hole cut in the spatha in order to pollinate the female flowers.

Thorenaar from numbered trees at Palembang. Two lists were added. A first list is alphabetically arranged according to family names, and it contains 1047 numbers of herbarium specimens. Within each family genus- and fairly often species names are specified. Each name goes with an enumeration of the number(s) by which it was collected by Endert or by Thorenaar or by both collectors. The same holds for the second list which specifies 143 numbers of dried fruits. In the letter it is stated that from the same numbers material is also present at the Forest Research Institute and at the Herbarium at Buitenzorg.

In 1928 F.H. Endert presented at Wageningen a thesis entitled: 'Geslachtstabellen voor Ned. Indische boomsoorten naar vegetatieve kenmerken [Generic keys to the Dutch Indian tree species using vegetative characters]'. Most of his collections from Sumatra, Java, Borneo and Celebes (Sulawesi) were deposited in the Forest Research Institute with duplicates at the herbaria in Bogor and in Leiden.

The following is an enumeration of the more important collections from tropical Asia and Australia that are present in the Herbarium Vadense. No completeness has been pursued. Where known, collecting localities, dates, and the number of specimens concerned are given.

- J.H. Becking: New Guinea (1961), 20 specimens.
- J.L. Boorman and others: Australia, Queensland, 47 specimens.
- F.J. Breteler: Australia, mainly Queensland (1989); 79 specimens; New Zealand, mainly South Island (1994), 131 specimens.
- D. Burger: Indonesia, Java (1918–c.1924), 186 specimens (voucher material for his book on tree seedlings).
- H. Dihm: Indonesia, Java, Sumatra etc. (1917–'23), 256 duplicates from München.
- F.H. Endert & A. Thorenaar: Indonesia (before 1927), 1190 specimens.
- Forest Research Institute: Indonesia, 704 duplicates from Leiden (L).
- H. Huber: Sri Lanka (Fl. Ceylon Project 1977), 43 duplicates from Hamburg (HBG).
- J. Jeswiet: Indonesia, Papua New Guinea, Australia (1912–1929), c. 2250 specimens.
- C. Kalkman: Indonesia, Irian Jaya (1956–'58), some duplicates of the Forestry Div. Neth. New Guinea.

- A.J.M. Leeuwenberg: China (1986 & '89), 80 specimens.
- A.J.M. Leeuwenberg: Indonesia & Singapore (1978–'94), 607 specimens.
- L.J.G. van der Maesen: India (1970–'82), 1036 specimens.
- W. Meijer: Indonesia, 200 specimens of rice from Sumatra.
- E. Meijer Drees: Indonesia (1936–'47), a few specimens.
- P. Molhuysen: Indonesia, Java (1903–'12), 82 Bryophytes and c. 40 ferns.
- J.P. Mousset: Indonesia, Tengger (1910–'13), 210 specimens.
- A.C. Smiet: Indonesia, Java, Kali Konto Project (1988), 61 duplicates from Leiden (L).
- H.U. Stauffer and others: New Guinea (1964), 15 duplicates from Zürich (Z).
- J.J.F.E. de Wilde: Indonesia, Irian Jaya, Biak (1959–'60), 112 specimens (nos 1147–1259) 76 of which were sent to Leiden.
- C.A. Wisse: Indonesia, N. Sulawesi (1932–'33), 106 specimens.

3.5.3 Tropical Central and South America

As in Asia, the nucleus of the tropical American collections has been brought together by foresters and agronomists educated at Wageningen University and assigned to duties in the former Dutch West Indies. Collections, mainly from forest trees, by e.g. C.J.J. van Hall, J.W. Gonggrijp and F. van Niel, made between 1905 and 1912 in Surinam, are among the oldest from this region present in the Herbarium Vadense.

Plants of the herbarium from Dr. Otto Buchtien collected respectively in northern Patagonia (nos 3052–3088), Bolivia (nos 3091–3130), and Chile (nos 3131–3223), all around 1907, were probably purchased by J. Valckenier Suringar. In 1928 J.T.P. Bijhouwer donated an important herbarium that contained 545 specimens collected by him on Cuba. In the subsequent 25 years little activity in the field of acquisition of herbarium from S. America has been recorded.

Between c. 1955 and 1968 Dutch technical aid to developing tropical countries made it possible to send G.H. Raets followed by the botanist F.J. Breteler, and later J. de Bruijn, to Venezuela and Colombia. They were stationed at the Instituto Forestal Latino-Americano at Merida. Besides providing training to local assistants in fieldwork and herbarium techniques they made important plant collections from which the original material is deposited at Wage-

ningen (e.g. Breteler nos 3054–5199; de Bruijn nos 938–1756). In this same period and in later years Dutch scientists and students working with the 'Dienst 's–Lands Bosbeheer [National Forest Service]' and with CELOS (Centrum Landbouwkundig Onderzoek Suriname [Centre for Agricultural Research Surinam]) added significantly to the collections from this area presently at Wageningen. Although most collaborators of the Herbarium of the Suriname Forest Service sent the originals of their collections to Utrecht, duplicates of these are often housed at Wageningen. In a few cases the entire collection was sent to Wageningen from where duplicates were distributed. Among the collectors of which the Herbarium Vadense holds material the following are cited: J.H.A. Boerboom, N.W.J. Borsboom, A. Budelman, A. de Gier, C.J. Gieteling, E. Groenendijk, C.C.H. Jongkind, R.W. den Outer, J.P. Schulz and J.T. Sterringa (see also de Bruijn, 1980).

In recent years important collections were also acquired by exchange. Foremost with the Herbário, Museu Botânico Municipal, Curitiba, Paraná, Brazil (MBM) which sent considerable sets of the herbarium Hatschbach. Many more duplicates from South American plants were received in exchange with Copenhagen (C), Madrid (MA), New York (NY: e.g. the collections H.S. Irwin, G.T. Prance, T.B. Croat etc.), Stockholm (S), and Washington (US).

3.6 Cultivated plants

J.J. Bos

In this chapter I have endeavoured to list all persons that have contributed cultivated plant material to the Herbarium Vadense in the course of its existence. Their status ranges from the professional collector to the pure amateur. The contributions vary from incidental to frequent and serial over extended periods of time. It was not feasible to glean the exact dates or periods of collecting from the actual specimens in the herbarium. Therefore, I have chosen to indicate the dates that contributions were made in the following manner: for prolonged periods of contributions the effective years in which they were made. In most cases exact data could not be given and a rough estimate is made preceded by 'c.'. In the case of more or

less incidental contributions the year(s) of one or few of such collections is preceded by fl. (*floruit*).

In this list there has been no discrimination according to the measure of domestication of the plants concerned. Perfectly wild plants with no known relation to man have been included whenever they were grown in a garden or conservatory and subsequently collected there.

The reasons for incorporating cultivated plants in the Herbarium Vadense have been various. In the beginning years whole collections have been purchased by, put at the disposal of, or donated to the Herbarium Vadense in order to provide demonstration material for classroom education. Initially this was mainly material from the temperate zones. Particularly for classes in garden design, ornamentals and dendrological collections were acquired. With the advent of education in colonial subjects tropical collections, particularly such gathered in the Dutch East Indies, were added. However, on the subject of plants cultivated in the tropics this list is certainly incomplete. In the Herbarium Vadense specimens recognized as having been collected from cultivated plants are identified by a CULTA stamp on the cover. Exotics planted in tropical countries are often not annotated as such on the labels of the collected specimens and have not received this stamp. As such they are not readily recognized as cultivated material. This is particularly the case of species used in forestry, shade– and wayside trees and ornamentals.

Apart from these, amateurs have donated plants they collected in private gardens and those in countries they visited, throughout the existence of the Herbarium. Also entire collections brought together by amateurs in the course of their lives have been donated at the end of their collecting days or eventually by their heirs. Such collections usually include wild plants as well.

Particularly after World War II, research carried out in the Wageningen Botanic Gardens focused more on trials of ornamentals and samples of the plants involved ended up in the herbarium. With the advent of the cultivar concept the necessity of conserving vouchers led up to what is now the Standard Specimen: conserved plant material vouching for the name of the cultivar. Plants involved in other types of research carried out by the various university departments and governmental research institutes started to find their way to the Herbarium Vadense as well.

In the course of several projects focusing on useful and economic plants in a number of African countries, the plants involved were studied not only in Africa, but in gardens and conservatories in Wageningen as well. Since c. 1960 such material has been conserved to a larger extent in the Herbarium Vadense, while in a number of cases also duplicates have been distributed to other herbaria, particularly to those in the countries where such research was initiated. Special value has to be attached to the private research collections of some specialists: the vast dendrological herbarium of Leonard Springer (Fig. 18), the reference collection of cultivated plants of B.K. Boom, the author of comprehensive volumes covering all ornamental taxa cultivated in the Netherlands, outdoors as well as indoors, and the almost exhaustive collection of temperate orchids of the late P. Vermeulen, many raised by the owner and subsequently conserved.

Fig. 18. L. Springer working on his dendrological collections in the Herbarium.

The contributors detected by me in the Herbarium Vadense are listed here alphabetically:

Abdallah, M.: taxonomist, fl. 1966, *Reseda* from Wageningen Bot. Gard.
Aleva, J.F., & H.H. de Leeuw: staff Wageningen Bot. Gard., fl. 1990, standard specimen of *Prunus* 'Bandolero'.
Amshoff, Miss G.J.H.: taxonomist, fl. 1955, *Hibiscus* collected at Rhodos.
Anonymus: Brooklyn Bot. Gard., fl. 1980, *Buddleja*.
Anonymus: Herb. Bot. Gard. Bogor, fl. 1921, *Lagerstroemia*.
Anonymus: Herb. Bot. Gard. Kew, periodically specimens of cultivated plants are received in exchange of usually non-cultivated duplicates from WAG.
Anonymus: Herbarium Vadense, fl. 1949, *Helianthemum* hybrids from various Dutch commercial nurseries.
Anonymus: Hort. Bot. Canterbury, fl. 1974, *Buddleja*.
Baas Becking, Miss L.H.: garden designer, c. 1910–1930 (?), Ornamental trees from commercial nurseries and Wageningen Bot. Gard., one particularly interesting collection was made by her in 1912 in the temperate conservatory of the villa Belmonte when it was still a privately owned country house (After WW II, when the villa was destroyed, the grounds became part of the Wageningen Bot. Gard. known as Arboretum Belmonte).
Backer, C.A.: taxonomist, fl. 1913, *Oryza sativa* accessions from Java (Indonesia).
Baenitz, C. (in cooperation with several other collectors in his collection): professional collector, c. 1900–1910, dendrological demonstration collection from parks and gardens in eastern Europe, particularly in East Germany and Poland. This collection was purchased by Valckenier Suringar for educational purposes in the horticultural school.
Baud, C.: herbarium staff, fl. 1958–1959, usually assisted J. de Bruijn in collecting plants from the Wageningen Bot. Gard. and conservatory WAG.
Bean, W.J.: taxonomist, fl. 1919, *Vitis* collection from Kew Gardens.
Becking, R.W.: forester, fl. 1948, *Platanus* from Hinkeloord, garden Dept. of Forestry, Wageningen Univ.
Beijerink, W., & Miss A. Krijthe:, ecologist, fl. 1927–1935, *Calluna vulgaris* from various localities in the Netherlands.
Beijerink, W., & Miss A.J. ter Pelkwijk: ecologist, 1947–1952, collection of *Rubus* from the new garden in Wijster (prov. Drente, the Netherlands). Sometimes also M.H. Vaandrager and rarely Th. Reichelt are involved as well.
Belder, J.: staff Wageningen Bot. Gard., c. 1970–1980, mainly ornamentals from the Wageningen Bot. Gard. and elsewhere, particularly roses.
Biegel, H.W.: assistant, fl. 1934, *Prunus* from Wageningen Bot. Gard.
Bijhouwer, J.T.P.: student, fl. 1928, *Hibiscus* and *Macadamia* cultivated in Cuba.
Bleijendaal, H.P.O.: forester, fl. 1980, woody ornamental legumes mainly from Dutch botanical gardens.
Boelema, G.: administrator, Dept. of Plant Taxonomy, c. 1930–1960, plants from the horticultural establishment of Copijn in Groenekan and often jointly with G.H. Ruisch in the Wageningen Bot. Gard.
Bolhuis, A.R.: agronomist, fl. 1958, *Hibiscus* and *Gossypium* from the conservatory of the Dept. of Trop. Crops and some plants cultivated in a private garden in the province of Zeeland.
Boom, B.K.: taxonomist, Institute for Horticultural Breeding, extensive collections of ornamental herbs, shrubs and trees as vouchers for his extensive publications in these fields.

Bos, J.J.: taxonomist, Dept. of Plant Taxonomy, as of 1993 also curator Wageningen Bot. Gard., 1964–present, miscellaneous collections from conservatory WAG, few from Wageningen Bot. Gard., occasional collections of cultivated plants from several African countries, extensive collection of *Capsicum* from Alemaya Agric. College, Ethiopia (accessions from all over the world).

Boschproefstation Buitenzorg: experimental garden Tjibodas, 1922, 1949 seedling and school collection of the Forestry Experimental Station in Bogor, probably incorporated for educational purposes in the Herbarium Vadense.

Braams, B.W.: amateur, fl. 1951, *Hibiscus syriacus* from Vught, the Netherlands.

Braat jr., C.G.S.: amateur, 1924–1931, ornamental trees and shrubs from several public parks in Dutch municipalities, particularly Vlissingen, The Hague and Wassenaar.

Brandenburg, W.A.: taxonomist, c. 1980–1987, *Clematis* species and cultivars related to his trial research.

Bremer, M.: status unknown, fl. 1907, contributed *Pisum* grown in Driebergen, the Netherlands.

Breteler, F.J.: taxonomist, Dept. of Plant Taxonomy, 1960–present, collections from conservatory and Wageningen Bot. Gard.

Buys, A.: status unknown, fl. 1933, *Amelanchier* from Wageningen Bot. Gard.

Cameron, A.G.: status unknown, fl. 1992, cultivated vegetable legumes in Australia.

Copijn, H., & son: horticultural establishment in Groenekan (near Utrecht, the Netherlands), 1942, cultivars of *Phlox subulata* (not identified).

Croockewit, H.W.E.: amateur, fl. 1956, ornamentals from East Africa.

Custers, J.B.M.: horticulturist, fl. 1971, spinach collection of the Dept. of Horticulture raised from seeds from widely diverging origins.

de Bruijn, J.: head of technical staff Herbarium Vadense, c. 1960–1990, plants cultivated in conservatory WAG and ornamentals from Wageningen Bot. Gard.

de Bruyne, P.: amateur, fl. 1903–1905, conifers (*Chamaecyparis & Thuya*) collected in private estates like Oranje Nassau Oord (a Royal residence near Wageningen) and the estate of miss Wolterbeek in Oosterbeek near Arnhem, also from the spice garden in Middelburg.

de Jong, P.C.: dendrologist, fl. 1969–1971, *Acer* from botanical gardens to municipalities and private gardens.

de Langen, F.: RIVRO (research institute), fl. 1983, *Dianthus* cultivars from the research station for floriculture.

de Nijs, L.J.: ecologist Dept. of Weed Control, fl. 1986, *Cyperus esculentus* from various sites in the Netherlands.

de Vette, A.: amateur, fl. 1950, *Magnolia* collected in Wageningen.

de Vries, E.: amateur, fl. 1920, few garden ornamentals (*Laburnum*) from private garden in Wageningen.

de Vries, Miss I.M.: PhD student, 1984–1987, *Lactuca* species and cultivars.

de Wilde, J.J.F.E.: taxonomist, 1956–present, miscellaneous collections from parental garden in Beverwijk to Wageningen Bot. Gard. and conservatory.

de Wilde, W.J.J.O.: taxonomist, fl. 1966, crops (*Gossypium*) in Ethiopia.

de Wilde–Duyfjes, B.E.E.: taxonomist, fl. 1959, *Allium* cultivated in Wageningen Bot. Gard. and private gardens.

de Wit, H.C.D.: professor of taxonomy and Head Dept. of Plant Taxonomy as of 1970, 1953–1980, miscellaneous plants from conservatory WAG and Wageningen Bot. Gard., emphasis on *Allium* and aquatic plants.

Debreczy, Z., & I. Racz: dendrologists, fl. 1979–1981, conifers from European, particularly Hungarian and Polish arboreta.

