Final report of the EC Research Programme 0890

'THE COLLECTION OF LAND-RACES OF CRUCIFEROUS CROPS IN EC COUNTRIES'

BY Q.P. van der Meer (coordinator) H. Toxopeus P. Crisp H. Roelofsen

The NUCLUSCI

D. Astley

Wageningen, The Netherlands, 1984

INSTITUUT VOOR DE VEREDELING VAN TUINBOUWGEWASSEN

WAGENINGEN

Rapport 198

Final report of the EC Research

Programme 0890

'THE COLLECTION OF LAND-RACES OF CRUCIFEROUS CROPS IN EC COUNTRIES'

- by Q.P. van der Meer (coordinator)
 - H. Toxopeus
 - P. Crisp
 - H. Roelofsen
 - D. Astley

Wageningen, The Netherlands, 1984



From left to right from the top:

E.V. Schelbeck D. Astley Y. Hervé J. Doornbosch H. Toxopeus Q.P. van der Meer H. Roelofsen P. Perrino L. van Hee R.F. Murphy P. Crisp

Authors of country reports:

Britain (CP1 + CP4 + CP5)

The Netherlands, horticultural cole crops (CP2)

The Netherlands, all other crucifers (CP3)

Ireland (CP6)

Denmark (CP7)

Federal Republic of Germany (CP8 + CP11)

Belgium (CP9)

France (CP10)

Italy (CP13 + CP15)

Münchner radi

Ismaning

Filderkraut



- : J.H. McNaughton, D. Astley and P. Crisp.
- : Q.P. van der Meer and Liesbeth de Groot
- : H. Toxopeus and H.J. Lubbers
- : R.F. Murphy
- : E.V. Schelbeck
- : P. Mattusch and H. Toxopeus
- : L. van Hee
- : Y. Hervé
- : D. Astley, P. Crisp and P. Perrino

'The collection of land-races of cruciferous crops in EC countries'

- 1 -

INDEX

Chapter		Page
1	Results and Conclusions	3
2	Preface and Abbreviations	7
3	Introduction	8
4	Cruciferous crops in Europe	10
	4.1. Species, crops and names	10
	4.2. Historical: genetic diversification and	10
	subsequent erosion	
	4.3. The present importance of cruciferous	14
	crops in Europe	
	4.3.1. Oilseed, fodder and green manure crops	15
	4.3.2. Vegetable crops	18
	4.3.3. Conclusions	19
5.	The potential value of cruciferous genetic resources	20
	in Europe	
6.	The Research Programme (contract 0890): Organisation	23
	and funding	
-	Country reports:	
	CP1 + CP4 + CP5 : Britain	29
	CP2 : The Netherlands	72
	CP3 : The Netherlands	97
	CP6 : Ireland	119

			Page
CP7	: Denmark		131
CP8 + CP11	: Federal Republic of Ger	many	148
СР9	: Belgium		165
CP10	: France		177
CP13 + CP15	: Italy		194
Lists of access	ions:		
Location of seed	d accessions		4
CP1 + CP4 + CP5	: Britain		38
CP2	: The Netherlands		80
CP3	: The Netherlands		104
CP6	: Ireland		127
CP7	: Denmark		131
CP8 + CP11	: Federal Republic of Germ	nany	154
CP9	: Belgium		171
CP10	: France		192
CP13 + CP15	: Italy		199

199

- 2 -

Chapter 1

The Coordinating Committee of EC research programme 0890

- 3 -

Results and conclusions

1. Location and numbers of accessions (see Table 1).

Most accessions are now located either in gene banks or in institutions under conditions of low humidity and low temperatures $(-10 \text{ to } -20^{\circ}\text{C}).$

The accessions have been (or are being) distributed in accordance with IBPGR recommendations. The base collection consists of the bulk of each seed sample. Its maintainer is responsible for storing it, multiplying it, and distributing it to any breeders or researchers who request it. Duplicate collections are stored intact in high quality gene banks; they are not intended for use (even for germination testing), and are an insurance against the loss of the base collection. If the base collection consists of ca. 100 g seed, then the duplicate should be 5-20 g, depending on its germination.

The total number of accessions is approximately 3500. The existence of this new genetic resource will be publicized by articles in the Eucarpia Cruciferae Newsletter, the IBPGR Newsletter, and by this report itself.

2. Cooperation between European scientists

The programme has brought together breeders and genetic conservationists from most of the EC countries. This has had two results which we believe require comment. Firstly, there has been an exchange of attitudes and data relating to research work. Secondly, there is often a gap between genetic conservationists and breeders. The members of this programme have bridged that gap: the conservationists now understand that breeders want material including current varaties (a common assumption had been that the more inaccesible or uncommon the

genetic resource, the greater its potential worth); the breeders now appreciate the extent of their gene pool much better than before, and understand the practical problems of seed bank management.

- 4

3. Material from the programme has already started to be used by breeders including those involved in the programme: van Hee, Hervé and Crisp have screened for clubroot resistance; Crisp has screened for cabbage root fly resistance; and van Hee has produced selfed progenies of land races for the genetic analysis of yield.

Table 1. Location of seed accessions.

Pr	ogramme	Country	Number	of samples	Location	of
					Base collection	Duplicate ⁺
СР	1	Britain		121	NVRS	IVT
СР	2	Netherlands	ca.	700	IVT	NVRS [*]
СР	3	Netherlands	ca.	400	SVP	IVT/NVRS/FAL*
СР	4	Britain		256	NVRS	IVT
ĊP	5	Britain		471	NVRS	IVT
СР	6	Ireland		62	NVRS	IVT
СР	7	Denmark		120	IVT	NVRS [*]
СР	8>	Germany	ca.	200	FAL	_ *
CP	9	Belgium		45	RVP	FAL *
СP	10	France	ca.	500	INRA, Rennes	NVRS/IVT*
СР	11	Germany	ca.	50	FAL	- *
CP	13	Italy		362	NVRS	Bari [*]
СР	15	Italy		211	Bari	NVRS/IVT [*]

* not yet done, or not yet arranged

+ changes will be made in the location of duplicate collections when the Dutch Gene Bank and possibly the French Gene Bank begin to operate.

Recommendations

1. Although we believe that the programme has been successful, we have had difficulties because. effectively, the first half of the five year programme was lost. The continuing success of this work under the proposed second five year programme will suffer if a long time elapses before this second term is approved. We ask the EC committee to make a rapid decision.

- 5 -

- 2. During 1983 a new application was made to EC for a programme to run during the period 1984-1988 to continue the progress made with this programme. We recommend that this new application is approved, for further work is needed under the following topics: Further collecting
 - Spain and Portugal may become part of EC during this new programme.
 - Crucifers in Greece have not yet been collected.
 - Further collecting is needed to complete the work already done in
 - France, Italy, Ireland and Belgium.
 - Wild relatives of Brassica oleracea (in particular) occur in Atlantic coasts of Ireland, Britain and France and Mediterranean coasts of France, Italy and Greece.

Multiplication

We estimate that about 40% of the samples collected are in need of multiplication because of small sample size or low germination. Characterization and evaluation

Systematic observations now need to be made of the accessions. Of immediate importance are the verification of their identity, and prevention of accidental duplication of samples. In the longer term more complete characterization and evaluation will be necessary, including phylogenetic classifications as an aid to breeders.

Chapter 2

PREFACE

This is the final report of the EC Research Programme 0890, which was conducted between 1980 and 1983. The programme consisted of an international collaborative effort by plant breeders and genetic conservationists to collect systematically and store for future use the genetic variation of all the (non-oleiferous) cruciferous crops grown in the countries of the European Community. After proper distribution to, and storage in, appropriate gene banks the material will be available to breeders.

The report was produced by Q.P. van der Meer

H. ToxopeusP. CrispH. RoelofsenD. Astley

The last four are the authors of the first six chapters. Authors of the country reports are mentioned with each of these reports.

ABBREVIATIONS

CGRG	: Crucifer Genetic Resources Group (1
IBPCR	: International Board for Plant Gene
IVRS	Hational Vegetable Research Station
IVT	: Instituut voor Tuinbouwplantenvere
	Netherlands (Institute for Horticu
SVP	Stichting voor Plantenveredeling,
	(Foundation for Agricultural Plant
FRG	: Federal Republic Germany
BBA	: Biologische Bundes Anstalt HQ, Bra
FAL	: Inst. Pflanzenbau und Saatgutforsch
SCRI	: Scottish Crops Research Institute,
СР	Collection Programme

- 6 -

3. We found considerable difficulties in the ease of organising collecting according to whether genetic conservationists were in post in each country. We recommend that more resources are made available nationally for genetic conservation, with corresponding international communication to foster a network of shared work and responsibilities.

4. We recommend that characterization and evaluation of the accessions are standarised as much as possible, and to this end the crucifer descriptor list currently being prepared through IBPGR should be used as a basis. - 7 -

eer IVT SVP HVRS Dutch Genebank

NVRS

Eucarpia)

etic Resources

on, Wellesbourne, Britain

deling, Wageningen, The

Itural Plant Breeding)

Wageningen, The Netherlands Breeding)

unschweig, FRG hung, Braunschweig, FRG Milnfield, Dundee, Britain - 8 -

Chapter 3

INTRODUCTION

The cruciferae family contains an exceptionally polymorphic group of closely related cultivated plants giving produce for highly diverse purposes. Centres of genetic diversity span the Eurasian continent. for the crops are products of the many ancient civilizations of this vast area. Europe contains several of these centres, but with increasing communication and objective breeding, genetic diversity has been eroding at an accelerating rate. Concern among breeders, who use genetic variation as their raw material, has grown proportionately. The introduction and subsequent success of hybrid varieties of certain crops like Brussels sprouts about a decade ago finally triggered off action as follows:

- During the Eucarpia "Cruciferae 1979" Conference held on 1-3 October 1979 at Wageningen, Holland, cruciferous crop breeders formed a working group, (The Crucifer Genetic Conservation Group) with the objective of preventing further genetic erosion of cruciferous crops, particularly in Europe. The conference adopted a motion. directed to the International Board of Plant Genetic Resources (IBPGR) expressing the participants'deep concern about the increasing genetic erosion of cruciferous crops in the world and suggesting that IBPGR initiate a global working group to tackle this problem.
- In August 1980 a report was prepared for IBPGR on the status of genetic resources of cruciferous crops in Europe on the basis of a questionnaire to CGCG members and others (Toxopeus and Crisp, 1980). Subsequent developments initiated by IBPGR led to a global report on the genetic conservation of cruciferous crops (IBPGR 1981, Toxopeus and Van Sloten 1981) and the drafting of descriptor lists for cruciferous crops which IBPGR are currently collating.

- From 10-14 March 1980 Toxopeus, Roelofsen, MacFarlane-Smith (SCRI), McNaughton (SCRI) and Crisp met at the NVRS and worked out a detailed proposal for a programme to collect the cruciferous crops genetic resource in countries of the European Community. The proposal was submitted to the EC Programme Committee on Plant Disease Resistance and the Use of Gene Banks. Eventually, in June 1981, the proposal was approved and the contract, EC nr 0890 was signed by the main contractory, IVT. The contract was to last only to 1983, the final year of the standard five year contract cycle operating in the EC. - The programme was restricted to 'non-oleiferous' cruciferous crops,
- because of an initiative taken by oil seed rape breeders organised in the Rapeseed Breeding Subcommittee of the Group Consultatif International de Recherches du Colza. On 29 April 1980 a meeting was held at the Agricultural Research Institute (FAL), at Braunschweig with Professor Dambroth (Director), Professor Röbbelen of the Institute for Agricultural and Plant Breeding Research of Göttingen University, Dr. Mattusch of the Vegetable Disease Research Station of the BBA at Fischenich (Cologne), and Toxopeus, to discuss and coordinate activities with respect to genetic conservation. A circular letter with a brief guestionnaire was sent to rapeseed breeders of the world inviting them to send samples of their genetic stocks to the gene bank of FAL as an interim emergency action subject to further coordination by IBPGR and approval by other interested parties. The Rapeseed Breeding Subcommittee strongly supported the efforts towards an integrated conservation of genetic resources of cruciferous crops.
- During the course of the activities reported above, it became clear that the following gene banks were prepared to accept samples for storage: NVRS, Wellesbourne; IVT, Wageningen; FAL, Braunschweig; Gatersleben; Nordic gene bank; Madrid; and Bari. Additionally, IBPGR designated several European gene banks (NVRS, IVT, FAL and Madrid) as centres for base collection of various cruciferous crops (IBPGR, 1983).