Dinn, Th.J.: garden designer, fl. 1902, collected *Statice* on the Canary Islands.
Doorenbos, S.G.A. sr. & J. jr.: breeders and horticulturists, fl. 1948, dendrological collections from Zuiderpark, The Hague.
Doorenbos, S.G.A.: director Zuiderpark, The Hague, c. 1930–1960, cultivated woody plants from various sources in Europe and the U.S.A.
Ekema, S.N.: status unknown, fl. 1971, *Hibiscus* and *Malvaviscus* collected in the Victoria Bot. Gard. (Limbe) in Cameroun and communicated by Leeuwenberg to the Herbarium Vadense.
Elzinga, D.: staff Wageningen Bot. Gard., fl. 1977–1978, ornamental perennials from the Wageningen Bot. Gard. and the *Vinca* collection from Bot. Gard. nursery 'Het Spijk'.
Espirito Santo: professional collector, between 1937 and 1955, few cultivated plants from Guinee Bissau (e.g. *Hibiscus sabdariffa*).
Frahm–Lelieveld, Mrs. J.A.: agronomist, c. 1950–1960, (Trop.) agricultural crops from various sources, particularly from the conservatories of the Dept. of Tropical Crops in Wageningen.
Frietema de Vries, Miss F.: graduate student, fl. 1987, *Cyperus esculentus* and its cv. Chufa grown at the Dept. of Weed Control.
Getachew Aweke: taxonomist, fl. 1965, collected few plants from the Wageningen Bot. Gard. during his liaison in Wageningen from Addis Ababa Univ.
Groen, L.E.: taxonomist, 1985–present, various collections with emphasis on succulents.
Groendijk–Wilders, Mrs. N.: assistant, 1980–present, particularly perennials from the Wageningen Bot. Gard.
Grotenbreg, W.H.: head gardener, c. 1960–1977, occasional collections from the conservatory WAG.
Guda, Mrs. dalla: status unknown, fl. 1992, *Hebe* cultivars from Inst. Sper. Floricultura, San Remo, Italia.
Hennipman, E. c.s.: Turkey expedition, taxonomists, fl. 1959, *Citrus* cultivated at Antalya Exp. Station.
Hensen, K.J.W.: garden taxonomist, c. 1950–1980, ornamentals from Wageningen Bot. Gard. particularly plants involved in his trials research and received from various horticultural sources.
Herb. Brandhorst: fl. 1928–1934, Dendrological collections a.o. from Nieuw Amelisweert (private estate near Utrecht) bequaethed to the Herbarium Vadense.
Herb. Hoogland Culturen (apparantly a herbarium of crops cultivated at higher elevations in colonial Indonesia, collectors a.o. Arendsen Hein, Giltay, van Gorkom and van Leersum): fl. e.g. 1898, particularly *Cinchona*, probably also intended for classroom demonstration.
Herb. Labohm: private collection, 1937–1949, woody ornamentals mainly from S. European and particularly Italian gardens. Donated to the Herbarium Vadense.
Hijwegen, T.: amateur, fl. 1956, *Rosa* from private gardens in Wageningen.
Hogenhout, J.J., & M.M. van der Knaap: herbarium staff, fl. 1955, *Crataegus* and *Malus* collections from Wageningen Bot. Gard.
Huizinga, M.: amateur, fl. 1958, garden ornamentals from gardens in The Hague, Voorburg, Wassenaar and Wageningen.
Hylmoe, B.: dendrologist (?), fl. 1981, *Cotoneaster* as cultivated in Sweden.
Jansen, A.A.M.: amateur, fl. 1958, monstrosity in *Asparagus* found in Dongen, the Netherlands.
Jansen, J.: commercial florist in Malden, the Netherlands, fl. 1927–1935, *Calluna vulgaris* from various localities in the Netherlands.
Jansen, P.C.M.: agronomist/taxonomist, fl. 1974–1975, various spices, particu-

larly *Nigella* and *Capsicum*, Dept. of Trop. Crops, Wageningen and Alemaya, Ethiopia.

Janssen, W.J.M.: chief horticulturist, Wageningen Bot. Gard., c. 1950–1970, few collections from Dutch Bot. Gard.

Jeswiet, J.: professor of Plant Taxonomy and director Wageningen Bot. Gard., fl. 1926–1945, *Oryza sativa* as cultivated in New Guinea and woody ornamentals from various botanical gardens in the Netherlands including his private garden in Bennekom.

Jongkind, C.C.H.: taxonomist, fl. 1993, few collections from Wageningen Bot. Gard.

Joordens, M.: agronomist, fl. 1960, *Pisum* from Dept. of Agronomy, Wageningen Univ.

Karper, J.J.: horticulturist, c. 1950–1960, ornamentals from private gardens.

Koehne, E.: professional collector, fl. 1904, Herbarium Dendrologicum mainly collected in the Bot. Gard. of Berlin. Like the herbarium of Baenitz this was purchased as demonstration collection for the horticultural school. Most specimens are accompanied by a detailed analytical drawing of the floral parts.

Kok Ankersmit, H.J.: promotor of agricultural education in Wageningen, c. 1850–1880, cultivated Dutch flora elements for educational purposes and donated agricultural crop collections to the school herbarium.

Koopman, W.J.M.: plant breeder, 1990–present, cultivated lettuce (*Lactuca* spp.) and related taxa.

Kreuzen, E.M.: chief gardener Wageningen Bot. Gard. before WW II, fl. 1924, *Robinia* and *Ulmus* from public parks in Utrecht.

Lancaster, R.: horticulturist, fl. 1982, *Buddleja* from English gardens.

Langendijk, G.: botanical illustrator, c. 1950–1970, several collections from Wageningen Bot. Gard.

Leeuwenberg, A.J.M.: taxonomist, staff member Dept. of Plant Taxonomy, c. 1955–1996, Miscellaneous collections from conservatory WAG and Wageningen Bot. Gard., occasional collections of cultivated plants in several African countries and Indonesia, particularly *Loganiaceae* (*Buddleja*) and ornamental *Apocynaceae* from European gardens.

Leeuwenberg, A.J.M., & Rudjiman: taxonomists, fl. 1984, *Cinchona* cultivated in central Java, Indonesia.

Legro, R.A.H.: plant breeder, fl. 1949, *Cyclamen* from the collection in the conservatory of the Dept. of Horticulture, Wageningen Univ.

Letschert, J.P.W.: PhD student, 1988–1992, voucher material of wild and cultivated *Beta* sect. *Beta* raised for his research.

Loos, B.P.: PhD student, 1990–1993, voucher material of wild and cultivated *Lolium* species raised for her research.

Macuacua, L.: professional collector, fl. 1979, *Lagerstroemia* from hortus INIO, Maputo, Mocambique.

Magaji, S.O.: status unknown, fl. 1965, *Lagerstroemia* from a Nigerian garden.

Magendans, J.F.C.: amateur, fl. 1959, ornamental garden plants from private garden in Katwijk, the Netherlands.

McClean, A.P.D.: status unknown, fl. 1959, *Citrus* collection from Buffelspoort Exp. Station, South Africa.

Meijer Drees, E.: agronomist, fl. 1959, collections from the garden of governmental experimental station for seed inspection.

Meijer, F.G.: agronomist (?), fl. 1964, cultivated crop (*Gossypium*) in Ethiopia.

Meijer, W.: taxonomist, fl. 1957, very extensive collection of *Oryza sativa* cultivated in W. Sumatra, Indonesia.

Mennega, E.A.: staff member Utrecht Bot. Gard., fl. 1969, *Gesneriaceae* grown in the conservatory in Utrecht in exchange for identifications by Leeuwenberg; fl. 1975, particularly *Buddleja* from Cantonspark.

Meyer, F.G., P. Mazeo, and others: status unknown, fl. 1968–1972, cultivated (woody) ornamentals, mainly from U.S. Nat. Arboretum in Washington D.C.

Middelhoven, W.J.: microbiologist, fl. 1963, *Allium* from Denmark.

Moerheim Nurseries ltd.: fl. 1942, herbarium specimens of perennials in exchange for identifications.

Mouthaan, M.R.: herbarium staff, fl. 1970, ornamental shrubs from Mallorca.

N.D.V. (Netherlands Dendrological Society): meets once a year at the Herbarium Vadense. Quite some interesting material shown on these occasions has found its way into the Herbarium Vadense brought in by park directors, arboretum owners and commercial growers.

Nannenga–Bremekamp, Mrs. N.E.: taxonomist, c. 1960–1970, various collections of plants cultivated in the Wageningen Bot. Gard., particularly *Araliaceae* incl. *Hedera*, *Philadelphus*, and *Umbelliferae*.

Perdue, R.E., & S.P. Kibuwa: professional collectors, fl. 1966, ornamentals in Kenya.

Peter, A.: professional collector, fl. 1914, *Cinchona* cultivated at Amani, Tanzania.

Peterse, A.: horticulturist, fl. 1985, Japanese cherries (*Prunus serrulata*) mainly from Wageningen Bot. Gard.

Plowman, T.: status unknown, fl. 1983, cultivated *Allium* from Chicago, USA.

Reekmans, M.: professional collector, fl. 1979–1981, ornamentals in Burundi.

Reilingh, W.: status unknown, fl. 1907, cultivated plants collected in Edina, Liberia, originally in the Groningen Univ. herbarium (GRO) of which the African collections were incorporated in the Herbarium Vadense in 1984.

Renkema, H.W.: assistant, fl. 1951, *Rosa* from Wageningen Bot. Gard.

Ross, H.: professional collector, fl. 1909, *Platanus* in herb. Siculum.

Ruisch, G.H.: Amanuensis, Dept. of Plant Taxonomy, c. 1930–1970, collections from conservatory WAG and Wageningen Bot. Gard.

Satabié, B.: director Nat. Herb. of Cameroun, fl. 1974, occasional cultivated ornamentals from gardens in Cameroon e.g. *Buddleja*.

Schallert, P.O.: professional collector, fl. 1963, purchased collection of cultivated ornamentals in a Florida private garden.

Schneider, F.: horticulturist, fl. 1965, assortments of ornamentals from the experimental station for arboriculture in Boskoop, e.g. *Acer*, *Calluna vulgaris* cultivars, *Daboecia* cultivars, *Rhododendron* spp.

Seegeler, C.J.P.: agronomist, fl. 1971–1973, conservatory and Dept. Trop. Crops *Linum* seedlings, *Carthamus tinctorius* from Wageningen Bot. Gard.

Siemonsma, J.S.: agronomist, fl. 1978, *Abelmoschus* (Okra) in Ivory Coast.

Snoeier, W.: horticulturist, fl. 1992, cultivars of *Catharanthus roseus* from the collection of the Division of Pharmacognosy in Leiden.

Sommer, I.: status unknown, fl. 1910, particularly *Laburnum* from (German?) gardens.

Springer, L.A.: landscape and garden architect, c. 1890–1930, extensive dendrological herbarium eventually donated to the Herbarium Vadense, consisting of ornamental woody plants from botanical gardens, private and public parks and horticultural establishments in the Netherlands and several other European countries.

Staring, A.C.W. sr. & W.C.H. jr.: poet and agronomist/geologist respectively, fl. 1833–1834, garden plants collected mainly in the garden of their country seat 'De Wildenborch' near Vorden, the Netherlands. This family herbarium was

donated to the Herbarium Vadense at its establishment by Staring jr. who, together with his friends Jongkind Koninck and Kok Ankersmit, was a promotor for the establishment of agricultural and horticultural education in Wageningen.

Tadessa Ebba: agronomist at Alemaya University, Ethiopia, c. 1965–1970, several Ethiopian crops and numerous Ethiopian accessions of cultivated *Eragrostis tef.*

ter Pelkwijk, Miss A.J.: assistant to S.G.A. Doorenbos and later to W. Beijerink, c. 1930(?)–1947 and 1947–1952 respectively, woody ornamentals often in herb. Doorenbos and *Rubus* from the living collection in the garden in Wijster, the Netherlands.

Touw, A.: taxonomist, fl. 1962, *Ulmus* from Wageningen Bot. Gard., Zuiderpark, the Hague and the Iepenproeftuin (exp. garden), Baarn.

Toxopeus, H.: plant breeder, fl. 1960, *Citrus* hybrids from the conservatory of the Dept. of Plant Breeding, Wageningen Univ.

Valckenier Suringar, J.: director Wageningen Bot. Gard. from 1899 to 1926, collection of cultivated plants as of 1900, mainly ornamental shrubs and trees, donated his entire herbarium in 1928.

van de Harre, A.: horticulturist at Kapelle near Goes, the Netherlands, fl. 1913, sent in vegetative samples of *Buxus* and *Prunus laurocerasus* possibly intended for classroom demonstration?

van de Laar, H.J.: horticulturist, c. 1960–1980, ornamentals from the experimental station for arboriculture in Boskoop, e.g. *Buddleja*, *Calluna vulgaris* cultivars, *Daboecia* cultivars, *Pyracantha*, *Rhododendron* spp.

van den Berg, R.G.: taxonomist, Dept. of Plant Taxonomy, c. 1980–present, cultivated plants particularly cultivated semi–domesticated relatives of the potato.

van den Ende, C.: graduate student, fl. 1961–1962, *Potentilla* and *Sorbus* from Wageningen Bot. Gard.

van der Laan, F.M.: technical assistant, 1977–1987, miscellaneous collections from Wageningen Bot. Gard. and conservatory WAG with emphasis on tropical African orchids.

van der Werf, S.: ecologist, fl. 1958, collections from experimental plots of various governmental research institutes in Wageningen.

van der Zon, A.P.M.: agrostologist, fl. 1984, crops cultivated in Cameroon.

van Eijnatten, C.L.M.: horticulturist, fl. 1962, horticultural and agricultural crops from Nigeria.

van Lennep, C.: status unknown, fl. 1895–1897, garden plants collected in Hort. Marb. (?Marburg). Particularly interesting is his collection of a *Laburnum* on 27 May 1897 in de Dreijen. De Dreijen is the initial garden laid out around the newly constructed horticultural school in 1896. This collection must be one of the earliest ones from what later became the Wageningen Bot. Gard.

van Oosten, M.: agronomist, fl. 1958, agricultural crops of Iran.

van Prehn Wiese, F.J.C.: staff Wageningen Bot. Gard., c. 1950–1970, ornamentals from Wageningen Bot. Gard. and municipality of Wageningen, garden plants from parks and private gardens in Spain.

van Setten, K.: herbarium staff Dept. of Plant Taxonomy, 1975–present, conservatories Depts of Plant Taxonomy and Tropical Crops, experimental plots of various Agric. Univ. Depts and DLO institutes of the Ministry of Agric. in Wageningen.

van Steenbergen, J.W.: herbarium staff c. 1960–1980, ornamentals from Wageningen Bot. Gard. and plants from conservatory WAG, often together with J. de Bruijn.

van Veldhuizen, J.: herbarium staff, 1973–present, plants cultivated in Wageningen Bot. Gard., conservatories and experimental plots of various institutes in

Wageningen.
van Zee, A.: herbarium staff, c. 1960–1970, ornamentals from Wageningen Bot. Gard., together with J. de Bruijn.
Vegilin van Claerbergen, Jhr. J.C.: amateur, fl. 1933, garden plants from the province of Friesland.
Venema, H.J.: professor of Plant Taxonomy and director Wageningen Bot. Gard., c. 1930–1970, scattered miscellaneous collections from Wageningen Bot. Gard. and Jardin des Plantes, Montpellier, France.
Verboom Bros. Nurseries: Boskoop, fl. 1942, herbarium specimens of perennials, probably in exchange for identifications.
Vermeulen, H.: plant breeder (?), fl. 1959, *Citrus* cultivars from the Faculty of Agriculture of Rehobot Univ., Israel.
Vermeulen, P.: orchidologist, c. 1930–1980, cultivated species of European orchid collected during his lifetime in a private herbarium and bequeathed to the Herbarium Vadense after his death.
Veth, M.E.: Schiphorst Nurseries, Wageningen, fl. 1959, perennials.
Vrugtman, F. & I., horticulturists, fl. 1967, *Acer* from Hamilton, Canada.
Westendorp, A.H.: amateur, may be pre–1900, probably a donation to the herbarium of the horticultural school consisting of woody ornamentals collected in gardens in Amsterdam.
Westphal, E. & J.M.C. Westphal–Stevels: taxonomic–agronomists, 1967–1968, Ethiopia, tropical crops and particularly legumes, after repatriation particularly legumes in Dept. of Tropical Crops in Wageningen, 1975–1982, Cameroon, particularly vegetables, these also from the Dept. of Tropical Crops in Wageningen in the years after their repatriation in 1978.
Wieringa, J.J.: PhD student, 1992–present, mainly introductions from Africa raised in the conservatory WAG.
Wiersma, J.H., & B. Schalk: foresters, fl. 1965, contributed duplicates of the demonstration collection of the Dept. of Forestry, mainly from the garden of Hinkeloord, the seat of the Dept.
Wiersum, K.F.: forester, fl. 1971, *Pinus* from exp. plots in Turialba, Costa Rica.
Wijnands, D.O.: director Wageningen Bot. Gard., 1977–1993, cultivated plants from various sources in Europe including the Canary Islands.
Wilson, A.P.: professional collector, fl. 1942, woody ornamentals from the Arnold Arboretum (probably acquired after WW II).

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3.7 Special collections

K. van Setten & J. van Veldhuizen

3.7.1 Wood samples

Collections of wood samples are reported already before the technique to make herbarium specimens was developed in the first half of the 16th century (den Oudsten, 1980). During the 17th and 18th century such collections consisted of small boxes shaped like a book. The box was manufactured from a certain kind of wood, its back and sometimes also its front and back cover decorated with a piece of bark. Inside one could find parts of the plant species i.e. a small twig, dried fruits, flowers, leaves, etc., and sometimes a short description of the wood and the tree. They were used primarily for educational purposes in botany, medicine and joinery. The Herbarium Vadense once owned such a collection but it was probably lost during World War II.

At present, wood samples are generally collected along with herbarium specimens, because without vouchers their value is extremely limited. Vouchered samples provide the possibility to check the right identity of the wood and to re–identify it when the original identification appears to be wrong. The wood samples are now mainly used for wood anatomical research and to check upon the description of bark and slash characteristics for identification purposes in the field.

The Herbarium Vadense belongs to the approximately 135 institutions in the world that own a collection of wood samples (Stearn, 1988). The building up of this collection started in the early 1960's and it has grown to about 4,500 numbers (Fig. 19). The majority of the collection was brought together by staff members and consists of material from Cameroun, Gabon and several West African countries. The emphasis of the wood collection from Africa is on shrubs, small trees, but especially on lianas. Important collections from Venezuela and Colombia gathered by Dr. F.J. Breteler and J. de Bruijn, comprising some 450 items, are kept at the Department. Duplicates of the latter collections were sent to various well–known foreign wood science institutes and to the herbarium at

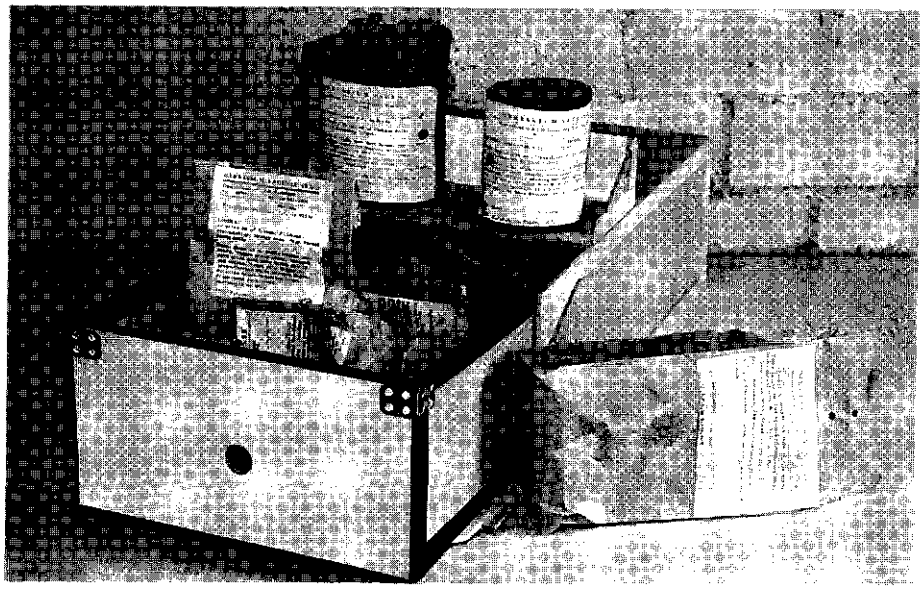

Fig. 19. Wood collections kept in special boxes and separate bags, or with labels pinned to sections of a stem.

Fig. 20. Part of the spirit material collection of the Herbarium Vadense.

Utrecht. This South–American collection concerns mainly trees of the tropical rain forest. A small number of wood samples originate from the Wageningen Botanic Gardens.

3.7.2 Alcohol material

Besides the possibility to conserve plant material by drying, one can also put particular plant elements in a conserving liquid. This has the great advantage that such plant elements retain their original shape. When one thinks of what happens when complicatedly shaped flowers such as orchids, or juicy fruits, are pressed and dried, the advantages of collecting and preserving of material in liquid are obvious. Such material is also preferred when botanical illustrations are prepared.

In the field the plant material is collected in plastic pots with the so–called conserving liquid F.A.A. composed of 60% alcohol (95%), 30% water, 5% acetic acid and 5% formaldehyde (37–40%). The material should remain in this liquid for at least 2 x 24 hours, after which it is put in glass bottles filled with alcohol 70%. Conservation in the field in 70% alcohol is also practised, but for anatomical and ontogenetic purposes the fixation in F.A.A. is preferred.

The alcohol collection, or 'wet herbarium', comprises a very important part of the Herbarium Vadense. The total number of alcohol–preserved specimens kept at the Herbarium Vadense amounts to slightly over 20,000 (Fig. 20) which renders this collection one of the largest in the world. It is not known when the collecting of material for alcohol preservation started, but probably it was early this century. The oldest samples conserved in alcohol date back about a hundred years. The majority of the collections originate from tropical Africa and is therefore of eminent importance for the study of the flora of this continent. Most collections accompany a herbarium collection and bear a label with field data. A minor part of the collection serves educational purposes and originates mainly from the botanic gardens and the tropical or temperate glass houses at Wageningen.

4 The role of the Herbarium Vadense in the taxonomy of the tropics, especially of tropical Africa

F.J. Breteler & A.J.M. Leeuwenberg

When in the early fifties Prof. de Wit aimed at taxonomic research of tropical Africa (Fig. 21) and to play a role in this field with virtually no means, one can imagine how great a challenge this was. There was little or no experience at the Herbarium Vadense with taxonomic research of tropical plants in general, and certainly not of Africa. The herbarium, apart from a few duplicate collections of Africa, had to start from scratch. The library more or less equipped to serve for teaching, was very much inadequate, like the herbarium, for taxonomic research of tropical African plants. And above all, there was no trained staff, neither technical nor scientific.

Besides all these disadvantages attached to the taxonomic research of tropical Africa, there was also a big advantage: there were no colonial ties which restricted the potential research to a certain part of Africa or to one or a few countries of that continent. Instead of doing floristic work, the Department could start its taxonomic work on a continental scale, i.e. doing monographic work.

To cope with the disadvantages, the monographic research that was undertaken by the young scientific staff included much fieldwork not only for general collecting but also for specific collecting of the taxon concerned. These collections had to be of good quality which meant well preserved and with good field notes. Collecting of accompanying flowers and fruits preserved in alcohol or F.A.A. became almost a rule and collecting wood samples was also done whenever possible. Collecting specimens of the taxon concerned by the monographer himself was considered to be indispensable for good monographic work. This is certainly true for families with many lianas (e.g. *Apocynaceae, Connaraceae, Dichapetalaceae, Loganiaceae*) which show great plasticity and therefore often have uncertain specific limits.

It is obvious that the number of specimens in the Herbarium Vadense increased most rapidly in these families. During their revision the *Loganiaceae* (1959–1980) increased 75–fold from 2 to 150 boxes and now occupy 350 boxes. The *Dichapetalaceae* (1966–

Fig. 21. The stone tablet placed in the new herbarium building commemorating Prof. de Wit as initiator of the study on African plants in Wageningen.

1986) increased from 12 to 165 boxes and the *Connaraceae* from the same number in 1980 to 130 at present. The same has happened for the families under revision now, the *Apocynaceae* (since 1971), the *Begoniaceae* (since 1978) and the *Caesalpinioideae* (since 1990). Especially through 'duplicate for determination' services the first mentioned family has increased considerably from a 100 boxes in 1971 to c. 600 now. This increase during monographic work is not in number of specimens only but also in taxonomic quality by obtaining many isotypes. As already mentioned above, collecting by the Wageningen monographers was not for their own purpose only but was general collecting with emphasis on their speciality and that of their colleagues either at the Herbarium Vadense or elsewhere.

As a characteristic of the Wageningen monographers may also be mentioned their aim to consult all available herbarium material of their speciality, and to label it with the correct name. Therefore, many visits to the main Africa herbaria are needed, first to select loans and later on to annotate the remaining material. The Department also tried to illustrate as many species as possible. Nowadays, this is no longer feasible because of severe cuts in funding.

The gentleman's agreement with the herbaria of the Leiden and

Utrecht universities was and still is not an armour to prevent any taxonomic activity across continental borders. Taxa which are mainly confined to Africa, but which have small extensions on other continents, have been monographed entirely. An early example is *Abrus* (*Leguminosae-Papilionoideae*) that was revised completely (Breteler, 1960). A more recent example is the revision of *Leucomphalos* (*Leguminosae-Papilionoideae*; Breteler, 1994) with all but one species in Africa. The monograph of *Adenia* (*Passifloraceae*) by W.J.J.O. de Wilde (1971) is another example. In this genus 78 species are restricted to Africa whereas only 13 are confined to Asia. Sometimes a worldwide treatment of a genus is needed in order to establish true generic boundaries. Leeuwenberg's revision of *Tabernaemontana* (*Apocynaceae*) is such an example. It has been published in two parts, one for the Old World (1991) and one for the neotropical species (1994). In the case of *Rhizophora* (*Rhizophoraceae*) the continents are the boundaries and the oceans the links between the various groups of species (Breteler, 1969, 1977).

In Wageningen, monographic work was often accompanied by research in other botanical disciplines, mostly by botanists from elsewhere. This multidisciplinary approach led to the publication of a second edition of the *Loganiaceae* in the series Die natürlichen Pflanzenfamilien (Leeuwenberg, 1980). Breteler's work in the *Dichapetalaceae* inspired Dr. Punt of Utrecht University to a thorough study of the pollen of this family (Punt, 1975) and to van Veenendaal & den Outer of Wageningen Agricultural University to perform wood anatomical research (1978). Usually such a multidisciplinary research is fruitful to all parties, especially so when the monographer has the possibilities to provide the other disciplines with vouchered and well–identified samples. In this way de Lange & Bouman (1992) of the Amsterdam University produced a fine study on the micromorphology of *Begonia* seeds in connection with the current monographic work on that genus at the Herbarium Vadense. This taxonomic support also offered good opportunities to J. Doorenbos & R.A.H. Legro to study horticultural aspects of *Begonia* as well as to investigate their cytology.

Fieldwork also offered opportunities to collect viable seeds for cultivation in the Wageningen glasshouses. This in order to study the mature plants, flowers and fruits as well as to count their chromosome number and to study the seedling morphology. The result of this blastogenetic research is mostly dealt with in the monograph of

the taxon concerned. Bokdam (1977) made a special study of seedlings of *Sapotaceae* in order to reveal their taxonomic significance.

In the beginning the cytological research (on *Loganiaceae* and *Dichapetalaceae*) was done by Dr. (later Prof.) T.W.J. Gadella from Utrecht University (see Leeuwenberg, 1980 and Breteler, 1986) but later on by staff members of the Department, Dr. J.C. Arends and his assistant F.M. van der Laan. They did some excellent work in the *Apocynaceae* (van der Laan & Arends, 1985) and the *Dichapetalaceae* (see Breteler, 1986). Both authors were enthusiastic orchid collectors which resulted in a fine living collection at the Wageningen conservatory. Their research on monopodial orchids yielded among others a new orchid genus: *Ossiculum* (van der Laan & Cribb, 1986; Fig. 22).

Based on the monographic work in the different families, contributions were made to regional and national floras as shown in the following list. Only contributions to African flora's are listed, but in the case of *Apocynaceae* there is also a substantial number of contributions to extra–African flora's.

Fig. 22. *Ossiculum aurantiacum* P.J. Cribb & F.M. van der Laan, a new species and genus of African orchids named after Dr. H.J. Beentje.

List of contributions to African flora's based on monographic work at the Herbarium Vadense.

Apocynaceae	Flora Zambesiaca 7(2) (1985; together with F.K. Kupicha et al.).
	Contributions to the flora's of Central Africa, Cameroun, Gabon, Madagascar, and Tropical East Africa are in preparation.
Connaraceae	Flore du Gabon 33 (1992).
Dichapetalaceae	Flora of Tropical East Africa (1988).
	Flora of Ethiopia 3 (1989).
	Flore du Gabon 32 (1991)
	Flore du Cameroun (submitted).
Dracaenaceae	Flora of Ethiopia (in press, together with Demel Teketai).
	Flora of Southern Africa 5, 3 (1992; together with A.A. Obermeyer).
Loganiaceae	Flora of West Tropical Africa 2 (1963; together with C.F.A. Onochie).
	Flore du Cameroun 12 (1972).
	Flore du Gabon 19 (1972).
	Flore d'Afrique Centrale (1979).
	Flora Zambesiaca 7(1) (1983).
	Flora of Ethiopia (submitted).
	Flore des Mascareignes (submitted).

The contributions based on the monographic work in the *Begoniaceae* are expected to follow soon.

At the Herbarium Vadense also special studies were undertaken. Although these studies were not monographic, their taxonomic basis had to be good. A fine example is the publication on Liberian High Forest Trees by A.G. Voorhoeve (1965; reprinted in 1979). It treats 75 important forest trees taxonomically, with reference to numerous related species. It is well–illustrated and a key to these trees based on vegetative characters is provided. Another example is the Guide des ligneux sahéliens et Soudano–Guinéens by C. Geerling (1982), an indispensable tool for range management. In this respect van der Zon (1992) published a useful tool for the grasses of Cameroun in two parts, one treating all species taxonomically, the other part dealing with phytogeographic and grassland aspects.

J.M. Reitsma (1988) made a special study of the forest vegetation of Gabon, based on the data from several one hectare plots in Gabon. The results were also compared with the results of similar studies elsewhere revealing the exceptionally high species diversity of the Gabonese rain forests. A study that hopefully will help to safeguard the Forêt du Banco near Abidjan (Côte d'Ivoire) is the monumental work by J. de Koning (1983), edited in two parts. The first part, 'La Forêt', deals with its history and composition, the second part, 'La Flore', treats all the species of the 86 Angiosperm families present with descriptions and keys.

Besides all these contributions, either monographic or special, the role of the Herbarium Vadense is increasingly important as an indispensable tool for research in biodiversity, especially for those countries of which the herbarium holds large collections. Identification services to all kinds of research illustrates its importance time and again.

The Department with its Herbarium Vadense has also played an important role in the establishment or growth of national herbaria, e.g. those in Yaoundé (YA, Cameroun), Dire Dawa (ACD, Ethiopia), Monrovia (LIB, Liberia), Maputo (LMA, Moçambique), and Libreville (LBV, Gabon). Many of the results are due to a close cooperation with these institutes and others. The fruitful cooperation with the Herbier National du Gabon is worth mentioning. This cooperation started in the early 1980's and had, until recently, its emphasis on the logistic support and the exploration of Gabon's vegetation (Fig. 23 & 24). It is expected that it will soon enter a new phase in which the exploration will be continued of course, but with much more attention to the training of local taxonomists. This will help to create a lasting, modern, well–equipped herbarium with its own scientific staff and library, capable to serve the nations needs.

Africa is still very much behind as regards its national herbaria. Many countries do not dispose of a good reference collection for the sustainable management of their vegetation. The knowledge, as far as it exists, is stored in the herbaria abroad, mainly in Europe. That such a situation may also have its advantages becomes apparent in countries were civil wars or other political disturbances caused either severe damage to the national herbarium (Congo, Brazzaville (JEC)), or may have destroyed it completely (Liberia, Monrovia (LIB)). It is hoped that the Herbarium Vadense with its experience and expertise in the field of supporting local herbaria will also play an important role in the future.

Fig. 23. Dr. J.J.F.E. de Wilde (left) and his colleague from Amsterdam Dr. F. Bouman (right) collecting plants in Gabon.

Fig. 24.
Xanthocercis gabonensis van der Maesen (*Leguminosae- Papilionoideae*), a new giant tree species discovered in Gabon.

5 The role of the Herbarium Vadense in the study of cultivated plants

R.G. van den Berg & N. Groendijk–Wilders

5.1 Introduction

The taxonomic study of cultivated plants encompasses a wide spectrum of activities. Research can be conducted on the relationships between cultivated plants and their wild progenitors and close relatives, on the various steps of the domestication process, and on the principles of classification of the products of modern plant breeding efforts.

Cultivated plants are those plants which man grows to provide for his needs. These plants may belong to ornamental, horticultural, agricultural, silvicultural or industrial crops. Man's activities have produced an enormous amount of variation in this material, which needs to be classified and named. The rules of the nomenclature of cultivated plants have been laid down in a separate Code (latest edition: Trehane, 1995), while the principles of their classification are being debated (Hetterscheid & Brandenburg, 1995; Hetterscheid et al., 1996), focusing on the question whether the classification unit of cultivated plants (the cultivar) can be considered as a 'taxon' or should rather be recognized as a different entity for which the term 'culton' has been coined.

Whether taxa or culta, the need to name and record specimens of the cultivated plant material studied is as acute as for wild plants. In some cases where economic interests are at stake the ability to confirm the identity of plant material may literally decide over the gain or loss of large amounts of money.

To establish the identity of cultivars, a preserved so–called standard specimen, similar to a type specimen for wild taxa, can be valuable. Reference collections of important assortments should be maintained to enable comparison between disputed material and the original cultivar. Assigning such standards to all of the cultivars of popular ornamentals like tulips, gerberas, chrysanthemums etc. is an impossible task, however. Still, the need for a stabilising system in the names of cultivars, comparable to the type-method in botanical nomenclature, is apparent.

A problem with herbarium material is that the unique characteristics of a cultivar may very well be lost in the vouchered specimen. Some kinds of plants are difficult to preserve as herbarium specimens, without losing their characteristic properties (e.g. colour patterns in ornamentals), others possess parts that are hardly suitable for drying, like for example, the heads of lettuce. In some cases (e.g. fruits of cucurbits) the specimens can only be kept as spirit material of which the Herbarium Vadense has an important collection containing also many taxa of cultivated plants.

5.2 The period until c. 1980

The Herbarium Vadense has a long and fruitful association with the Department of Plant Taxonomy. This department is a combination of two former departments which concerned themselves with the taxonomy of tropical African plants and the taxonomy of cultivated plants, respectively. Since this fusion the holdings of 'culta' specimens have been enlarged substantially. Almost 15% of the total collection of the Herbarium Vadense consists of cultivated material (see also paragraph 3.6).

The collection of the Herbarium Vadense already contained many specimens of ornamental plants, due to the close connection with the Botanic Gardens. Among these are important reference collections, such as the one used for the 'Flora of Boom', dealing with plants cultivated in The Netherlands.

In the period before World War II hardly any taxonomic research activities on cultivated plants took place at Wageningen. Cultivated plants were mainly looked upon as ornaments or crops. Some demonstration material was kept at the Herbarium Vadense for education purposes; this comprised mostly trees and shrub species. Several lists of the hardy woody plants and the plants grown in the Botanical Gardens were published (e.g. Valckenier Suringar, 1923), as well as several contributions dealing with nomenclatural issues.

From about 1950 onwards, many studies on the assortments of ornamental plants were performed, later on in cooperation with the Dutch Association of Growers of Garden Perennials and the International Society of Hardy Plants. Some of the woody ornamental groups studied were *Acer* by P.C. de Jong, *Aesculus* and *Sorbus* by K.J.W. Hensen, *Rosa* by J. Belder and *Ulmus* by A. Touw. A study of the *Philadelphus* collection present in the Belmonte Arboretum has

been performed by Mrs. N.E. Nannenga–Bremekamp, using the herbarium collections of Valckenier Suringar and Springer of the Herbarium Vadense and that of Boom of the Rijksherbarium at Leiden.

Examples of some herbaceous groups studied are: *Aconitum, Anemone japonica, Arabis, Astilbe, Cimicifuga, Cyperaceae, Delphinium, Gramineae, Helenium, Heliopsis, Iberis, Lavandula, Luzula, Papaver, Sedum, Trollius* and *Vinca.* One of the larger research projects on assortments was that of Drs. K.J.W. Hensen on the *Hosta* collection. The first specimens brought to Europe by Von Siebold and Miquel in the herbaria of Leiden and Utrecht were examined as well. Between 1965 and 1980 the *Hosta* collection in the Wageningen Botanical Garden was expanded with plants from Japan, the United Kingdom and the U.S.A. About 250 specimens were collected, the majority representing cultivars, and 3 new cultivars were described by Hensen (1985).

5.3 Recent developments and research projects

Over the last 15 years, research on the taxonomy of cultivated plants has been conducted on a large number of taxa like *Allium, Aster, Beta, Brassica, Clematis, Daucus, Lactuca, Lolium, Oenothera, Salix, Solanum*, and *Tulipa*, to name but a few. Several of these were performed under the guidance of W.A. Brandenburg and later of R.G. van den Berg.

The late Dr. D.O. Wijnands (Fig. 25) was highly interested in historical aspects of cultivated as well as wild plants. He regularly published on nomenclatural problems he came across while unravelling the historical puzzles. He also wrote several contributions for the European Garden Flora project.