Chapter 4

CRUCIFEROUS CROPS IN EUROPE

4.1. Species, crops and names

The species concept of the cultivated cruciferous crops is clear cut and firmly based on cytogenetical evidence and crossing barriers. There is however confusion about the status of a number of scientific names below the broad species level. We have suggested that the classification and nomenclature in table 2 is used. This is based on crops, their accepted English names or the original name and accepted equivalent English names.

- 4.2. Historical: genetic diversification and subsequent erosion. The evolution of crops is a product of, and contributes to, the evolution of civilisation. In broad terms, the development of farming from the subsistence to market levels, and the increasing importance of feeding large urban populations are accompanied by increasing diversity of crop types. There is historical evidence that the European cruciferous crops followed this pattern, and perhaps even give the best example of this kind of evolution:
 - In ancient Greek times (+ 400 BC) Theophrastos mentioned two types of cole crops and one turnip, both accompanied by a wild type.
 - In the heyday of the Roman empire (0-100 AD) Plinius (<u>+</u> 50 AD) described seven different types of cole plants which varied in height and thickness of the stem, size of leaves, and leaf form. He did not refer to anything like compactness of the head. This is generally interpreted to indicate that our present heading cabbage did not exist at the time.
 - Plinius and Columella (60 AD) in particular referred to two types of turnips. Columella mentioned the use of turnips as fresh winter fodder crop sown in the grain stubble during late summer. Various authors stated that turnips were staple food for common people.

Table 2. Species and names of cruci	ferous crops collected.	
Brassica oleracea L.	B. napus L.	B. rapa L.
n=9, genome c	n=19, genome ac	(synonym <u>B. campestris L.</u>)
cabbages: white	fodder rape	n=10, genome a
red	oilseed rape - winter	turnips - consumption
savoy	- summer	- fodder
Filderkraut	rutabaga (swede turnip)	turnip greens
cauliflower		brocoletto di rapa, cyme
sprouting broccoli		turnip rape - winter
Brussels sprouts	Raphanus sativus L.	- summer
curly kale, borecole	n=19, genome r	11
kohlrabî	radish	-
marrowstem kale	rettich, rammenas (giant radish, fodder radish)	
1000 head kale (fodder kale)	oelrettich, bladrammenas (oilseed radish)	
Sinanis alba l Fruca sativa l	Rorinna (Nasturtium) snn enidium sativum	

- 11 -

cress vatercress rocket white mustard

Crop differentiation had also gone on in Byzantine and Arabic cultures. This is shown in the book on agriculture of Ibn el Awam (\pm 1150 AD) who described three types of cauliflowers and purple topped turnips in addition to the crops described by the Roman authors.

From the late late middle ages European culture gathered momentum and started to diversify. One sign of this was the appearance of a new crop: 'raapzaad', seed from the rapa (turnip) from which oil could be extracted. This was a new cashcrop for farmers, initially a fringe benefit from the stubble turnip fields, a part of which were allowed to overwinter and flower and seed the following spring and early summer. In the 16th century a specialized long. slender-rooted type of turnip is mentioned as the best type to produce winter turnip rape seed; a clear sign of the gradual differentiation of this crop type. Around the turn of the 17th century the existence of a much higher yielding type of rape seed is reported. This crop is produced by a type of cole-plant and is probably the first report of what we presently know as winteroilseed rape (B. napus L.). This plant combines the chromosomes of cole crops with those of tunips ! Within the species of B. oleracea crop differentiation increased spectacularly in the 16th century. To the cabbage and curly kale of Fuchs (1543(, half a century later Dodoens added white, green, savoy and red cabbage^{*}, cauliflower, kohlrabi and various kales. At about the same time Camerarius showed a guite astonishing range of kales and he made a most intriguing remark: each community grows its own type of cole story (Toxopeus, 1976, 1977). Indeed, the European 'market garden' industry, located around major urban areas, must have operated like islands in the way that they encouraged genetic isolation within the differentiating gene pool. In 1830 Metzger described and classified a larger number of crops than we know today. In the species B. napus L. he mentions vegetable crops such as white and dark red forms of 'Schnittkohl'. Later in that century

* he also mentioned a type called "Roosken", this is shown in certain paintings too; this crop does not exist anymore today. Vilmorin-andrieux (1870) also described a great diversity of crucifer vegetable types; again some (such as black skinned turnips and some kohl rabi types) are largely unknown today. The process of crop differentiation had apparently reached its limit.

We may therefore state that European farmers created the major part of the range of cruciferous crops in the period between about 1100-1800 A.D. Some 700 years and at least 300 plant generations were involved spanning the whole of agricultural Europe with all its variation from maritime to continental climates, highly varied soils, pests, diseases, topography and market demands. Clearly, this massive, diverse process of domestication cannot be repeated or substituted in any meaningful way, as we describe below.

A quarter of a century ago, the ability to mutate genes with radiation or chemicals led to a belief that useful, new genes could be created, but except in very rare instances this has not happened. Currently, the new techniques of 'genetic engineering' appear to open possibilities of creating new genes, but, again. this is an unrealistic expectation: genetic engineering will produce new <u>methods</u> to be used in breeding, it will not, for the forseeable future, procedure new <u>materials</u>. For most practical purposes existing genetic variation will continue to supply breeders' raw material.

Crop species (indeed, even individual <u>fields</u> of a crop) until recently usually contained enough genetic variation for a breeder to make progress by selecting within readily accessible populations. However, over the last few decades this genetic variation has decreased at an accelerating rate. This has partly been due to breeding producing more uniform varieties,

, i

- 12 -

but has also been due to varieties being bred for international rather than local markets allied to increasing standardisation in methods of growing, processing and marketing, and to National List regulations. which have the effect of limiting the number of varieties that are allowed to be marketed.

The effects of genetic erosion on agricultural productivity in EC countries are as yet minimal. or at least are masked by other agricultural techniques. However, highly developed agricultural systems (uniform varieties, chemicals and a high level of mechanization) are less stable and can suddenly become upset for reasons that previously were trivial - novel pest epidemics on 'green revolution super rices' are an obvious example. Sufficient flexibility to overcome such problems must include the exploitation of genetic variation.