In the research projects on cultivated plants cooperation has been established with partners like the Vaste Keurings Commissie (VKC), the Centre of Genetic Resources in The Netherlands (CGN), the Centre for Plant Breeding and Reproduction Research(CPRO-DLO), and several departments of the Wageningen Agricultural University. All of these projects have resulted in collections of material that needed to be preserved. Generally, a shift from ornamentals towards food crops has taken place in the research programme.

Below, a number of the more recent research projects will be discussed, focusing on their relations with the Herbarium Vadense.

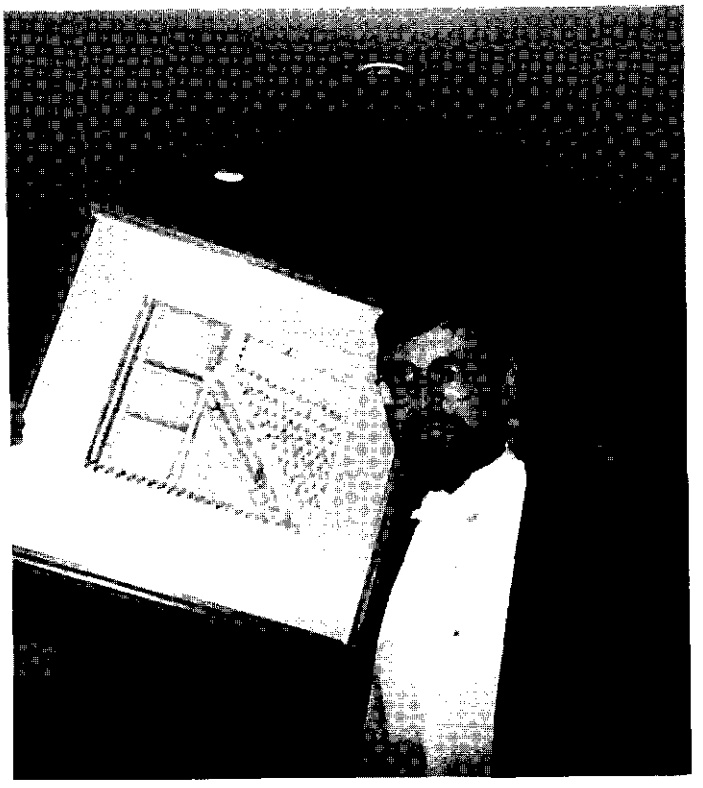

Fig. 25. Dr. D.O. Wijnands.

5.3.1 Aster

In cooperation with the VKC, Aalsmeer, a collection of current cultivars was brought together and studied to establish the status of their cultivar epithets, their affiliation with species names, and the status of those species. Finally, the cultivars producing small flowers for the cut flower industry were grouped in cultivar-groups, which were discussed with representatives of the industry in order to establish a stable, acceptable classification (Hetterscheid & van den Berg, 1996). Specimens of each cultivar were vouchered and standard specimens were designated according to the recommendations of the ICNCP 1995. These were the first standard specimens to be deposited in the Herbarium Vadense.

5.3.2 Beta

The wild relatives of commercial beets were the subject of a PhD project from 1988 to 1992. The morphological similarities and differences between the taxa of *Beta* sect. *Beta* were studied and the geographical variation of *Beta vulgaris* was analyzed (Letschert, 1993) using material from the collection of the CGN, Wageningen, from other gene banks and plants collected in Portugal, southern Spain and Cyprus.

During the inquiries into the problematic typification of the Linnaean names for wild and cultivated beets, it became necessary to establish lectotypes for the names *Beta vulgaris* and *Beta vulgaris* var. *cicla*, and neotypes for the names *Beta maritima, B. vulgaris* var. *perennis*, and *B. vulgaris* var. *rubra.* Lectotype material was selected from the pre–Linnaean collections of van Royen and Clifford. The neotype material was collected in Nieuwpoort along the Yser estuary on the Belgian coast, vouchered as Letschert & Fey 137 and deposited in the Herbarium Vadense (see Fig. 26).

Fig. 26.
Beta vulgaris L.subsp. *maritima* (L.) Arcang., the neotype specimen.

5.3.3 Clematis

In the course of a research project focusing on the yellow-flowered *Clematis* species (*C. orientalis* and its relatives) a large collection was gathered by soliciting seeds from many botanical gardens and extant collections of wild material. For a number of years a living collection was maintained in Wageningen and about 1070 specimens were collected from the trial fields. In the course of lectotypefying *C. orientalis* typotype material of that species was rediscovered (Brandenburg et al., 1987).

5.3.4 Lactuca

Wild and cultivated lettuce has been the subject of extensive research projects in Wageningen. Geographic distribution and morphological variation within the *Lactuca serriola*-complex based on the study of herbarium specimens was reported on by van den Boom (1986). Morphological variation, SDS-electrophoresis, crossing results, chromosome banding, karyotype and DNA content have been studied (de Vries, 1989; de Vries & van Raamsdonk, 1994; Koopman et al. 1993; Koopman & de Jong, 1996). Presently, the major part of the gene bank holdings of the CGN (Wageningen) of *Lactuca* and material of related genera like *Mycelis* and *Cicerbita* have been the subject of these types of research, while molecular studies (ITS sequence analysis and genome painting) on the same material are in preparation. It is obviously of paramount importance to secure a lasting record of the plants studied. In fact, the collection of lettuce material is exemplary in its attention to preserve as much information as possible, each herbarium specimen being accompanied by photographs of several stages in the development of the plant, slides of the pappus hairs, and 'seed' samples (see Fig. 27).

5.3.5 Lolium

A PhD project (1990–1993) studied rye-grass taxa. Some of these taxa were already influenced by man by the time Linnaeus first described them. One of the research questions was to what extent wild populations were still extant in the Netherlands and, inversely, whether cultivated material is influenced by introgression from wild populations. 51 populations obtained from gene banks, breeders, or research institutes, were classified into 7 *Lolium* species, and their

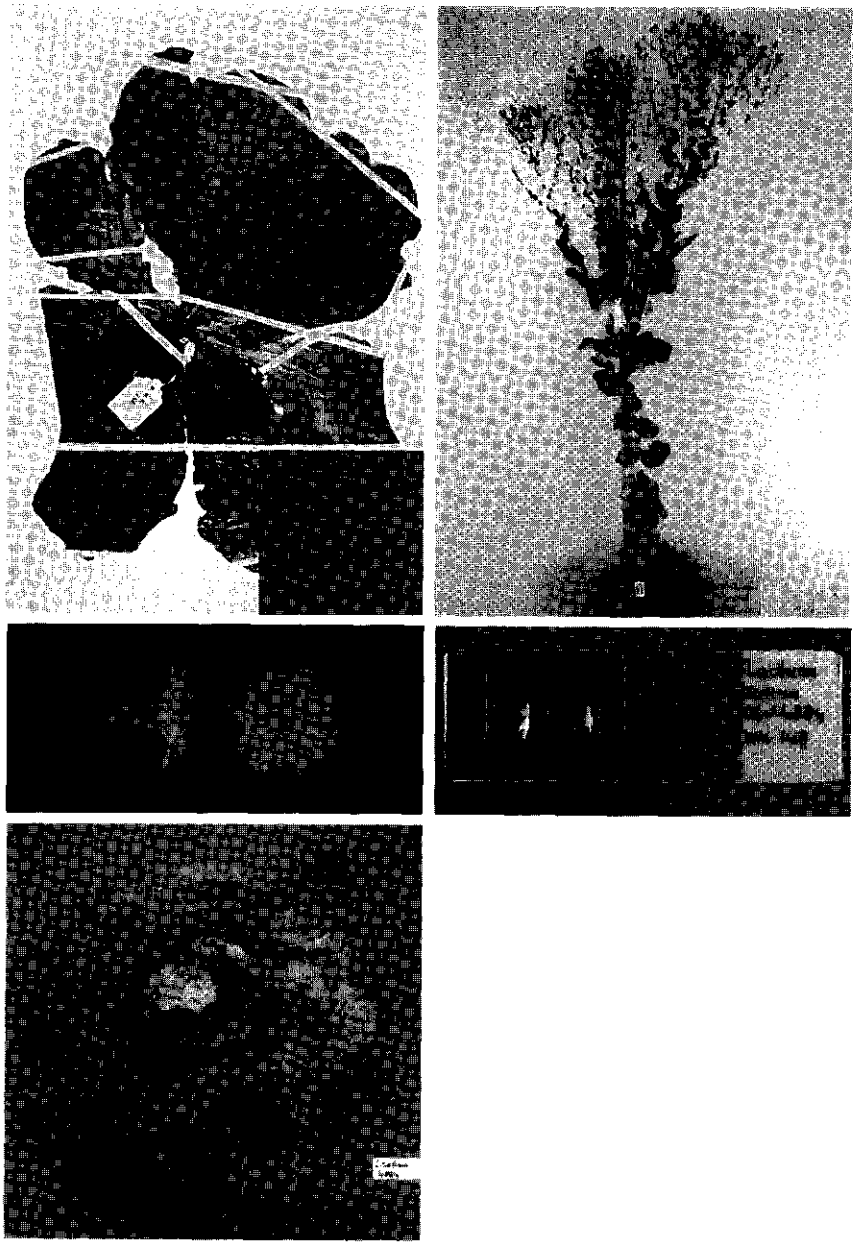

Fig. 27. *Lactuca sativa* L.; a: herbarium specimen; b: habit of flowering plant; c: capitulum; d: slide with pappus hairs; e: rosette.

morphological variation and within- and between-population allozyme variation was described. Concentrating on cultivated material, 21 Dutch *Lolium perenne* populations, 15 European populations and 6 *L. perenne* cultivars were investigated for their morphological variation, allozyme differentiation and the relation to ecogeographical factors (Loos, 1994). All of the studied material was vouchered and deposited at the Herbarium Vadense.

5.3.6 Solanum

Much attention has been and continues to be devoted in Wageningen to the study of the potato. *Solanum tuberosum*, our cultivated potato, is but one out of a group of approximately 200 tuber-bearing species. These wild relatives of the potato constitute a valuable resource for plant breeding efforts. Collections of this material have been brought together and are maintained in three major gene banks: CIP (Lima, Peru), IRS-1 (Sturgeon Bay, USA), and CGN (Wageningen, formerly the Braunschweig Genetic Resource Centre) harbouring the Dutch-German collection. The availability of many thousands of accessions of wild species as seed samples, makes it possible to conduct biosystematic research projects on this important group (Spooner & van den Berg, 1992; van den Berg & Groendijk-Wilders, 1993; van den Berg et al. 1996). Over the years many of the accessions of this gene bank collection have been vouchered to record the variability of these species, and a growing herbarium collection of culta material has accumulated (Fig. 28). The results of collecting trips in the regions where the tuber-bearing species occur in the wild (expeditions to Bolivia in 1993 and 1994 (Fig. 29), and to Guatemala in 1995) have been added to these culta specimens, while recently duplicates were received from the herbarium of Copenhagen, donated by Dr. P.J. Hjerting who collected extensively with Dr. J.G. Hawkes, a world authority on the group.

5.4 Conclusion

For the taxonomical study of cultivated plants a herbarium collection is indispensable to establish the identity of the studied material and to provide the possibility to check morphometric observations. The Wageningen Agricultural University is fortunate

to possess an extremely valuable collection of both historical and current importance, and of the well-equipped facilities needed to maintain it.

Fig. 28. Propagation field of the Dutch–German genebank collection at Braunschweig (material of *Solanum megistacrolobum* Bitter).

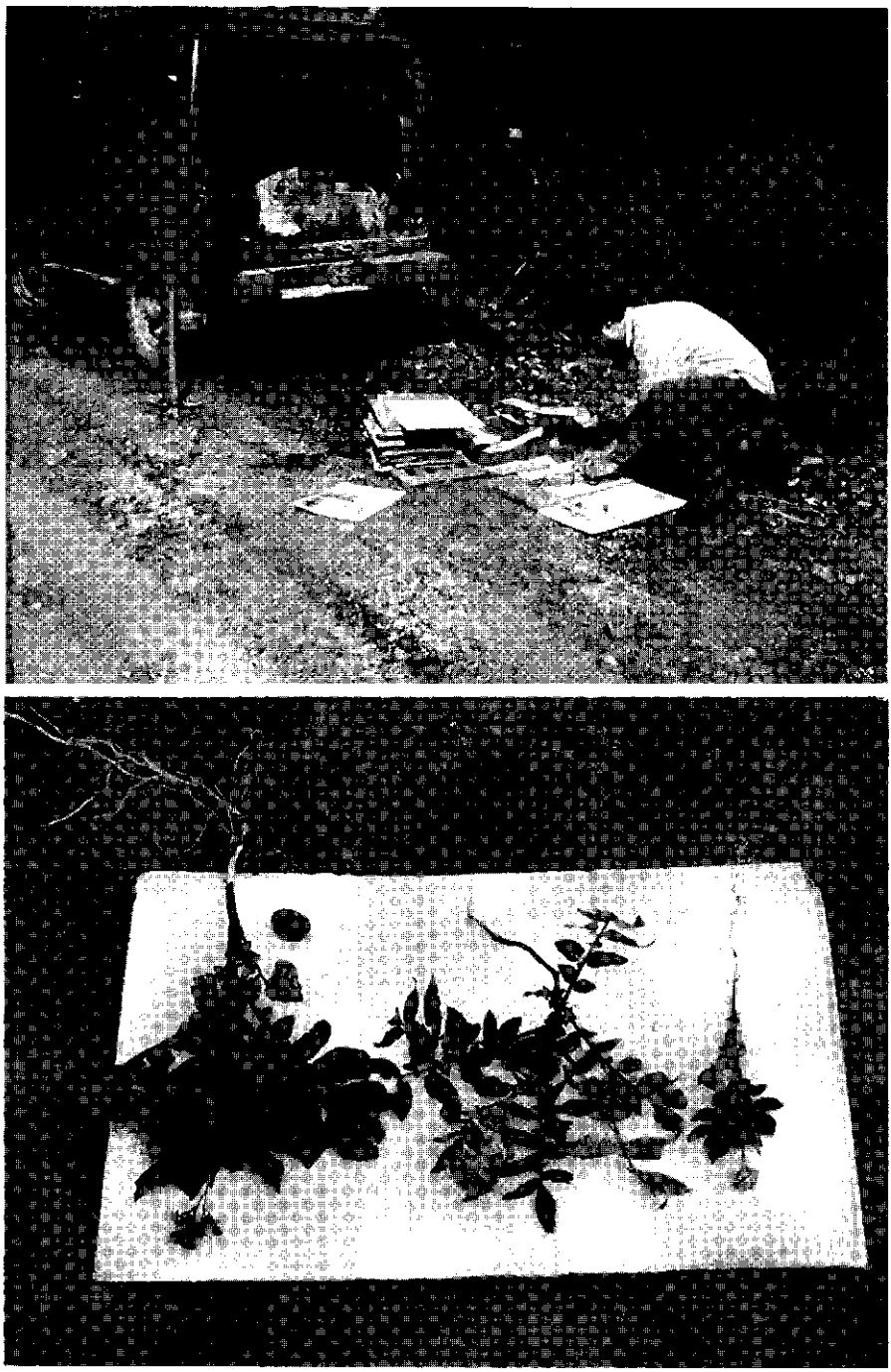

Fig. 29. Collecting wild potatoes in Bolivia; a: R. van den Berg pressing plants; b: variability within a population of *Solanum brevicaule* Bitter.

6 The Herbarium Vadense and its contribution to economic botany of the tropics

P.C.M. Jansen

6.1 Introduction

The scientific study of plants directly or indirectly utilized by man is commonly named 'economic botany'. Direct usage can be domestic, commercial or ornamental; indirect usage includes the need of man's livestock and the maintenance of the environment. Economic botany is multidisciplinary and includes besides purely botanical disciplines like taxonomy, ecology, physiology, cytology and biochemistry also certain aspects of agriculture, forestry and horticulture concerned with the propagation, cultivation, harvesting, manufacture and economics of production and marketing, and certain ethnobotanical aspects (Wickens, 1990).

Only in the second half of its existence (since around the 1950's), Herbarium Vadense was considerably enlarged with collections of tropical plants, after H.C.D. de Wit had been nominated professor at the Wageningen Agricultural University (WAU) to teach plant taxonomy and plant geography of the tropics and subtropics. Professor de Wit realized very early on that the quickly growing WAU, where a large practical impact was evident, sooner or later would call him to account for the significance of plant taxonomy for other university disciplines. Although it is a scientifically sound statement that taxonomic research of the wild flora is basic to all other plant sciences, he knew that in a world of agronomists, plant breeders and foresters such an explanation would not be accepted as sufficient. Applied botanical research and economic botany were needed and would also have the future in terms of financial grants. Therefore, since the beginning of tropical taxonomy at WAU, economic botany has always played a modest but constant role in the research programmes and not rarely it were projects on economic botany in Africa that also made it possible to collect for the study of the general flora of Africa and vice versa.

Economic botany research at the Department of Plant Taxonomy has always been based on the following principles:

- The identity of the plants studied should be checked thoroughly.

Type specimens should be consulted and voucher specimens should be deposited in the herbarium and referred to in the publications.
- The correct names of the plants should be used and nomenclatural problems should be solved as far as possible.
- The botanical aspects of the research should be studied profoundly. The plants should be described based on original measurements and observations, and compared with existing literature, from seedling to seed, including morphology, phenology, variability and distribution. Illustrations should be based on original material if possible.
- Non–botanical data (ethnobotanical aspects, vernacular names, uses, preparations, cultivation, etc.) should be collected in the field and compared with data from the literature.
- The research results should become available by publication in books or periodicals.

Tropical economic botany at the Dept. of Plant Taxonomy has been mainly effected for Africa and South–East Asia. For Africa work concentrated on pulses, oil producing plants, spices and condiments, medicinal plants and vegetables. For South–East Asia work is mainly concentrated on participation in the Plant Resources of South–East Asia (PROSEA) programme.

6.2 Economic botany in Africa

Between 1965 and 1977 Herbarium Vadense was enriched with about 30,000 Ethiopian plant specimens, collected all over Ethiopia by staff members, students and cooperators of WAG. In the same period a project, coded NUFFIC–LHW/2 and financed by NUFFIC (Netherlands University Foundation for International Cooperation) and DGIS (Directorate General for International Cooperation, Netherlands Ministry of Foreign Affairs), was executed which aimed to survey the useful plant resources of Ethiopia. This project has been the largest economic botany contribution for Africa by Herbarium Vadense. The project was a cooperation between the Alemaya College of Agriculture (being the Faculty of Agriculture of the Addis Abeba University) and the Departments of Plant Taxonomy and Tropical Crops of the Wageningen Agricultural University. During the 7 years of the project, the home–base of the Dutch participants in Ethiopia was the College of Agriculture at

Alemaya, where housing and working facilities were provided and where also the Ethiopian counterparts Dr. Tadessa Ebba and Dr. Amare Getahun were stationed. Besides doing the work for the project, the Dutch cooperators also headed the Alemaya herbarium and participated in botany teaching at the College. Four main surveys were produced: on the pulses by Westphal (1974), the agricultural systems by Westphal (1975), the spices, condiments and medicinal plants by Jansen (1981; Fig. 30) and on oil plants by Seegeler (1983). Mainly due to political circumstances in Ethiopia, field work had to be terminated in 1977.

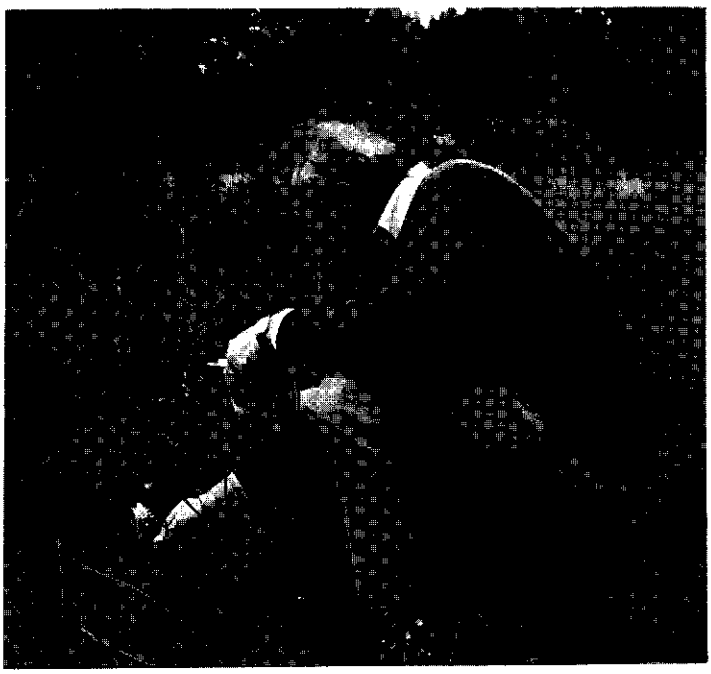

Fig. 30. Dr. P.C.M. Jansen botanizing.

Various other economic botany projects were carried out by staff members and students in a wide range of other tropical African countries. A short overview of these economic botany activities in Africa, ordered by subject and subdivided by country, is presented below.

6.2.1 Pulses (Ethiopia)

In 1974, Westphal finalized his work on the pulses with a PhD thesis entitled: 'Pulses in Ethiopia, their taxonomy and agricultural significance'. This was the first result of the NUFFIC–LHW/2 project on Ethiopian useful plants, after fieldwork in Ethiopia from April 1967 to August 1968.

After introductory chapters on the physical and biological environment, the agro–ecological regions in which Ethiopia can be divided, the agricultural systems and some taxonomic problems with special reference to 'cultivar' taxonomy, the book deals with 19 papilionoid crops, roughly in accordance with the guidelines as indicated above.

Although seemingly obvious, Westphal had the brilliant idea to collect seed and other plant material offered for sale at the numerous local markets in Ethiopia. By growing those samples in Alemaya and in Wageningen and collecting all relevant stages for the herbarium, this proved to be a quick and reliable method, besides collections directly made in the field, to obtain a wide survey of the diversity and variability of Ethiopian useful plants. Westphal's successors followed similar methods.

A key based on general characteristics and a key on seed characteristics precede the thorough treatments of the 19 major pulse crops in the book. All species are illustrated with one or several original botanical full page drawings and all distinguished cultivars are illustrated by a black and white photograph of the seed. Some important Ethiopian pulses (all Leguminosae) are:

Cicer arietinum L. (chickpea). The most important pulse crop of Ethiopia (also of the Middle East and India). Based on the morphology and colour of the seed for Ethiopia 7 cultivars were designated.

Pisum sativum L. (pea). Westphal distinguished cultivar (cv.) group Abyssinicum with 4 cultivars and cv. group Sativum with 6 cultivars for Ethiopia.

Phaseolus vulgaris L. (common bean). Based on colour and shape of the seed, 33 cultivars can be distinguished in Ethiopia.

6.2.2 Oil plants (Ethiopia)

In 1983, Seegeler published his PhD thesis as a result of the project on Ethiopian useful plants (NUFFIC–LHW/2). It was entitled:

'Oil plants in Ethiopia, their taxonomy and agricultural significance'. Fieldwork had been carried out in Ethiopia between July 1971 and December 1973.

After cereals and pulses oil plants are the third major component of Ethiopian agriculture. The seeds are a major source of energy and protein. Although data from the literature are conflicting, it is estimated that about 700,000 ha oil crops are cultivated annually in Ethiopia. Seegeler treats 12 species elaborately, 11 species get a shorter treatment and in a long list of 20 pages numerous other oil containing species are surveyed in tabular form only.

The long and short treatments follow roughly the guidelines mentioned above and the set up is comparable to the pulses treatment of Westphal. Many species are illustrated with a full page botanical drawing or with a photograph. Specific attention has been given to the ecology with special subparagraphs on temperature, water, soil and light. Very useful for surveying markets is a table of 321 market places all over Ethiopia indicating on which day(s) of the week the market is held. Two remarkable species are:

Cordeauxia edulis Hemsley (Leguminosae; vernacular names: sulei, mogollo). A very interesting 3 m tall shrub, growing in the hot dry climate of a limited area of Somalia and adjoining Ethiopia. The plant can live for more than 200 years. It starts flowering just before the first rains fall and, depending on the amount of rain, the fruits can develop in less than 2 weeks. As soon as the rains cease, fruit formation stops immediately, the ovaries are not shed but remain dormant for 4–5 months and attain maturity in about one week as soon as the next rain falls. The seed is eaten raw, roasted or cooked, having a sweet agreeable taste and they contain a yellow oil. From its leaves a tea is brewed and the extract is also used as a dye.

Guizotia abyssinica (L.f.) Cassini (Compositae; trade name: niger seed). The most important oil crop of Ethiopia, estimated to be cultivated annually on 400,000 ha producing 260 million kg seed. The oil extracted from the seed is the prime supplier of cooking oil. It is pale yellow with a faint odour and a sweetish taste, consisting for about 70% of linoleic acid. Besides for cooking, the oil is also used for anointing the body, for adulterating more valuable oils and medicinally to control birth and to treat syphilis (cooked with spices). Refined oil is used for soaps and paints, for lighting, and for cleaning machinery.

6.2.3 Spices, condiments (Ethiopia, Cameroun)

Ethiopia

As a result of the project on Ethiopian useful plants (NUFFIC–LHW/2) Jansen published in 1981 his PhD thesis: 'Spices, condiments and medicinal plants in Ethiopia, their taxonomy and agricultural significance'. He performed fieldwork in Ethiopia from April 1975 to July 1977. In his book he described 12 spices (condiments) which really occur in Ethiopia (wild or cultivated) in detail, and in a long table many other species are listed. For Ethiopians, the significance of spices can hardly be over-estimated as they always enter the sauce ('wot') in which the bread (in the form of a pancake: 'enjera') is dipped before being eaten. The more sorts of spices are added to the 'wot', the more it is appreciated.

The treatment of the 12 spice-species is similar to the treatments of the Ethiopian pulses by Westphal in the same project. Some spices worth mentioning are:

Aframomum corrorima (Braun) Jansen (Zingiberaceae; trade name: korarima; Fig. 31). An aromatic, rhizomatous, indigenous Ethiopian mountain forest species bearing glossy red fruits containing packets of somewhat angular, brownish seeds. The seeds have a mild sweet aroma and taste, and are used to flavour all kinds of wots, butter and coffee. Their quality is better than the seeds of the better known Grains of Paradise or Melegueta pepper (*Afra-momum melegueta* (Rosc.) K. Schum.) from West Africa.

Anethum foeniculum L. and *Anethum graveolens* L. (Umbelliferae; trade names: fennel and dill respectively). Seeds of fennel and dill can be found on every market in Ethiopia, often mixed also with cumin (*Cuminum cyminum* L.), and are popular spices to flavour all kinds of dishes. Jansen concluded that fennel and dill belong to the same genus; nevertheless fennel remains better known as *Foeniculum vulgare* Miller.

Rhamnus prinoides L'Hér. (Rhamnaceae, trade name: buckthorn, gesho). In Ethiopia, the leaves and branches of this shrub have a function like hops for beer, to prepare alcoholic beverages like 'talla' (beer) and 'tedj' (a kind of honey drink).

Cameroun

In 1980, Westphal et al. published: 'A conspectus of spices in Cameroon'. This study is part of a much wider survey of the edible

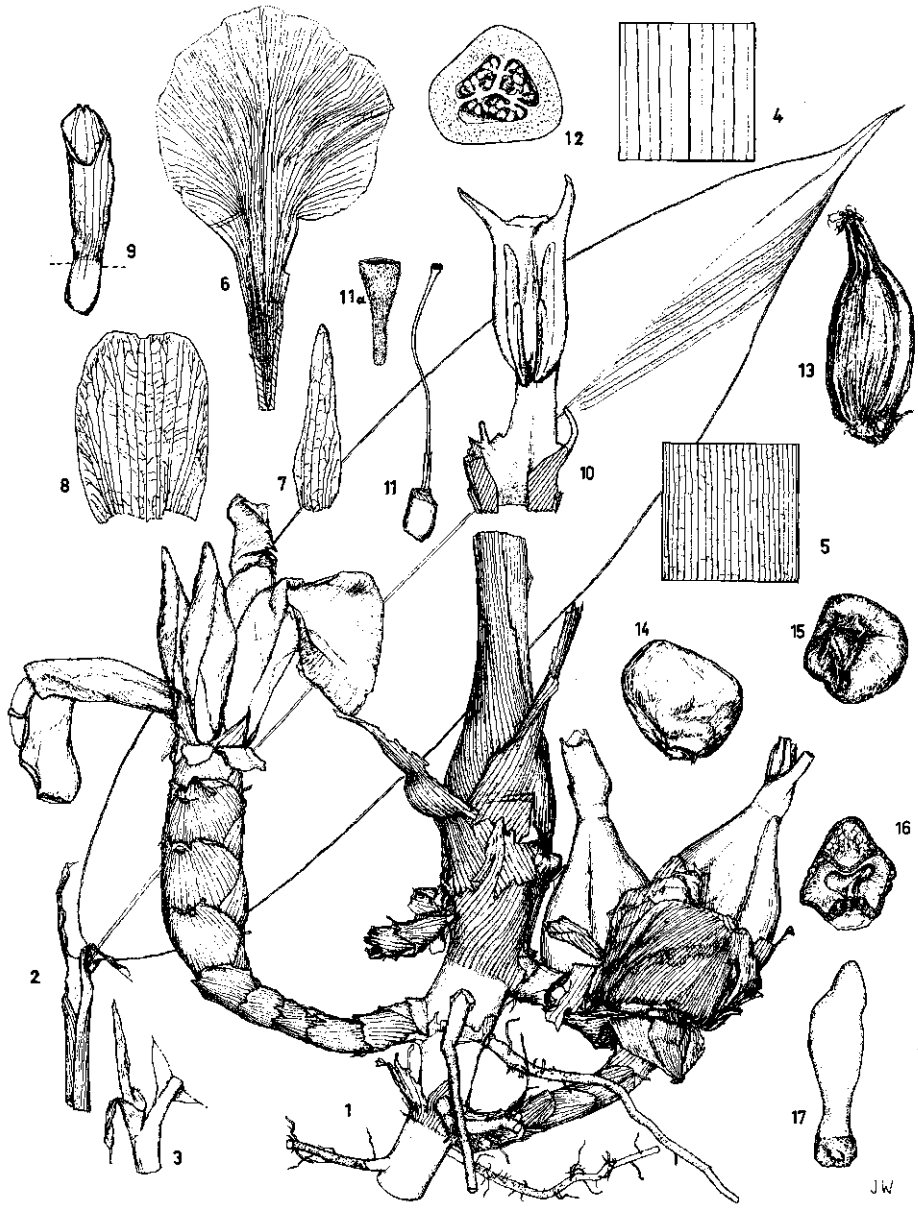

Fig. 31. Drawing with many plant details of *Aframomum corrorima* (Braun) Jansen.

plants of Cameroun, a project undertaken by Westphal et al. in the period 1975–1979 at the National Advanced School of Agriculture at the University Centre of Dschang. Spice specimens and samples were collected in gardens, fields, markets and from the wild all over Cameroun, and, sometimes after being grown to obtain all relevant stages, deposited in the WAG and YA herbaria. The Wageningen Dept. of Plant Taxonomy also assisted in identifying the species. Although more than 50 spices were found in Cameroun, in this publication only 30 have been described and the others are listed in tabular form. Many species are illustrated with black–and–white photographs. In Cameroun, the spices are mainly used to add flavour to various sauces, like the yellow sauce for taro, meat or fish sauces, vegetable sauces and a peculiar sauce called 'nkui', prepared from the branches of *Triumfetta cordifolia* A. Rich., producing a sticky mucilaginous fluid to which numerous spices are added and which is eaten with couscous of maize. Like everywhere in Africa, *Capsicum* peppers are the most important spice, but Cameroun shows a remarkable wealth of wild spice species. Some notable species are:

Scorodophloeus zenkeri Harms (Caesalpinioideae; vernacular names: olom (bark), doumka (seed)). An up to 30 m tall tree, of which the scaly older bark and the seeds are used to give a garlic flavour to the 'nkui' sauce.

Parkia biglobosa (Jacq.) R.Br. ex G. Don (Mimosoideae; vernacular names: African locust bean, néré). This up to 20 m tall tree produces fruits with edible pulp and its seeds are decorticated, crushed and left to ferment, dried, rolled to balls or sticks and, having a penetrating odour, used to flavour sauces.

Dorstenia scabra (Bureau) Engl. (Moraceae; vernacular name: afousi). A 1 m tall herb from West and South Cameroun. The red-brown roots are dried, crushed and used to flavour sauces.

6.2.4 Vegetables (Benin [Dahomey], Côte d'Ivoire, Cameroun)

Benin (Dahomey)

Since 1963 the 'Centre de Formation Horticole et Nutritionnelle de Ouando' was established in southern Benin to promote horticulture and to improve nutrition in Benin. G.J.H. Grubben was project leader of NEDERF (Fondation Neérlandaise pour la Création de Jardins Familiaux) in this Centre from 1968–1972 and Director of the Centre from 1972–1973. Besides his duties as project leader and director, Grubben did much research on the leaf vegetables of

Dahomey and was assisted in this work by trainees from Dutch Universities (e.g. van der Zon, Jansen, Siemonsma).

In 1975 Grubben published his PhD thesis entitled: 'La culture de l'amarante, légume-feuilles tropical', based on his research in Benin. The collective name amaranth comprises all species and cultivars of the Amaranthaceae that are used as leaf vegetable (mainly *Amaranthus cruentus* L., *A. dubius* Mart. ex Thell., *A. tricolor* L. and *Celosia argentea* L.). His PhD is a thorough study of this important group of vegetables dealing with a wide variety of subjects such as cultivation in Benin, consumption and food value, botany and geography, cultivation methods and breeding. Especially for the chapter on botany the Dept. of Plant Taxonomy was involved. A full page botanical drawing for each of the 5 major species accompanies a thorough overview of the taxonomy of those species, vouchers of which were deposited in WAG. A key facilitates identification.

In 1976 van der Zon and Grubben published the book: 'Les légumes-feuilles spontanés et cultivés du Sud-Dahomey' as a follow-up of the work in Benin. After a short introductory chapter with details on e.g. nutritional value, cultivation and commercialization of the leaf vegetables, and the vegetation of southern Benin, the book presents alphabetically 69 species used in Dahomey as leaf vegetable. All species were collected, identified, stored in WAG and described and illustrated by van der Zon at the Dept. of Plant Taxonomy. Many wild species are eaten as a leaf vegetable and sometimes also sold at local markets. Some much appreciated wild leaf vegetables in Benin are: *Crassocephalum rubens* (Juss. ex Jacq.) S. Moore (Compositae), *Croton lobatus* L. (Euphorbiaceae), *Emilia praetermissa* Milne-Redhead (Compositae), *Erigeron floribundus* (Kunth) Sch. Bip. (Compositae), *Justicia anselliana* (Nees) T. Anders. (Acanthaceae), *Stachytarpheta angustifolia* (Mill.) Vahl (Verbenaceae) and *Vitex doniana* Sweet (Verbenaceae).

A most remarkable plant is *Fleurya aestuans* (L.) Gaud. ex Miq. (Urticaceae): its leaves can be eaten as a vegetable but are also used to treat ulcers, and above all, it is a sunshine plant possessing secret powers to stop the rain. *Peperomia pellucida* (L.) Kunth (Piperaceae) is the counterpart: it can be used to start the rain.

Côte d'Ivoire

From the 1950's to the 1990's WAU had its 'Centre Néerlandais' near Abidjan, Côte d'Ivoire, domiciled at the French ORSTOM

Institute, to enable students and scientists to do research under tropical circumstances. The Dept. of Plant Taxonomy has always been well represented at the Centre, and many persons performed plant taxonomic research there and deposited collected specimens in WAG. Siemonsma (Dept. of Tropical Crops, WAU) was director of the Dutch Centre between 1976 and 1980. In 1982 he published his PhD thesis entitled: 'La culture du gombo (*Abelmoschus* spp.), légume-fruit tropical (avec référence spéciale à la Côte d'Ivoire)'. His thesis represents a thorough study of okra in all its aspects and Siemonsma paid much attention to the botanical part, for which he deposited numerous voucher specimens in WAG.