We must also see the conservation of variation of European cruciferous crops in a world context. Several crucifers of Asian origin already contribute to European agriculture (B. rapa cabbages, Asian radishes. and B. juncea mustard). Similarly, the European crop types of B. oleracea L. and B. napus L. are now of major importance in other parts of the world. The species B. oleracea L. and B. rapa L., which are, respectively one parent each of the African B. carinata and the Asian B. juncea, have a great part of their diversity in Europe.

Europeans have a duty to the rest of the world to conserve their native crop genotypes so that non-Europeans can exploit this genetic resource.

4.3. The present importance of cruciferous crops in Europe The vegetable crucifers (cabbage, cauliflowers, Brussels sprouts, etc.) are, as a group, the most important outdoor vegetables in Europe. Oilseed rape is one of the three main European oil crops, and is the only one that can be grown profitably in northern countries. Crucifer fodder crops are. collectively, the most important crop for animal food behind Graminae.

4.3.1. Oilseed, fodder and/or green manure crops Areas devoted to oilseeds are fairly well documented in EC countries. But figures for fodder and green manure crops are more difficult to establish because these crops are usually not recorded in annual census statistics since they are sown late in summer and harvested in early winter.

The federal Republic of Germany

The oilseed rape area sown annually is between 100.000 - 150.000 ha. The biggest area of crucifer fodder and green manure crops is in the FRG. Forage rape is part of the cropping system for small grains, grown in the time span between the harvesting of winter barley (July) and the sowing of winter wheat (October). The annual area of production is about 750.000 ha and in the 2-3 month growth period the crop produces a large amount of very palatable fresh fodder (4 tons dry matter per ha) at a time that pastures have ceased to be productive. The crop leaves a wellrooted stubble. Moreover the German farmer believes that the forage rape is responsible for the continued productivity of the top soil in the narrow cereal-rotation, which are grown on nearly two million ha of goodquality land !

The area of stubble turnips is approximately 150.000 ha. This crop is sown in the cereal stubble (hence the name) from late July to mid-August, as fodder crop in a mixed farming system. In addition there are two crops that are used for green manure purposes: white mustard and oilseed radish. They are grown on an area of roughly 300,000 ha. These crops can be sown well into September. They are grown for the purposes of weed control, to improve the structure and organic

matter content of the soil, and clear up soil borne pathogens. The total area of agricultural crucifers in the FRG is about 1.4 million ha every year.

France

Nothern France is the largest producer of oilseed rape in Europe: about 400.000 ha annually. Turnips play no role, but, fodder rape and fodder kale total approximately 300.000 ha in roughly equal shares, mostly in Normandy and Brittany. This adds up to about 700.000 ha of agricultural crucifers.

Britain

Between 200.000 and 250.000 ha of oilseed rape are grown annually. Forage rape has its main centre of diversity in the U.K., where since the 16th century it has been the traditional crop producing fresh fodder in winter. Here landraces occur, one of which is called 'Hungry gap kale'. This seems to imply that in the past. when the name was given, this crop materially helped small farmers and their (few) cattle to survive the winter, the hungry gap in the year. On the continent this hungry gap was mainly filled by the stubble turnip, which apparently only became known in the U.K. in the 1970s when it was introduced by Dutch breeding companies. Towards the end of that decade nearly 50.000 ha of this crop were cultivated. Apart from these two stubble crops there is also the swede (B. napus L.) which is grown as main crop and so is 1000 head-kale (B. oleracea L.). At a reasonable guess, the total area of these fodder crops in the U.K.

is between 150.000 and 200.000 ha.

Altogether an area of roughly 400.000 ha sown to agricultural crops.

Belgium

Flanders is the area in Belgium where stubble turnips are still grown. This is where, in the middel ages, the crop was cultivated again for the first time since the Roman era. The Flemish cropping systems became famous in 16th century Europe for crops like stubble turnips and clovers which played a key role. Fallow land could be exploited with these crops and their beneficial effect on the following crops was considered to be particularly important.

The present area under stubble turnips is about 35.000 ha, and together with a smaller area of fodder rape and oilseed rape the aggregate is approximately 70.000 ha.

The Netherlands

The area of oilseed rape is slowly expanding to 15.000 ha, of which about 6.000 is grown in the Ijsselmeerpolders. Of the 100.000 ha which were sown with stubble turnips up till the early 1970s less than 10% now remains due to the transition from small mixed farms to dairy farming, based on fodder maize and perennial ryegrass. This decline in acreage had nothing to do with the turnips as such because in dry summers, like 1976, with a poor performance of grass early in the year, turnips were grown widely. O_n average however, including a small area of fodder rape and the recently expanding area of white mustard and oilseed radish the combined area is

estimated at 20.000 ha.

This adds up to 35.000 ha of agricultural crucifers.

The position of Italy, Luxembourg and Denmark was not yet clear.

All together EC countries grow at least 800.000 ha of oilseed rape and 1.800.000 ha of fodder- and green manure crucifers, an aggregate of 2.600.000 ha of agricultural crucifers.

4.3.2. Vegetable crops

Statistics from EC, FAO and national Ministries of Agriculture differ as to the amounts of each crucifer vegetable grown in each EC country. However, the major vegetables are clearly cabbages and cauliflowers, followed by Brussels sprouts, and then by calabrese broccoli, radish, turnip, swede and kohl rabi. About 15% of the total commercial vegetable tonnage produced by EC countries is attributable to crucifers.

The largest producers are as follows (the figures, derived from several statistics, must be taken as decriptive rather than definitive):

<u>Italy</u> produces at least 600.000 tonnes each of cabbages and cauliflowers. Substantial quantities are also produced of broccoli (including calabrese broccoli) and 'turnip tops' (broccoletto di rapa, cima di rapa).

France produces about 500.000 tonnes of cauliflower. Estimates for cabbage range from 250.000 to 750.000 tonnes. Brussels sprouts, radish and turnip add a further 150.000 tonnes.

Britain produces about 1.000.000 tonnes of cabbage and 350.000 tonnes of cauliflower. It is the major site of Brussels sprouts production in the EC, with about 300.000 tonnes.

The Federal Republic of Germany produces 600.000 tonnes of cabbage, and other cole crops including kale and kohl rabi in appreciable quantities amounting to about 150.000 tonnes.