Cameroun

Between 1975 and 1979 J.M.C. Stevels studied and collected traditional vegetables in Cameroun and worked out her data at the Dept. of Plant Taxonomy. In 1990 she published her PhD thesis: 'Légumes traditionnels du Cameroun, une étude agro-botanique'. The study deals with 67 traditional vegetables, of which 20 species are discussed in greater detail. Differential keys to groups of species and to individual species, based on characteristics of the edible product, are supplied. Introductory chapters deal a.o. with agro-ecological regions of Cameroun and nutritional aspects. The treatments of the 20 species are thorough and roughly follow the above-mentioned guidelines. Many species are illustrated with detailed original botanical drawings and black-and-white photographs. Voucher specimens have been deposited at WAG. Some remarkable species are:

Vernonia amygdalina Del. (Compositae; vernacular name: bitterleaf). This shrub, up to 4 m tall, is widespread in tropical Africa, and in Cameroun its leaves are a popular vegetable. At higher altitudes, *V. hymenolepis* A. Rich. is used in a similar way.

Gnetum africanum Welw. & *Gnetum buchholzianum* Engl. (Gnetaceae; vernacular names: okok, koko). The leaves of these two very similar-looking lianas are used as a vegetable in Cameroun. The 2 species can be distinguished by their different male inflorescences.

Abelmoschus caillei (A. Chev.) Stevels & *A. esculentus* (L.) Moench (Malvaceae; vernacular names: okra, gombo). The young fruits of these species are very popular as a vegetable and sometimes the leaves are used as well. *A. caillei* has been discovered by Siemonsma in Côte d'Ivoire as an okra species different from *A. esculentus* but it has been named by Stevels (Fig. 32).

Fig. 32. *Abelmoschus caillei* (A. Chev.) Stevels, a new species described by J.M.C. Stevels.

6.2.5 *Medicinal plants (Côte d'Ivoire, Ethiopia, Moçambique, Sénégal)*

Côte d'Ivoire

Between May and December 1973 Mrs E. Visser did anthropological work amongst the Ando people in Côte d'Ivoire and concentrated on collecting information on wild and cultivated food plants and medicinal plants. In 1975 she published the information on the latter as: 'Plantes médicinales de la Côte d'Ivoire'. Voucher specimens were deposited in WAG where also final identifications were made. In Côte d'Ivoire Mrs Visser was assisted by the Wageningen taxonomist De Koning, director of the 'Centre Néerlandais'. Mrs Visser included in her publication data on plants collected by De Koning. After an introductory part, the publication comprises a survey of the collected plants, arranged alphabetically by family and within family by genus and species. Of each species the vernacular Ando names and the medicinal and other uses are described and several species are illustrated with a botanical drawing. A lot of interesting information is presented. It is remarkable, for example, that the Ando people classify some useful plants in a much more detailed way than botany does. For the yams they distinguish 42 varieties, botanically classified into 2 species only (*Dioscorea cayenensis* Lamk & *D. rotundus* Poir.); one could imagine, however, that the Ando varieties can be botanically considered as cultivars. Less useful species, however, are not differentiated by the Ando people; for example the botanically very different species *Hoslundia opposita* Vahl (Labiatae), *Lantana camara* L. (Verbenaceae), *Momordica cissoides* Planch. ex Benth. (Cucurbitaceae) and *Passiflora foetida* L. (Passifloraceae) are not individually distinguished by name and collectively called 'bird-food'. The Ando people do not separate sharply the natural and spiritual worlds; as a consequence, in their view medicinal plants lose their power if not applied properly.

Ethiopia

In his thesis of 1981 on Ethiopian useful plants Jansen also treated medicinal plants, 13 in a detailed way, in a format similar to his treatments of the spices, and in a table numerous other species are listed. Ethiopia still has a rich medicinal plant lore, because about 85% of the population is not reached by modern medicine. It is

amazing that '... almost all plants of the Ethiopian flora are used somewhere somehow medicinally'. Some remarkable plants are:

Catha edulis (Vahl) Endl. (Celastraceae; vernacular name: chat). This shrub of 2–6 m height (seldom a tree up to 25 m tall) is a good source of income for the Ethiopian Hararge Province where it is cultivated widely by smallholders. Besides being considered as a panacea (curing 501 diseases), chat is much more a stimulant. Fresh young leaves and twigs are chewed (ca 500 g, 2 hours of chewing), making the chewer feel excited, strong, and not hungry. It has become a daily necessity for many people in East Africa and South–Arabia to chew chat, and because fresh parts are preferred, chat is quite expensive due to high transportation costs. It is not considered as a drug to which one might become addicted. Nevertheless, many people cannot live without it (just like tobacco), and, when used in too large quantities, harmful effects may result. Ethiopia and Yemen are the main producers of chat, consumers are mainly Moslems in East Africa and southern Arabia.

Hagenia abyssinica (Bruce) J.F. Gmelin (Rosaceae; vernacular name: kosso). Tea made from the dried female flowers of this up to 20 m tall tree is used as a powerful anthelmintic in Ethiopia, especially to expel tape worm. It is a strong medicine, and dangerous when used in excess dosages. In the past, every Ethiopian had his 'kosso day' once every 1–3 months.

Phytolacca dodecandra L'Hér. (Phytolaccaceae; vernacular name: endod). The roots and fruits of this common lianescent shrub are used to cure venereal diseases, to induce abortion, to heal wounds and the berries are commonly used as soap to wash clothes. The saponin present in the berries is also a powerful snail killer and much research has been devoted to this activity to find a cheap method to kill bilharzia-transmitting snails.

Moçambique

In the period 1980–1985 Jansen worked in Moçambique to make a survey of the Moçambican medicinal plants. He started a series of books, together with his Moçambican colleague Orlando Mendes, on the 'Plantas medicinais, seu uso tradicional em Moçambique', of which 5 were completed but only 4 have been published up to now. In each book the plants are presented alphabetically by family and within the family by genus and species. Every species is illustrated with a full page drawing and a map of its distribution in Moçam-

bique. Due to political circumstances the work could not be completed. In total about 150 species were treated (all species from Acanthaceae to Compositae). Some remarkable species are:

Sclerocarya caffra Sond. (Anacardiaceae; vernacular names: canho, tsula). This up to 18 m tall tree is considered in Moçambique as the 'Queen of all trees' because from its fruits the popular drink 'bukanye' is prepared. The tree is very common all over Moçambique and it always fruits unbelievably rich in October–December. From the flesh of the rather small fruits a nice sweet–sour soft drink, or, after distillation, a strong alcoholic beverage is prepared. One can imagine that in those months the atmosphere in the country side is often gay and high–spirited. The soft drink is very healthy, containing up to four times more vitamin C than orange juice.

Strophanthus kombe Oliv. (Apocynaceae; vernacular names: utsulo, kombe). The seeds of this liana are very poisonous and used as arrow poison wherever they occur. Medicinally the seeds are highly valued and internationally traded – they contain the glucoside strophanthin which is used to prepare medicines against heart diseases.

Warburgia salutaris (Bert. f.) Chiov. (Canellaceae; vernacular name: chibaha). The roots and bark of this 10 m tall tree of southern Africa is widely used to cure fevers (malaria) and especially throat diseases. Because of its popularity as medicine, the tree is threatened by extinction as stripping the bark and cutting the roots kills the trees.

At the 14th International Botanical Congress in Berlin, 24 July – 1 August 1987, a special session was devoted to medicinal plants. During this symposium Angelina Maite presented a paper on some medicinal Malvaceae of Moçambique. In Moçambique, Mrs Maite had been supervised and guided by Jansen and De Koning to prepare a MSc thesis on medicinal Malvaceae of Moçambique. Unfortunately, the promising and skilful scientist Mrs Maite was cowardly killed together with her husband by RENAMO soldiers in May 1992.

Sénégal

Ms Lieke van der Steur collected ethnobotanical information in eastern Sénégal from June to December 1991. She stayed 7 months amongst the people of which she wanted to study the traditional medicinal system, learned their language and by gaining their

confidence she succeeded in collecting very useful ethnobotanical information. In 1993, she published a MSc thesis entitled: 'Les plantes médicinales de Gouloumbou, Sénégal–Oriental, une récherche ethnobotanique integrée'. In this study anthropological, botanical and pharmacological data are given and 64 medicinal plant species are described and illustrated. Vouchers have been deposited at WAG. A summary of the botanical and medicinal information was published in 1994. Unfortunately, Lieke died by an accident on Crete (Greece), where she was working on medicinal plants, and with her a much promising and capable ethnobotanist passed away.

6.2.6 Miscellaneous subjects

Agricultural systems in Ethiopia

In 1975 Westphal & Westphal–Stevels published the book: 'Agricultural systems in Ethiopia'. This book provides a wealth of background information for the work on the useful plants of Ethiopia (NUFFIC–LHW/2 project). It treats the agricultural systems in Ethiopia: the seed-farming, ensat-planting and pastoral complex and shifting cultivation. Numerous photographs, tables and maps contribute to its usefulness. From the viewpoint of the economic botanist, especially chapter 8 is interesting, in which a checklist of about 400 useful Ethiopian plant species is presented in tabular form, alphabetically by their scientific name with family name, vernacular names, uses and references to the sources of information. Chapter 7 presents an overview of plant products that can be encountered on markets.

Ethnobotany of the Wagenia (Kisangani, Zaire)

In 1976 Bokdam & Droogers published: 'Contribution à l'étude ethnobotanique des Wagenia de Kisangani, Zaire'. A very interesting study, giving much information on the Wagenia, a tribe of about 7000 people living along the river Zaire near Kisangani, who live from fishing and gathering wild plants. The authors especially collected information on the names and uses of 110 plant species, of which voucher specimens have been deposited in WAG.

The information on the plants is given by family (alphabetically) and within the family alphabetically by genus and species. Numerous photographs and botanical drawings contribute to the attractivity of this publication.

Vernacular plant names in Moçambique

In 1993 De Koning published the 'Checklist of vernacular plant names in Mozambique'; a very useful publication for everybody working with Moçambican plants. The list has been compiled from all available sources and gives about 7000 names, arranged in two ways: alphabetically by the vernacular name referring to the scientific name and alphabetically by the scientific name and listing the vernacular names by language.

Other publications

Since the Dept. of Plant Taxonomy focused on Africa, numerous taxonomical publications of the staff and cooperators appeared, especially on African Loganiaceae, Apocynaceae, Dichapetalaceae, Begoniaceae, Connaraceae and Gramineae (see Literature list elsewhere in this publication). Most of these publications also contain directly or indirectly valuable information for and on African economic botany. The taxonomic support of staff members and of the Herbarium Vadense for authors on African economic botany has been very important but too numerous to mention here separately.

6.3 Economic botany in South-East Asia

Although there is no direct connection between the Herbarium Vadense and work on economic botany in South-East Asia, staff members of the Dept. of Plant Taxonomy have been and are involved in two major projects on economic botany in South-East Asia which should be mentioned here.

6.3.1 Rumphius Memorial Volume

In 1959 the 'Rumphius Memorial Volume' to celebrate the 250th anniversary of Rumphius' death was published (editor professor de Wit). Rumphius (?1627-1702) is the greatest naturalist that ever lived and worked in the Moluccas (Indonesia) and one of the first and most famous economic botanists. Besides editing the whole volume, prof. de Wit wrote the introductory chapter on the life and work of Rumphius and made a checklist to his most famous work on plants, 'Herbarium Amboinense', which de Wit described as 'indestructible,

an ever green and ever flourishing garden, the inspiring evidence of the life of a great man and great scientist'.

6.3.2 PROSEA

What Rumphius started and what was continued by numerous economic botanists in South–East Asia (e.g. Heyne in Indonesia, Burkill in Malaysia, Brown in the Philippines) came to a new climax in the project: Plant Resources of South-East Asia (PROSEA). This project started in 1985 as a cooperation between the Wageningen Agricultural University (WAU) and the Indonesian Institute of Sciences (LIPI) to document and make available the existing wealth of information on the plant resources of South-East Asia for education, extension work, research and industry in the form of a computerized data bank and a multi-volume handbook. PROSEA grew out to become the largest economic botany project that ever existed, and is now a Foundation under Indonesian law with an international charter, governed by a Board of Trustees formed by the participating institutes: FRIM in Malaysia, LIPI in Indonesia, IEBR in Vietnam, UNITECH in Papua New Guinea, PCARRD in the Philippines, TISTR in Thailand and WAU in the Netherlands. It consists of a Network Office in Bogor (Indonesia) coordinating 6 Country Offices in South–East Asia and a Publication Office in Wageningen (Netherlands). A major task is producing a handbook of 20 volumes, of which 10 have been published to date. Each volume deals with a survey of one plant commodity group (e.g. Pulses, Edible fruits and nuts, Dye and tannin–producing plants, Timber trees, Rattans, Bamboos, Vegetables etc.) and is written by an international group of author-specialists and editors. A thorough overview of the state of knowledge of every useful South-East Asian plant species is given, covering all fields of plant sciences (taxonomy, botany, agronomy, forestry, horticulture, plant breeding, plant genetics, phytopathology, etc.). The Dept. of Plant Taxonomy has been involved in PROSEA from its very beginning, and at present 4 full–time staff members are working for it, focusing on editorial work regarding the botanical, taxonomic and silvicultural aspects of the handbook. Due to the success of PROSEA in Asia, plans are being made to start a similar project for Africa.

6.4 Miscellaneous contributions to economic botany

6.4.1 Cicer L.

In 1972 van der Maesen published his PhD thesis entitled: '*Cicer* L., a monograph of the genus, with special reference to the chickpea (*Cicer arietinum* L.), its ecology and cultivation'. He had worked on *Cicer* since 1967 and made collecting trips to India, Turkey, Spain and northern Africa. In his monograph van der Maesen distinguishes 39 species (8 annual, 31 perennial). The species are arranged alphabetically and besides the botanical treatment, notes on geography and ecology are given. All species are illustrated with a full page botanical drawing and a key to the species makes identification possible. The larger part of the thesis is dedicated to chickpea, the third pulse crop in the world after beans and peas. About 90% of the total worldwide chickpea cultivation of about 10 million ha is effected in India and Pakistan. Chickpea, as other pulses still has the image that it is food for the poor, although it is very nutritious and healthy and eaten by all classes of society. It may contain up to 30% protein and is of major importance in vegetarian diets, and as part of balanced foods it may form an important supplement to the protein nutrition of children. In traditional medicine it has many applications. In the Middle Ages it was generally believed that it acted, like most pulses, as a sexual stimulant and priests and scholars should not eat them to avoid '...an inhibition of high spiritual principles and the process of thinking'.

6.4.2 Metroxylon

In 1986 Rauwerdink published: 'An essay on *Metroxylon*, the sago palm'. Sago palms are very important wild and cultivated food plants in Asia and 5 species exist. The best known species is *M. sagu* Rottb., a very variable species. Rauwerdink reduced the number of existing infraspecific taxa for this species from 21 to 4. Remarkable was his discovery that the former distinction on species level of sago palm with spines and spineless sago palm could not be upheld.

6.5 Conclusions

At its 100th Anniversary, the Herbarium Vadense can look back proudly at its role in the numerous contributions to the economic botany of the tropics. Economic botany cannot exist without plant taxonomy and all economic botany research undertaken by the Dept. of Plant Taxonomy has always been carried out on a sound taxonomic base.

Plant taxonomy and economic botany are complementary sciences which ideally walk hand-in-hand at the same institute. Economic botany reveals the diamonds that have been named and often discovered by plant taxonomy and lets them shine. It makes use of the pathways laid by plant taxonomy in the jungle of the plant kingdom, to reveal uses and capacities of plants for the well-being of man and to satisfy man's ethnobotanical interest. While doing so, it also makes plant taxonomy more popular in the non-scientific world and contributes significantly to its survival.

No economic botany without taxonomy but also no taxonomy without economic botany; with these two principles in its flag, the Herbarium Vadense can trustfully start its next 100 years.

Appendix 1: Scientific personnel

D.M. Wassink

The list of personnel below only contains those persons who were appointed at the Department and were somehow connected with the Herbarium Vadense. Therefore, the zoologists working in the Biological Field Station Wijster, which was once part of the Department, have been omitted. Figure 33 shows most of the personnel of the Department in 1996.

Amshoff, Mej. Dr. G.J.H. (1913–1985): doctorated at Utrecht University in 1939 on *Leguminosae* of the Flora of Surinam; appointed as research assistant at Utrecht afterwards, and treated several other plant families for the Flora of Surinam, and later on also for the Flora of Java; worked as research assistant at the Herbarium Vadense from 1955 until her retirement in 1978; was famous for her vast amount of identifications and her knowledge of plants and literature.

Arends, Dr.Ir. J.C. (1940–x): passed his MSc in 1968 at the University of Hawaii and his exam at Wageningen in 1969; appointed as research assistant at the Department of Horticultural Crops from 1969 to 1971 after which he became staff member of the Department; doctorated in 1992 on a biosystematic study of *Begonia*, supervisors Prof. van der Maesen & Prof. Doorenbos; resigned in September 1996.

Bakker, Mrs. Ir. J. (1939–x): passed her exam at Wageningen in 1963; appointed as research assistant from 1963–1968 to write her PhD thesis on Oak forest vegetation in the southern Netherlands; doctorated in 1969 under the supervision of Prof. Venema; became journalist.

Barkman, Dr. J.J. (1922–1990): appointed as local director of the Biological Field Station at Wijster in 1957 to succeed Dr. W. Beyerink; doctorated in 1958; became part–time lecturer at Leiden University in 1968; went to the Department of Vegetation Science in 1967 when the field station became part of that Department.

Beentje, Dr. H.J. (1951–x): passed his exam at Amsterdam in 1978; appointed as research assistant at the Department from 1979 to 1982; doctorated in 1982, supervised by Prof. de Wit; worked as

associated staff member until 1983, when he went to work at the East Africa Herbarium in Nairobi, Kenya; later on he was appointed as a staff member of the Kew herbarium, England.