The Netherlands produce 350.000 tonnes of cabbage; Brussels sprouts and cauliflower add a further 100.000 tonnes.

The smaller producers - Denmark, Luxembourg and Ireland - produce about 200.000 tonnes of cabbage and 100.000 of cauliflower.

In all these countries several minor crucifer crops are also commercially grown: - sprouting broccoli, radish, turnip, kale (including borecole),

swede, watercress, etc. Additionally, the crucifers are very important traditional garden crops, and very substantial amounts are grown in the numerous gardens for home consumption in all of the EC countries. Yields are approximately 10 t/ha for caulifloweres and Brussels sprouts, 20 t/ha for root crucifers (radish, turnip, swede and kohl rabi), and 30 t/ha for cabbage. Allowing an extra 10% for the minor types, and 30% for garden crops, this gives an approximate area within the EC countries of 500.000 ha devoted to vegetable crucifers.

4.3.3. Conclusion

Our estimate shows that the area grown to the whole range of crucifer crops in EC countries exceeds 3 million ha per annum.

- 20 -

Chapter 5

THE POTENTIAL VALUE OF CRUCIFEROUS GENETIC RESOURCES IN EUROPE The primary and overriding importance of genetic resources is that, when fully available, they provide breeders with the widest possible basis of genetic variation that arose under domestication. This statement is self-evident, but is made so often in a theoretical context that we believe it needs more careful analysis.

Firstly, the resources must be known and must be available; too often the 'gene pool' of a crop is undefined, and a breeder may have no real idea of the extent of the variation available to him. We record here that, as individuals, our experiences of conducting this programme has expanded our knowledge of the crops on which we work. Not only do we now have more tangible gene pools to exploit, but because we also now know much more of variability of cruciferous crops, we can also set more realistic limits on what is biologically possible within those crops.

Secondly, many of the arguments in favour of the conservation of genetic resources are emotive rather than factual, and lose validity because there are few examples where the use of a 'genetic resource' has per se saved an industry, prevented starvation, or created a new crop. We believe that the usefulness of genetic resources is more subtle, and is virtually indistinguisable from conventional plant breeding. To guote N.W. Simmonds (1979, Principles of Crop Improvement, Longman, London, p.186) "The parents used in a plant breeding programme generally fall into two categories: locally adapted varieties whichare expected to contribute immediately to overall performanceand varieties chosen for a particular attribute". Either or both of these can be regarded as the genetic resource. Either kind can be also in danger of extinction and therefore both need to be conserved.

Quite apart from these two arguments, it is axiomatic that the scope of

a breeding programme is a function of the available genetic variation. Single cross hybrids, which are increasingly common, do not provide a

platform for radical improvement. If anything, breeders are becoming more dependent on genetic variation. Where cruciferous crops in Europe are concerned there are several possible uses of the genetic resources we have obtained:

New Crops

The cruciferae are a 'natural' taxonomic unit containing many similar species, only a few of which have given rise to major crops. There are, for example, several species (e.g. species of Crambe, Eryngium and Sisymbrium) which are potential oil crops with different properties to the Brassica rapa and B. napus oil seed types. Several species are minor vegetables (e.g. species of Eruca, Crambe and Rorippa) and could conceivably become major human or animal foods. Even among the authors of the report, Toxopeus (1983) has recently developed beet cyst nematode resistant varieties of white mustard and "oelrettich", both green manure crops which now have the property of reducing populations of this nematode. McNaughton has bred allopolyploids from Raphanus x Brassica with potential as new fodder crops. And Crisp has developed new forms of broccoli from cauliflower x broccoli.

New cultivars and new problems

There must be considerable defects in all cultivars and crop types currently being grown: - they seldom reach their full potential in quality, yield, or financial return to the farmer because of susceptibility to pests, diseases, and edaphic and climatic factors. The major part of crucifer breeding is (and will probably remain) aimed at overcoming these problems. However, new problems frequently appear: for example, where cruciferous crops are concerned, the diamond back moth (Plutella xylostellaL.)

a major world-wide pest, has in SE Asia evolved resistance to all pesticides that are currently available. There is also a need for greater uniformity in vegetables for processing; new pests and diseases of horticultural crucifers are appearing due to the increase in oilseed rape in Europe; there is a need for resistance to new herbicides; and so on. Other potential problems cannot be foreseen, and may require genes (or gene complexes) which are not available in current cultivars.

Agricultural production systems depend increasingly on agrochemicals particularly for pest and disease control. As has been illustrated above, the risk of pathogens developing resistance to the chemicals is real. Despite difficulties in the development of reliable screening methods to identify stable mechanisms of resistance to pests and diseases, giving partially or fully resistant cultivars, the availability of the widest possible genetic variation is a precondition.

Chapter 6

THE RESEARCH PROGRAMME (CONTRACT 0890): ORGANISATION AND FUNDING

- 6.1. The programme was initiated and organised throughout by a Coordinating Committee which consisted of one member from each of IVI, SVP, SCRI and NVRS as follows: H. Roelofsen (IVT) - chairperson until March 1983 Q.P. van der Meer (IVT) - chairperson from September 1983 P. Crisp (NVRS)until January 1983 D. Astley (NVRS)January 1983 H. Toxopeus (SVP) throughout W.H. MacFarlane-Smith (SCRI)until January 1981 I.H. Macnaughton (SCRI)from January 1981. Roelofsen and Astley are genetic conservationists and during the course of this project were in charge of gene banks at their institutes;
 - Toxopeus, MacFarlane-Smith and MacNaughton are agricultural crucifer breeders: Van der Meer and Crisp are horticultural crucifer breeders. Financial administration was conducted by J. Doornbosch (SVP). The distribution of funds is given in Table 3.
- 6.2. An annual meeting was held to plan and review the work, and to arrange the distribution of funds. These meetings consisted of the members of the Coordinating Committee and representatives of each other country participating in the collection work. The work was divided into collection programmes (CP's), each of which deal with a specific area over one or more years and was organised by specialists agreed between the Coordinating Committee and the country representatives.

The financial support of a CP was formalised by a subcontract between

IVT and national research institutes which employed the specialists. The cost analyzis of a 'Standard' CP is given in Table 4. CP coordinators were allocated funds, and were responsible for local planning and reported twice a year to the Coordinating Committee, who in turn reported to the EC Programme Committee on Plant Disease Resistance and the Use of Gene Banks.

- 6.3. CP's were conducted in 8 of the 10 countries (Luxenbourg & Greece were not included). Table 5 lists the CP's.
- 6.4. The original concept of the project was that visits would be made to traditional agricultural areas to collect land-race^{*} and primitive varieties. To these were to be added obsolete varieties obtained from seed merchants. That is, we expected to use the same methods as described in the genetic conservation literature (notably in IBPGR Newsletters).

However, we decided that it was also important to collect currently popular varieties, because:

They were readily available, in large quantities, and were represented by good quality seed.

Most breeding, now and in the forseeable future, will include such material.

There is a rapid rate of disappearance of such cultivars. Very often 'land-race' representatives of modern types no longer exist.

* Land-races are taken to be populations selected and multiplied in a traditional manner by growers. They will therefore possess genetic adaption to local conditions and against annual variation. Also, European farmers often will not donate seed samples without payment or a written promise that their material will not be given to a seed company. In a few cases, therefore, we had to impose embargoes on the release of seed subsequently stored in gene banks. All three methods were used in different proportions according to the particular Collecting Programme, and are discussed in their reports.

No collections of the wild relatives of cultivated crucifers were planned or made.

Table 3

26

Funds from the E.C. over the years 1981 untill 1984 (Dfl)

Namaa	Funds from the E.C.			
Names	1981	1982	1983	totaal
Dr. P. Crips, Dr. D. Astley and assistents National Vegetable Research Station, United Kingdom	41.588,70	13.744,=	44.139,= ¹⁾	99.471,70
Ir. H. Roelofsen and assistents Instituut voor de Veredeling van Tuinbouwgewassen, Nederland	33.344,40	15.285,=	25.094,= ²)	73.723,40
Ir. H. Toxopeus and assistent Stichting voor Plantenveredeling SVP, Nederland	18.864,60	3) 22,011,=	25.176,= ³⁾	66.051,60
Dr. I.H. MacNaughton and assistents Scottish Crop Research Institute, United Kingdom	7.599,30	7,622,=	4.534,=	19.755,30
Dr. Erl v. Schelbeck and assistents Den Kgl. Veterinaer - and Landbohøjskole, Denmark	-,-	16.452,=	5.750,=	22.202,=
Dr. R.F. Murphy and assistents The Agricultural Institute, Ireland	-,-	21.671,=	11.925,=	33.596,=
Ir. L. van Hee and assistents Rijksstation voor Plantenveredeling, België	-,-	8.138,=	11.903,=	20.041,=
Y. Hervé and assistents Station d'Amélioration des Plantes, France	-,-	21.557,=	29.853,=	51.410,=
Dr. P. Perrino and assistents Instito del Germoplasm	· · · · ·	- ₉ -	17.296,=	17.296,=
TOTAAL	101.397,00	126.480,00	175.670,00	403.547,00

1) incl.: coordination and CP Italy

and final report f 20.745,= and CP's FRG 2) " : 3) " :

26

27

.

<u>desk)</u> -- 1980 = ƒ 21.510 -- 54% field) lection Programme Programme is given below but the d on local conditions. || |-+5 = f 1.500= f 1.000 --= f 11.000= f .750 = f 3.780f 40.000 .460 1 1 1 1 1 100% 27% 3% %6 1% 4% 2%

Table 5. Collection Programme

Number Country	Scope of programme	Persons responsible	Date started
CP 1 Britain	Winter cauliflower in England	P. Crisp	1981
CP 2 The Netherlands	Horticultural cole crops	H. Roelofsen	1981
CP 3 The Netherlands	All other crucifers	H. Toxopeus	1981
CP 4 Britain	Agricultural crucifers	I.H. McNaughton	1981
CP 5 Britain	Horticultural crucifers	P. Crisp D. Astley	1981 1983
CP 6 Republic of Ireland	All cultivated crucifers	R.F. Murphy	1982
CP 7 Denmark	Horticultural crucifers	v. Schelbeck	1982
CP 8 Federal Republic of Germany	Horticultural crucifers in S. Germany	P. Mattusch H. Toxopeus	1982
CP 9 Belgium	Agricultural crucifers in Flanders	L. van Hee	1982 1983
CP 10 France	All cultivated crucifers in W France	Y. Hervé	1982
CP 11 Federal Republic of Germany	Agricultural crucifers in SW Germany	H. Toxopeus P. Mattusch	1983
CP 13 Italy	Horticultural crucifers in S Italy(seedsmens' varieties)	P. Crisp D. Astley	1982 1983
CP 14 Italy	Horticultural crucifers in S Italy (landraces)	P. Perrino	1983

CRUCIFEROUS CROPS IN BRITAIN

- 1. This report is derived from projects CP1, CP4 and CP5, and deals with the cruciferous crops of England, Wales and Scotland. Contributors to the report are Dr. I.H. McNaughton, Dr. D. Astley and Dr. P. Crisp.
- 1.1. Common names and their scientific synonyms The crops traditionally grown in Britain are as follows:
 - Species and variety Common name Brassica oleracea L. var. capitata L Cabbage var. sabauda L. var. italica Plenck. Broccoli
 - var. botrytis L. Cauliflower var. acephala DC. Scotch kale, Thousand head kale, var. gemmifera (DC.) Leveille

B. campestris L. ssp. rapifera Sinsk. ssp. oleifera Sinsk.

B. napus L. *

var. napobrassica (L.) Peterm. ssp. oleifera Sinsk.

Swede Oil seed rape,

Turnip

Uncommon names or types Poll or cattle cabbage Savoy cabbage Savoy Purple, white or green sprouting broccoli; calabrese; Cape broccoli; Nine-star broccoli Heading broccoli Marrow stem kale, Borecole, curly kale

Brussels sprouts

lurnip		Nере	(neep)
Stubble	turnip	Turni	p-rape

Swedish-turnip Swede-rape, rape-kale, Hungry Gap, Siberian Fodder rape and Ragged Jack kales

- 30 -

B. nigra L.

Sinapis alba L.

Raphanus sativus L. var. radicula Pers. ssp. oleifera Metzg.