Beumée, Dr. J.G.B. (1889–1966): acted as director of the Herbarium Bogoriense at Java from 1924 to 1931; accepted a high position at the Department of Agriculture and became director of the Agricultural Research Institute; appointed as lecturer in Plant Systematics and Plant Geography in Wageningen in 1947; retired in 1953 and was succeeded by Prof. de Wit.

Beyerink, Dr. W.: founded the private Biological Field Station at Wijster in 1927; the field station became part of the Wageningen University under the Department in 1952 and Beyerink was appointed as senior lecturer; retired in 1957.

Bijhouwer, Prof.Dr.Ir. J.T.P.: present at the Agricultural University from 1921 onward but without an appointment; doctorate on 28 September 1926 at Wageningen, supervisor Prof. Jeswiet; lecturer in garden design from 1935–1946; full professor in Garden and Landscape Design at Wageningen from 1946 to 1966.

Boer, Ir. E. (1960–x): passed his exam at Wageningen in 1985; worked in Burkina Faso and Kalimantan (Indonesia); appointed as staff member of the PROSEA Project in 1993.

Boerboom, Dr.Ir. J.H.A. (1926–x): passed his exam at Wageningen in 1953 and became research assistant in the same year; doctorated in 1960 on the plant communities of the Wassenaar dunes, supervised by Prof. Venema, and went to the Department of Forestry.

Bokdam, Ir. J. (1926–x): worked as a botanist and ethnobotanist in Zaïre; appointed to replace J.J.F.E. de Wilde from 1–8–1974 to 1–12–1975.

Boom, Dr.Ir. B.K. (1903–1980): passed his exam at the Agricultural University in 1927; appointed as assistant of Prof. Jeswiet from 17–9–1928 to 17–2–1929; doctorated in 1930 on botanical-serological investigations, supervisor Prof. Grijns; well-known for his work on the cultivated plants in the Netherlands and vast number of reference collections at WAG.

Bos, Dr.Ir. J.J. (1939–x): passed his exam at Wageningen in 1966; went to work in Liberia for the F.A.O. until 1968; appointed as staff member of the Department in 1968 and was stationed at Kribi (Cameroun) until 1970 and at Dire Dawa (Ethiopia) from 1974 to 1975; doctorated in 1984 on a study of West African *Dracaena*, supervisor Prof. de Wit; succeeded Dr. Wijnands as

director of the Botanical Gardens in 1994.

Breteler, Dr.Ir. F.J. (1932–x): passed his exam at Wageningen in 1959; appointed as research assistant at the Department since 1958; stationed at the herbarium in Yaoundé (Cameroun) from 1960 to 1962, from 1963 to 1966 in Merida (Venezuela), and in 1971 in Togo for the F.A.O.; doctorated in 1973 on a study of the African *Dichapetaleceae*, supervisor Prof. de Wit; since 1973 staff member of the Department.

de Graaf, Mr. A.; associate staff member from 1978 to 1984 to study water plants, especially *Echinodorus*.

de Jong, Dr.Ir. P.C. (1938–x): passed his exam at Wageningen in 1968; appointed as research assistant from 1968 to 1971; went to the Institute for Breeding of Horticultural Crops; doctorated in 1976 on a study of flowering and sex expression in *Acer*, supervisors Prof. de Wit & Prof. Bruinsma; became director of the Utrecht Botanical Garden and later on staff member of Boskoop.

de Koning, Dr.Ir. J. (1943–x): passed his exam at Wageningen in 1972; appointed as manager of the Centre Néerlandais in Côte d'Ivoire from 1972 to 1976; research assistant of the Department in 1977–1978; went as operational expert to the Herbarium in Maputo (Moçambique) in 1978; doctorated in 1983; became director of the Foundation of Dutch Botanic Gardens and later on Prefect of the Leiden Botanical Garden.

de Kruif, Ir. A.P.M. (1955–x): passed his exam at Wageningen in 1981; appointed as research assistant from 1981 to 1984 to study some genera of the African *Apocynaceae*.

de Vries, Drs. I.M. (1956–x): passed her exam at Utrecht in 1982; appointed as research assistant from 1984 to 1987 to work on a thesis on *Lactuca*.

de Wilde, Dr.Ir. J.J.F.E. (1932–x): passed his exam at Wageningen in 1958; appointed as scientific officer in 1958, interrupted by his military service in 1958–1960; doctorated in 1968 on a study of the African *Trichilia*; stationed at Dire Dawa (Ethiopia) in 1968/1969, and in Cameroun in 1974.

de Wilde-Duyfjes, Mrs. Dr. B.E.E. (1936–x): passed her exam at Leiden in 1966; became temporary research assistant at the Department from 1968 to 1973; associated staff member at the Rijksherbarium, Leiden; went to work at the Gunung Leuser Nature Reserve, Sumatra; doctorated in 1977 in Wageningen on a study of the genus *Allium*, supervisor Prof. de Wit.

de Wit, Prof. Dr. H.C.D. (1909–x): appointed as agricultural re-

search officer at the University of Pretoria from 1938–1940where he doctorated; botanist at the Herbarium Bogoriense (Java, Indonesia) from 1940 to 1946; botanist for the Flora Malesiana Foundation in Bogor and Leiden from 1946 to 1953; senior lecturer at Leiden as well as in Wageningen from 1953 to 1959; appointed as professor of Plant Systematics and Plant Geography of the Tropics and Subtropics at the Agricultural University in 1959; retired in 1980, but remained active especially in the field of biohistory.

Dekker, Ir. A.J.F.M. (1955–x): passed his exam at Wageningen in 1981; appointed as research assistant from 1981 to 1983; accepted a position at the F.A.O., Rome.

Doing, Dr.Ir. H. (1927–1996): passed his exam at Wageningen in 1956; became temporary research assistant until 1962; doctorated in 1962 on a floristic and systematic study of Dutch forest and shrub vegetation, supervisor Prof. Venema; went to work in Australia for the CSIRO; appointed as scientific officer at the Department of Vegetation Science, Ecology and Weeds in 1972.

Doorenbos, Prof.Dr.Ir. J. (1921–x): passed his exam at the Agricultural University in April 1947; was appointed as temporary assistant on 1–3–1947 until 1–1–1949, when he moved to the Laboratory for Horticulture where he became lecturer in 1956 and professor from 1963 to 1986; since 1994 working as an associated staff member on a revision of the sections of *Begonia*.

Groen, Ir. L.E. (1946–x): passed his exam at Wageningen in 1976; worked a.o. for the Institute for Breeding of Horticultural Crops; appointed as part–time scientific officer to take care of the succulent plant collection at the Flevohof from 1983 to 1988; continued this work paid by external funds until 1993; worked as associated staff member from 1988 onwards, mainly for the Botanical Garden and on his research on African succulents.

Hensen, Drs. K.J.W. (1918–x): passed his exam at Amsterdam in 1954; appointed as scientific officer in 1954; was mainly occupied with research on ornamental plants; retired in 1983.

Jansen, Dr.Ir. P.C.M. (1943–x): passed his exam at Wageningen in 1974; appointed as research assistant at the Department in 1974; stationed in Dire Dawa (Ethiopia) from 1975 to 1979; doctorated in 1981 on a study of spices, condiments and medicinal plants of Ethiopia, supervisors prof. de Wit & Prof. Ferwerda; went to Moçambique as expert for the Dutch Ministry of International Cooperation from 1980 to 1985; appointed as scientific officer at

the Department in 1985 to work on the PROSEA Project.

Janson, Ir. T.J.M. (1949–x): passed his exam at Wageningen in 1957; appointed as temporary assistant to support the director of the Botanical Gardens from 1973 to 1975.

Jeswiet, Prof.Dr. J. (1879–1960): thesis at Zürich in 1913 on the the flora of the Dutch dunes; worked as assistant in the breeding of sugar cane in Pasoeroean, Java; appointment as professor in Plant Systematics, Dendrology and Plant Geography and as director of the Arboretum in 1925; discharged in 1946 because of his collaboration with the Germans during World War II.

Jongkind, Dr.Ir. C.C.H. (1954–x): passed his exam at Wageningen in 1984; appointed as research assistant at the Department from 1987 to 1989; doctorated in 1989 on a study of the African *Connaraceae*, supervisor Prof. van der Maesen; worked as associated staff member until present, interrupted by a stay of c. 1 year (1994–1995) in Ghana where he worked for the Missouri Botanical Garden (U.S.A.).

Kardolus, Ir. J.P. (1966–x): passed his exam at Wageningen in 1991; appointed as research assistant at the Department in 1993, working on a PhD thesis concerning a biosystematic study in *Solanum*.

Koopman, Mrs. Ir. L. (1923–x): passed her exam at the Agricultural University in January 1949 and succeeded J. Doorenbos as temporary assistant from March 1949 until 16–3–1952.

Koopman, Ir. W.J.M. (1963–x): passed his exam at Wageningen in 1988; worked from 1988 to 1989 at a laboratory for tissue culture; working as associated staff member from 1992 to present, and performs biosystematic research on *Lactuca* and *Solanum*.

Kostelijk, Dr. P.J. (1914–1993): worked as associated staff member from 1984 to 1993, mainly for the Botanical Garden.

Kuitert, Dr.Ir. W.P. (1955–x): passed his exam at Wageningen in 1982; worked as free–lance landscape architect since 1975; obtained a Research Fellowship at the Kyoto University from 1984 to 1987; doctorated in 1988 on a study of the history of Japanese garden art, supervisors Prof. Vroom, Prof. van Gulik (Leiden) & Prof. Nakamura (Kyoto); worked closely with D.O. Wijnands as associated staff member at the Department from 1992 to 1995, after which he accepted a position at the Kyoto University, Japan; was appointed shortly in 1994 to assist in ordering the inheritance of D.O. Wijnands.

Leal, Drs. M.E. (1967–x): passed his exam at Utrecht in 1994; became associated staff member since 1995 to study the African

flora.

Leeuwenberg, Dr. A.J.M. (1930–x): passed his exam at Utrecht in 1957; doctorated in 1958 in Utrecht on a study of the *Gesneriaceae* of Guiana, supervisor Prof. Lanjouw; since 1957 until his retirement in 1995 appointed as staff member of the Department and stationed in Nkongsamba (Cameroun) in 1971–1972; associated staff member since his retirement.

Legro, Dr.Ir. R.A.H. (1927–x): passed his exam at Wageningen in 1951; became lecturer at the Department and director of the Botanical Gardens in 1970; was relieved of his management duties in 1974; resigned in 1981.

Lemmens, Dr.Ir. R.H.M.J. (1954–x): passed his exam at Wageningen in 1984; appointed as part–time research assistant from 1984 to 1989; doctorated in 1989 on a study of the African *Connaraceae*, supervisor Prof. van der Maesen; became a staff member on the PROSEA Project in 1988 (part–time until 1989, full–time afterwards).

Letschert, Dr. J.P.W. (1960–x): passed his exam at Amsterdam in 1986; appointed as research assistant from 1988 to 1992; doctorated in 1993 on a study of *Beta* section *Beta*, supervisor Prof. van der Maesen; went to work in the field of environmental pollution.

Loos, Mrs. Dr.Ir. B.P. (1966–x): passed her exam at Wageningen in 1989; appointed as research assistant and stationed at the CPRO–DLO from 1990 to 1994; doctorated in 1994 on a study of the genus *Lolium*, supervisor Prof. van der Maesen; went to work in an environmental consultancy bureau.

Maas, Prof.Dr.Ir. F.M. (1930–x): passed his exam at Wageningen in 1955; appointed asresearch assistant from 1954 to 1957; doctorated in 1959 on the vegetation in springs and spring forests in The Netherlands at Wageningen, supervised by Prof. Venema; became professor at the Technical University Delft.

Moraux–Baas Becking, Miss L.H. (1882–1969): assistant curator of the Herbarium Vadense from 1-4–1913 to 1–4–1914 and from 1–4–1915 to 1–5–1921; resigned because of her marriage; had great interest in garden design and designed the part of the Dreijen Arboretum around the Linnaeus statue.

Muller, Dr. F.M. (1907–x); passed his exam at Utrecht in 1930; doctorated in Utrecht in 1933 on the metabolism of red suphur bacteria, supervisor prof. Went; worked in agricultural research until his retirement in 1972; became an associated staff member from 1972 to 1987 to work on a flora of the seedlings of north-

western Europe and later on identified and updated the nomenclature of the European and Mediterranean collections of the Herbarium.

Nannenga–Bremekamp, Mrs. Drs. N.E. (1916–1996): appointed as senior technician in 1964 to check plant names in the Botanical Gardens; appointed as scientific staff member from 1966 to 1970; several temporary appointments in 1971.

Ott, Drs. E.C.J. (1930–x): appointed as scientific officer in 1965; went in 1972 to the Department of Vegetation Science, Ecology and Weeds, retired in 1990.

Persoon, Drs. J.G.M.P. (1956–x): passed his exam at Utrecht in 1982; worked as a teacher from 1983 to 1984; appointed as research assistant from 1984 to 1987 to study the African *Landolphieae*; accepted a position in the computer branch.

Plaizier, Ir. A.C. (1953–x): passed his exam at Wageningen in 1980; appointed as research assistant from September to December 1980; accepted a position at Kluwer Academic Publishers.

Scheffer, Prof.Dr. J.J.C. (1947–x): passed his exam at Leiden in 1972; appointed as scientific officer at Leiden in 1973; doctorated in 1978 on an analyses of essential oils; appointed at Wageningen as special professor to take care of the lectures on Herbal Science from 1985 onwards.

Seegeler, Dr.Ir. C.J.P. (1940–x): passed his exam at Wageningen in 1971; worked for the Department of Tropical Crops on a study of Ethiopian oil plants from 1971 to 1977, until 1974 stationed in Dire Dawa (Ethiopia); since 1977 associated staff member of the Department; doctorated in 1983 on a study of the Ethiopian oil plants.

Sosef, Dr. M.S.M. (1960–x): passed his exam at Leiden in 1985; appointed as research assistant in Wageningen in 1988; doctorated in 1994 on a systematic and biogeographical study of African *Begonia*; since 1992 appointed as part–time staff member of the PROSEA Project, full time since 1993.

Springer, Mr. L.A. (1855–1940): lecturer garden design from 1897–1900; designed the garden around the new building for the Horticultural School, which later housed the Herbarium Vadense.

Stapelveld, Ir. E.: passed his exam at Wageningen in 1953; was scientific officer at the Biological Field Station at Wijster from 1953 to 1957, after which he was appointed at the State Forest Service.

Touw, Dr. A. (1935–x): appointed as scientific officer from 1962 to 1963 and left for the Rijksherbarium, Leiden.

Valckenier Suringar, Prof.Dr. J. (1864–1932): in 1896 deputy vice director of the Rijksherbarium, Leiden; in 1899 appointed as lecturer in dendrology at the Horticultural College and as lecturer in systematics of the Indian forest flora at the State College for Agriculture, Horticulture and Forestry; became professor in Applied Plant Systematics and Plant Geography in 1918; superannuation on 1 january 1925.

van den Berg, Dr. R.G. (1952–x): passed his exam at Leiden in 1978; appointed as research assistant at the Department from 1981 to 1984; doctorated in 1985 on a pollen morphological study of *Begonia*, supervisor van der Maesen; appointed as staff member at the Department in 1986.

van der Burgt, Ir. X.M. (1958–x): passed his exam at Wageningen in 1994; worked as associated staff member from 1994 until recent; short period free–lance appointment in 1995 and 1996 to assist in editing the proceedings of the XIVth AETFAT symposium, and for the ECOSYN Project in 1996.

van der Maesen, Prof.Dr.Ir. L.J.G. (1944–x): passed his exam at Wageningen in 1968; doctorated in 1972 on an agricultural-taxonomical study of *Cicer*, supervisors Prof. Ferwerda & Prof. de Wit; worked in Iraq (FAO) and India (ICRISAT); appointed as successor of Prof. de Wit in 1984.

van Dilst, Mrs. Drs. F.J.H. (1934–x): passed her exam at Utrecht in 1963; associated staff member working mainly on Apocynaceae since 1981.

van Nek, Ir. F.I. (1967–x): passed his exam at Wageningen in 1992; worked as associated staff member until 1994 when he left to work for a computer software company.

van der Ploeg, Ir. J. (1952–x): passed his exam at Wageningen in 1983; worked as associated staff member from 1982 to 1984, after which he went to Niger and Nepal to work in a rural development programme.

van der Poel, Ir. A.J.: appointed as research assistant from 1954 to 1956 to investigate the microclimate of forest communities; went to Zürich.

van der Werf, Dr.Ir. S. (1930–x): passed his exam at Wageningen in 1968; appointed as research assistant in the same year; went to the State Institute for Nature Conservation in 1971.

van Rompaey, Dr. R.S.A.R. (1965–x): passed his exam at Gent in 1987; was appointed as research assistant at the Department of Forestry from 1987 to 1989 during which he was stationed at the

Centre Néerlandais at Adiopodomé (Côte d'Ivoire); doctorated in 1993 on a study of forest gradients in West Africa, supervised by Prof. R.A.A. Oldeman; was appointed as research officer for the ECOSYN Project in 1996.

Venema, Prof.Dr. H.J. (1899–1983): assistant at the Botanical Laboratory in Leiden from 1924–1929; appointed as assistant in Wageningen in October 1929; succeeded Prof. Jeswiet and became professor in Plant Systematics, Dendrology and Plant Geography as well as director of the Botanical Gardens in 1947; retired per 1–11–1969.

Voorhoeve, Dr.Ir. A.G. (1934–x): passed his exam at Wageningen in 1960; appointed by FAO and stationed at Monrovia (Liberia) from 1960 to 1963; was appointed at Wageningen in 1963 where he doctorated in 1965, supervised by Prof. de Wit; went to Surinam to work for the State Forest Service.

Westhoff, Prof.Dr. V. (1916–x): appointed as researcher in 1947; well–known scientist in the field of plant communities, ecology and plant geography; resigned per 1–1–1957 to found the State Institute for Field Biological Research; became full professor at Nijmegen University.

Westphal, Dr.Ir. E. (1938–x): passed his exam at Wageningen in 1966; worked in Ethiopia from 1967 to 1968; became scientific officer at the Department and at the Department of Tropical Crops from 1969 to 1974; doctorated in 1974 on a study of the pulses of Ethiopia, supervisors Prof. de Wit & Prof. Ferwerda; went to the Department of Tropical Crops, and became important staff member of the PROSEA project.