Lepidium sativum L

Nasturtium officinale R. Br Watercress

Crambe maritima L.

Seakale

Black mustard

White mustard

Fodder radish

Radish

Cress

1.2. Utilisation

Most of the B. oleracea types, the culinary radish, cress, watercress and seakale have been and are still used exclusively as human vegetables.

Cabbage and kale (B. oleracea) and some of the B. napus kales were grown for either human or animal (sheep and cattle) food. They are now mainly grown for animals.

Some leafy, fodder forms of B. campestris, B. napus and R. sativus have never been recognised human foods, and are used exclusively for animals.

The two crops with large storage roots, turnip and swede, are traditional human foods (500,000 ha of turnips were grown for human consumption before the introduction of the potato); although small amounts are still grown as storage for winter food.

B. nigra and S. alba were grown for their seed, which is ground to give the condiment mustard. B. nigra was completely replaced about 30 years age by B. Juncea L. (brown mustard).

The oil seed form of B. napus is a minor traditional crop, which has recently started to be grown over much larger areas (currently 250,000 ha).

There is not traditional use in Britain of crucifers as green manure.

- 31 -

1.3. Cultural practices and crop rotations

Although many of the crops given an all-the-year-round supply of fresh product, the main importance of crucifers has until recently been as winter food for humans and animals. The introduction of processed foodstuffs for both humans and animals has reduced the dependence on winter crucifers; and new farming practices have increased the output from other seasons of the year.

Crops are grown as follows. There are wide regional variations due mainly to climate; a single asterisk (^{*}) indicates a practice restricted to central Britain and southwards, with a double asterisk (***) for southern England and Wales.

- a) Autumn-sown, wintered under cover, spring-planted for summer maturity - summer cauliflowers, following any crop.
- b) Autumn-sown for winter to early summer maturity
 - spring cabbage^{*}
 - stubble turnips)
 - calabrese broccoli^{**})

c) Autumn-sown for late summer maturity

- oil seed rape (B. napus), following cereals

- d) Spring-sown for summer/autumn maturity
 - summer and autumn cauliflower, cabbage, calabrese, broccoli, turnip and radish, all for human food
 - fodder forms of kale, rape and radish
 - white and brown mustards
 - All may follow any crop, including crucifers
- e) Spring/summer-sown for winter maturity
 - winter cauliflower^{**}. often following early potatoes

 - marrow-stem^{*} and thousand-head kales, turnip, swede and cabbage for animals
 - All may follow any crop, including crucifers

following cereals, peas, early potatoes

- Scotch kale, Savoy cabbage and cabbage^{*} for human food; Brussels sprouts

- f) Spring/summer-sown for spring maturity
 spring cauliflower^{*}, sprouting broccoli^{*}
- g) Spring/summer harvested from perennial beds
 - watercress^{*} (beds last ca. 10 years)
 - seakale^{*} (beds usually re-established every 2 years
- h) Seedlings harvested in any season, sown under cover
 - cress

1.4. Main problems of cultivation

1.4.1. With so many different climatic and edaphic conditions and so many different types of crucifer crops, successful combinations of crop and environment have been developed, but these mask many of the mayor problems in crucifer production.

For example, clubroot (<u>Plasmodiphora brassicae</u>) is a problem in the wetter, more acidic soils of west Britain. It has caused a decrease in <u>B. oleracea</u> and <u>B. napus</u> kales for animal food, with an increase in clubroot-resistant stubble turnips and fodder radish. It has probably also contributed to (by not hindering) increased horticultural brassica production in the east. It remains, therefore, a major constraint on what can be grown, and where.

Similar regional differences exist for other diseases (<u>Mycosphaerella</u> <u>brassicae</u>, Erysiphe <u>cruciferarum</u> and <u>Peronospora parasitica</u>), pests (aphids, lepidoptera, <u>Ceutorhynchus pleurostigma</u>, <u>Delia</u> brassicae), and, most obviously, for cold temperatures and frost.

- 1.4.2. The rapid increase in oil seed rape appears to be causing increasing incidences of diseases on other agricultural and horticultural crucifers:- <u>Alternaria</u> <u>brassicicola</u>, <u>A. brassicae</u>, <u>Phoma lingam</u>, <u>Mycosphaerella brassicae</u>, <u>Gloeosporium concentricum</u>, <u>Peronospora parasitica</u>, and several viruses may all be more common than a decade ago. Several pests may also be increasing. The potential extent of the problems cannot be defined.
- 1.4.3. Additionally, there are the range of improvements necessary for most crops: improved uniformity and cosmetic quality in vegetables; and improved yield, digestibility and reduced toxicity in animal food.

1.5 Localities and acreages

Distinct, traditional areas of production for specific crops, where they exist, are described in the CP reports. The acreages of each crop are given in Table 1.

Table 1 Areas of the main cruciferous crops grown commercially in Britain: 1982 or 3 data, in '000 ha.

England

15.4
0.7
15.4
12.3
3.1
0.1
24.0
23.3
218.0
312.3

1.6 Economic value

It is difficult to compare the different kinds of crops. Animal food crucifers are too minor in comparison with graminaceous foodstuffs to be accurately calculated. Even among vegetables, although the wholesale value of some types can easily calculated, the omission from the official statistics of the amounts grown by amateur gardeners can be a serious deficiency. For example, 50% more seed of sprouting broccoli is sold than of cauliflower, but the commercial acreage (which includes kale) is 1/16th of the size.

33 -

	Wales	Scotland
	0.4	0.8
	0	0.3
	0.4	0.7
	0	0.5
	0.3	0.6
	0	0
¢	4.1	15.6
	4.0	37.7
	0.4	3.9
	9.6	60.1

- 34 -

The best we can do is categorise the crucifer crops as follows.

- Major oil seed rape (worth ca. £m 500)
- Important turnip, swede, kale for animals
 - Brussels sprouts, cabbage and cauliflower humans (worth £m 30-60)

- rape-kale, cabbage and fodder radish for animals

Minor

- brown and white mustards for condiments

- turnip, swede, calabrese and watercress for humans (worth

£m 2-5); and probably culinary radish and sprouting broccoli

- Very small cress and seakale
 - 'foreign' crucifers, e.g. Chinese cabbage, mouli radish and kohl rabi

2. Varietal situation

Reasons for the loss of varieties, and its extent, have been discussed in the CP reports.