Westphal–Stevels, Mrs. Dr.Ir. J.M.C. (1942–x): passed her exam at Wageningen in 1966; appointed as research assistant at the Department from 1980 to 1986; became associated staff member until 1990; doctorated in 1990 on a study of the legumes of Cameroun, supervisors Prof. de Wit & Prof. Flach.

Wieringa, Ir. J.J. (1967–x): passed his exam at Wageningen in 1991; appointed as research assistant from 1991 to 1995 to study African *Caesalpinioideae*; became associated staff member afterwards.

Wijnands, Dr. D.O. (1945–1993): passed his exam at Amsterdam in 1969; appointed as scientific officer at the Botanical Gardens of Amsterdam from 1969 to 1977; appointed as senior scientific officer and director of the Wageningen Botanical Gardens in 1977; doctorated in 1983 on a study of the Commelins and was especially interested in biohistory; suddenly passed away in 1993.

Fig. 33. Personnel of the Department of Plant Taxonomy. In the rear (from left to right): T.D.G. Bosma, J. van Valkenburg, N. Bezemer, E. Boer, F.J. Breteler, J. van Veldhuizen, K. Monsch, T. Smaling, J.J. Wieringa, J.J.F.E. de Wilde, M.A. van Bergen, K. van Setten, D.M. Wassink, G. Aweke (guest from Ethiopia), J.P. Kardolus, L.E. Groen; middle row (from left to right): R.A. Pattiasina (kneeling), J. Doorenbos, W.J.M. Koopman, H.H. de Leeuw, L.J.G. van der Maesen, J.F. Aleva, J.J. Bos, K.J. Manschot, J. Tedros, F.J.H. van Dilst; front row (from left to right): J. van Garderen, J.J. Jansen, P.C.M. Jansen, R.H.M.J. Lemmens, N. Groendijk–Wilders, W. Wessel–Brand, R.G. van den Berg, M. Spitteler, M.J. Zevenbergen, W. Pinkster, F.M. Blok–Bosch, M.S.M. Sosef. Absent are a.o. M.E. Lemmens–Pott, J.M. van Medenbach de Rooy–Ronkel.

Appendix 2: Publications

C.T. de Groot

Dissertations

Abdallah, M.S., 1967. The Resedaceae. A taxonomic revision of the family. 132 pp.

Arends, J.C., 1992. Biosystematics of *Begonia squamulosa* Hook. f. and affiliated species in section *Tetraphila* A. DC. 223 pp.

Bakker, J.G., 1969. Vegetatiekundig en oecologisch–geografisch onderzoek van het Quercion robori–petraeae in de Nederlandse zandgebieden ten Zuiden van de Waal [Vegetational and ecological–geographical research of the Quercion robori–petraeae in the Dutch sand areas south of the river Waal]. 144 pp.

Beeftink, W.G., 1965. De zoutvegetatie van ZW–Nederland beschouwd in Europees verband [Salt marsh communities of the SW–Netherlands in relation to the European halophytic vegetation]. 168 pp.

Beentje, H.J., 1982. A monograph on *Strophanthus* DC. (Apocynaceae). 191 pp.

Berg, R.G. van den, 1985. Pollen morphology of the genus *Begonia* in Africa. 66 pp.

Beumée, J.G.B., 1922. Floristisch–analytische onderzoekingen van de korte flora in kunstmatig aangelegde djati–plantsoenen op Java, in verband met de ontwikkeling van den djati–opstand [Floristic-analytical studies of the short flora in artificial teak plantations in Java, in relation to the development of the teak stand]. 166 pp.

Boerboom, J.H.A., 1960. De plantengemeenschappen van de Wassenaarse duinen [The plant communities of the Wassenaar dunes near The Hague]. 136 pp.

Bos, J.J., 1984. *Dracaena* in West Africa. 126 pp.

Bos, L., 1957. Heksenbezemverschijnselen, een pathologisch-morfologisch onderzoek [Witches' broom phenomena, a patho-morphological study]. 84 pp.

Breteler, F.J., 1973. The African Dichapetalaceae, a taxonomical revision. 124 pp.

Bijhouwer, J.T.P., 1926. Geobotanische studie van de Berger duinen [Geobotanical studies of the dunes near Bergen]. 204 pp.

de Koning, J., 1983. La forêt du Banco. 2 Parts. 156 & 921 pp.
de Wilde, J.J.F.E., 1968. A revision of the species of *Trichilia* P. Browne (Meliaceae) on the African continent. 208 pp.
de Wilde–Duyfjes, B.E.E., 1976. A revision of the genus *Allium* L. (Liliaceae) in Africa. 239 pp.
Diemont, W.H., 1938. Zur Soziologie und Synoekologie der Buchen– und Buchenmischwälder der nordwestdeutschen Mittelgebirge. 182 pp.
Doing, H., 1962. Systematische Ordnung und floristische Zusammensetzung Niederländische Wald– und Gebüschgesellschaften. 86 pp.
Endert, F.H., 1928. Geslachtstabellen voor Nederlandsch–Indische boomsoorten naar vegetatieve kenmerken, met een beschouwing over de practische en systematische waarde dezer kenmerken [Generic keys for the identification of Dutch East Indian trees after vegetative characteristics, with notes on the practical and systematic value of these characteristics]. 242 pp.
Feekes, W., 1936. De ontwikkeling van de natuurlijke vegetatie in de Wieringermeer–polder, de eerste groote droogmakerij van de Zuiderzee [The establishment of natural vegetation in the Wieringermeer Polder, the first large reclamation in the Zuyder Zee]. 320 pp.
Geerling, C., 1983. Guide de terrain des ligneux Sahéliens et Soudano–Guineens. 340 pp.
Houtzagers, G., 1937. Het geslacht *Populus* in verband met zijn beteekenis voor dehoutteelt [The genus *Populus* and its significance in silviculture]. 266 pp.
Jansen, P.C.M., 1981. Spices, condiments and medicinal plants in Ethiopia, their taxonomy and agricultural significance. 327 pp.
Jong, P.C. de, 1976. Flowering and sex expression in *Acer* L.; a biosystematic study. 202 pp.
Jongkind, C.C.H., 1989. The Connaraceae; a taxonomic study with emphasis on Africa. 403 pp.
Lemmens, R.H.M.J., 1989. The Connaraceae; a taxonomic study with emphasis on Africa. 403 pp.
Letschert, J.P.W., 1993. *Beta* section *Beta*: biogeographical patterns of variation and taxonomy. 155 pp.
Loos, B.P., 1994. The genus *Lolium*; taxonomy and genetic resources. 101 pp.
Maas, F.M., 1959. Bronnen, bronbeken en bronbossen van Nederland, in het bijzonder die van de Veluwezoom. Een plantensociologische en oecologische studie [Springs, springbrooks and

springwoods of the Netherlands, especially those of the southern fringes of the Veluwe. A phytosociological and ecological study]. 166 pp.
Maesen, L.J.G. van der, 1972. *Cicer* L., a monograph of the genus, with special reference to the chickpea (*Cicer arietinum* L.), its ecology and cultivation. 342 pp.
Meijer Drees, E., 1936. De bosvegetatie van de Achterhoek en enkele aangrenzende gebieden [Forest vegetation of the Achterhoek, Gelderland, and some adjoining areas]. 172 pp.
Nahal, I., 1962. Contribution à l'étude de la végétation dans le Baer–Bassit et le Djebel Alaouite de Syrie [Contribution to the study of the vegetation in the Baer–Bassit and the Jebel Alaouite of Syria]. 165 pp.
Omino, E., 1996. A contribution to the leaf anatomy and taxonomy of Apocynaceae in Africa. 178 pp.
Ouédraogo, A.S., 1995. *Parkia biglobosa* (Leguminosae) en Afrique de l'Ouest: Biosystématique et amélioration. 205 pp.
Rietsema, I., 1928. Beschrijving en rangschikking van in Nederland voorkomende kersenvormen [Description and classification of cherry types in the Netherlands]. 242 pp.
Rudjiman, 1987. A revision of *Beaumontia* Wallich, *Kibatalia* G. Don and *Vallariopsis* Woodson (Apocynaceae). 99 pp.
Seegeler, C.J.P., 1983. Oil plants in Ethiopia; their taxonomy and agricultural significance. 368 pp.
Sissingh, G., 1950. Onkruid–associaties in Nederland. Een sociologisch-systematische beschrijving van de klasse Rudereto-secalinetea Br.–Bl. [Weed associations in the Netherlands. A sociological systematic description of the class Rudereto-secalinetea Br.–Bl.]. 226 pp.
Sosef, M.S.M., 1994. Refuge begonias. Taxonomy, phylogeny and historical biogeography of *Begonia* sect. *Loasibegonia* and sect. *Scutobegonia* in relation to glacial rain forest refuges in Africa. 306 pp.
Stevels, J.M.C., 1990. Légumes traditionnels du Cameroun, une étude agro-botanique] Traditional pulses of Cameroon, a agro-botanical study]. 262 pp.
van der Zon, A.P.M., 1992. Graminées du Cameroun. Vol. 1: Phytogeography et paturages. Vol. 2: Flore. 86 & 557 pp.
Voorhoeve, A.G., 1965. Liberian high forest trees. A systematic botanical study of the 75 most important or frequent high forest trees, with reference to numerous related species. 416 pp.

Westphal, E., 1974. Pulses in Ethiopia, their taxonomy and agricultural significance. 263 pp.
Wijnands, D.O., 1983. The botany of the Commelins. 232 pp.
Zonneveld, I.S., 1960. De Brabantse Biesbosch. Een studie van bodem en vegetatie van een zoetwatergetijdedelta [The Biesbosch of Brabant. A study of soil and vegetation of a freshwater tidal area]. 397 pp.

Periodicals

Belmontia; Miscellaneous publications in botany.

Ser. I:	Taxonomy.	1957–1973. Vol. 1–14
Ser. II:	Ecology.	1957–1972. Vol. 1–17
Ser. III:	Horticulture.	1957–1970. Vol. 1–10
Ser. IV:	Incidental.	1957–1970. Vol. 1–13

- continued as: Belmontia; Miscellaneous publications in botany. New Series 1974–1996. Vol. 1–29.

Mededeelingen van het Arboretum der Landbouwhoogeschool te Wageningen. 1935–1937. Vol. 1–3.
- continued as: Mededelingen van de botanische tuinen en het Belmonte Arboretum der Landbouwhogeschool te Wageningen. 1957–1970. Vol. 1–13
- continued as: Bulletin van de Botanische Tuinen te Wageningen. 1978–1996. Vol. 1–33.

Serial works

Breteler, F.J. (Ed.), 1969–1986. The African Dichapetalaceae, parts 1–9.

de Wilde, J.J.F.E. (Ed.), 1983–1992. Studies in Begoniaceae, parts 1–4.

Leeuwenberg, A.J.M., 1961–1979. The Loganiaceae of Africa, parts 1–18.

Leeuwenberg, A.J.M. (Ed.), 1976–1996. Series of revisions of Apocynaceae, parts 1–41.

NOVITATES GABONENSES:

1. F.J. Breteler, 1990. A new species of *Trichostephanus* Gilg (Flacourtiaceae). Bull. Nat. Plantentuin Belg. 60: 143–146.
2. C.C.H. Jongkind, 1990. A new species of *Aristolochia* and some critial observations on *Aristolochia* versus *Pararistolochia*. Bull. Nat. Plantentuin Belg. 60: 147–150.
3. F.J. Breteler, 1990. *Albertisia porcata*, a new Menispermaceae (Triclisieae) from Gabon. Bull. Nat. Plantentuin Belg. 60: 405–407.
4. J.J. Bos, 1990. Another new species of *Impatiens* (Balsaminaceae) from Gabon. Bull.Mus. natn. Hist. nat., Paris, 4e sér., 12, section B, Adansonia: 239–242.
5. F.J. Breteler, 1991. The identity of *Lingelsheimia longipedicellata* J. Léonard (Euphorbiaceae) from Gabon. Bull. Mus. natn. Hist. nat., Paris, 4e sér., 12, section B, Adansonia: 293–295.
6. C.C.H. Jongkind, 1991. Some critical observations on *Combretum* versus *Quisqualis* and two new species of *Combretum*. Bull. Mus. natn. Hist. nat., Paris, 4e sér., 12, section B, Adansonia: 275–280.
7. C.C.H. Jongkind, 1991. A new section and a new species in *Agelaea* Sol. ex Planchon (Connaraceae). Bull. Nat. Plantentuin Belg. 61: 71–75.
8. M.S.M. Sosef, 1992. Seven new *Begonia* species from Gabon. Wag. Agric. Univ. Papers 91–4: 83–116.
9. F.J. Breteler, 1992. Notes on *Bonamia* (Convolvulaceae) in Central Africa with emphasis on Gabon. Bull. Mus. natn. Hist. nat., Paris, 4e sér., 14, section B, Adansonia: 61–71.
10. F.J. Breteler, 1993. *Keayodendron bridelioides* (Euphorbiaceae) its typification, correct author citation, and recent discovery in Gabon. Bull. Nat. Plantentuin Belg. 62: 187–190.
11. F.J. Breteler, 1993. The distribution of two noteworthy Gabonese Euphorbiaceae: *Conceveiba macrostachys* and *Pogonophora letouzeyi*. Bull. Nat. Plantentuin Belg. 62: 191–195.
12. C.C.H. Jongkind, 1993. Five new species of *Combretum*. Bull. Nat. Plantentuin Belg. 62: 197–203.
13. C.C.H. Jongkind, 1993. Three new species and one new combination in *Combretum*. Adansonia 14: 257–262.
14. F.J. Breteler, 1994. *Dialium lopense*, a new Leguminosae-Caesalpinioideae from Central Gabon. Bull. Nat. Plantentuin Belg. 63: 201–204.
15. F.J. Breteler, 1994. The genus *Peddiea* (Thymelaeaceae) present

in Gabon. Bull. Nat. Plantentuin Belg. 63: 205–207.
16. F.J. Breteler, 1993. *Dichapetalum rabiense* (Dichapetalaceae) a new species from Gabon. Bull. Mus. natn. Hist. nat., Paris, 4e sér., 14, section B, Adansonia: 351–354.
17. F.J. Breteler & A.M.W. Mennega, 1994. *Conceveiba leptostachys*, a new Euphorbiaceae from Gabon and Cameroun. Bull. Nat. Plantentuin Belg. 63: 209–214.
18. C.C.H. Jongkind, 1994. A new species of *Rhynchosia* (Leguminosae: Papilionoideae). Bull. Nat. Plantentuin Belg. 63: 219–221.
19. C.C.H. Jongkind, 1994. A new species in *Trichoscypha* (Anacardiaceae). Bull. Nat. Plantentuin Belg. 63: 223–225.
20. F.J. Breteler, 1994. *Diospyros rabiensis* (Ebenaceae), a new species from Gabon. Bull. Nat. Plantentuin Belg. 63: 227–232.
21. F.J. Breteler, 1994. A new species of *Baphia* (Leguminosae Papilionoideae) from Gabon. NOVON 4: 83–85.
22. F.J. Breteler, 1995. *Tapura arachnoidea* (Dichapetalaceae), a new species from Gabon. Bull. Mus. natn. Hist. nat., Paris, 4e sér., 16, section B, Adansonia: 321–323.
23. F.J. Breteler & T. Nzabi, 1995. *Delpydora* (Sapotaceae), its taxonomy and myrmecophily. Bull. Mus. natn. Hist. nat., Paris, 4e sér., 17, section B, Adansonia: 29–38.
24. C.C.H. Jongkind, 1995. A new species in *Utsetela* (Moraceae). Bull. Nat. Plantentuin Belg. 64: 179–181.
25. F.J. Breteler, 1995. Notes on the Central African genus *Dipteropeltis* Hall.f. (Convolv.) with special reference to Gabon. Bull. Nat. Plantentuin Belg. 64: 183–192.
26. F.J. Breteler, 1995. *Magnistipula devriesii* (Chrysobalan.), a new species from Gabon. Bull. Nat. Plantentuin Belg. 64: 193–196.
27. F.J. Breteler et al., 1996. *Engomegoma* Breteler (Olacaceae), a new monotypic genus from Gabon. Bot. Jahrb. Syst. 118: 113-132.
28. L.J.G. van der Maesen, (in print). A new *Xanthocercis* (Leguminosae–Papilionoideae) in Gabon. Bull. Nat. Plantentuin Belg.
29. F.J. Breteler, A.M.W. Mennega & W. Punt, (submitted). A new species in *Mareyopsis* Pax & K. Hoffm. (Euphorbiaceae) from Gabon with notes on the taxonomic position of the genus. Bull. Nat. Plantentuin Belg.
30. C.C.H. Jongkind, (submitted). A new species in *Agelaea* Sol. ex Planch. (Connaraceae). Bull. Nat. Plantentuin Belg.

PROSEA:

The handbook

- No 1. Pulses. L.J.G. van der Maesen and Sadikin Somaatmadja (Editors). Pudoc, Wageningen. 1989/ESCAP CGPRT Centre, Bogor. 1990/Prosea, Bogor. 1992.
- No 2. Edible fruits and nuts. E.W.M. Verheij and R.E. Coronel (Editors). Pudoc, Wageningen. 1991/Prosea, Bogor. 1992.
- No 3. Dye and tannin–producing plants. R.H.M.J. Lemmens and N. Wulijarni–Soetjipto (Editors). Pudoc, Wageningen. 1991/ Prosea, Bogor. 1992.
- No 4. Forages. L. 't Mannetje and R.M. Jones (Editors). Pudoc, Wageningen. 1992/Prosea, Bogor. 1992.
- No 5(1). Timber trees. Major commercial timbers. I. Soerianegara and R.H.M.J. Lemmens (Editors). Pudoc, Wageningen. 1993/Prosea, Bogor. 1994.
- No 5(2). Timber trees. Minor commercial timbers. R.H.M.J. Lemmens, I. Soerianegara and Wong Wing Chong (Editors). Backhuys Publishers, Leiden. 1995/Prosea, Bogor. 1995.
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Figures in italics refer to a photograph.