- 2.1. It is virtually impossible to quantify the extent of genetic erosion, and there are many contributory factors, but one of these - National Listing must have an over-riding effect. (National Listing is combined for practical and legal purposes with Plant Variety Rights in the EC, but it is clear that PVR in itself need not lead to genetic erosion). The crops can therefore be divided into those under the National Listing scheme, and those which are not.
- 2.2. A further division can be made for those crops where substantial breeding has been done. With the exception of calabrese, all of these are National Listed. Crucifers have a readily exploitable incompatibility system which encourages F_1 hybrid breeding, so a measure of breeding effort can be taken from the proportions of F_1 hybrid varieties in the different crops. These are given in Table 2.

Table 2 Numbers of varieties (excluding 'approved maintenances' of varietal types) and proportions of hybrids in crucifer crops in Britain.

	Natior	al List		NIAB Rec	ommended List
Crops	Total	% hybrid		Total	% hybrid
For humans:					
Cabbage	140	29		81	48
Brussels sprouts	55	71		35	100
Cauliflower	116	2		60	3
Scotch kale	9	0		-	_
Kohl rabi	7	0		-	-
Radish	28	7		-	- *
U.					
For animals:					
Kale	14	0		12	0
Turnip (human and animal)	64	0		16	0 (animal
					only)
Swede	22	0	ý	9	0
Fodder radish	3	0		3	0
(Fodder rape - see below)					
For seeds:					
Oil seed rape)	26	0		8	0
Fodder rape)				13	0
Brown mustard	3	0		-	
White mustard	3	0		-	

2.3. The high numbers of varieties of cabbages and cauliflowers are due to distinct types being grown in different seasons of the year. There are an average of about 10 varieties per month of production for the three major crops - Brussels sprouts, cabbages and cauliflowers.

Clearly, the high incidence of F_1 hybrids among cabbage and Brussels sprouts in both the National List and, more so, the NIAB Recommended List suggests substantial breeding effort in these crops, and therefore probable high genetic erosion.

- 35 -

Although it appears from these data that cauliflowers may have suffered less genetic erosion due to breeding, this is unlikely to be true because many summer- and autumn-maturing varieties are effectively inbred lines.

- 2.4. Turnips, swedes and radishes are represented by fairly high numbers of varieties and few hybrids, and may be less eroded. Scotch and agricultural kales and fodder rape are native British crops, now represented by very few varieties, and must be substantially eroded. Kohl rabi, fodder radish, oil seed rape, and brown and white mustards are not British, and the low number of varieties is therefore unimportant.
- 2.5. A further distinction could usefully be made of the proportions of varieties of each crop which are of British origin, and which are not, but this is made almost impossible by the increasingly international nature of the seed trade: for example, some Brussels sprouts hybrids now grown in Britain are bred in Holland, but probably include material which developed as local strains in Britain over several centuries.
- 2.6. There are no officially recognised varieties of the broccolis (although calabrese is National Listed in other EC countries), cress, watercress and seakale. Neither are there F_1 's or evidence of substantial breeding in these crops (with the notable exception of calabrese). These are unlikely to have suffered much genetic erosion due to recent legislation or breeding. However, it is correspondingly difficult to assess whether accessions acquired in CP5 differ:- most were obtained from seed companies and may have come directly or indirectly from the same seed stock.
- 3. Gene banks

All accessions are stored as base collections in the NVRS Gene Bank. Duplicates have been sent to the IVT.

4. Collecting strategy

This is fully described in the reports for CP1, CP4 and CP5: the major part of the collecting (in terms of numbers of accessions) was of current varieties.

5. Collection localities

All regions of Britain were covered except Ulster (Northern Ireland).

6. Collection results

The numbers of accessions are given in Table 3, where most of the duplications have been omitted; and a full list is appended to this report.

- 37 -

7. Degree of collection

All areas except N. Ireland and all crops have now been collected as adequately as possible, although odd stocks will probably continue to appear, partly as a consequence of this programme. Numbers of accessions acquired (where applicable h = horticultural,

Table 3

a = agricultural)

Crop	Land races/ growers' stocks	Obsolete Varieties	Current Varieties	
Cabbage h	1	19	115	
a	0	0	16	
Broccoli	0	1	79	
Cauliflower	21	67	35	
Kale h	0	9	12	
а	0	0	24	
Brussels sprout	· · · -	112	-	
Turnip h	0	6	17	
а	0	0	12	
Swede h	0	4	12	
а	0	26	29	
Fodder rape h	8	0	3	
a	0	0	19	
Radish h	0	3	45	
a	0	1	27	
Watercreșs	0	1	7	
Cress	0	0	27	
Totale	30	249	516	-

Crucifer seed stocks collected in Britain (project CP1, CP4 and CP5)

Project CP1

EWK's Maystar

Lenten Monarch

Late Queen

May Blossom

Brassica oleracea L. convar botrytis (L) Alef. var botrytis - cauliflower

National List Varieties	Quan
Roscoff winter type	
Newton Seale	30 0g
Seale Hayne No 5 RXA	30 0g
St Buryan	30 0g
St David	300g
St Gwithian	300g
St Hilary	300g
St Keverne	300g
St Mark	300g
St Mawes	30 0g
St Thomas	300g
Old English and Walcheren winte	r types
<u>Old English and Walcheren winte</u> April Queen	r types 300g
<u>Old English and Walcheren winte</u> April Queen Asmer Juno	<u>r types</u> 300g 300g
<u>Old English and Walcheren winte</u> April Queen Asmer Juno Asmer Midsummer	<u>r types</u> 300g 300g 300g
<u>Old English and Walcheren winte</u> April Queen Asmer Juno Asmer Midsummer Asmer Pinnacle	<u>r types</u> 300g 300g 300g 300g
<u>Old English and Walcheren winte</u> April Queen Asmer Juno Asmer Midsummer Asmer Pinnacle Asmer Showcap March	<u>r types</u> 300g 300g 300g 300g 300g
<u>Old English and Walcheren winte</u> April Queen Asmer Juno Asmer Midsummer Asmer Pinnacle Asmer Showcap March English Winter	<u>r types</u> 300g 300g 300g 300g 300g
Old English and Walcheren winte April Queen Asmer Juno Asmer Midsummer Asmer Pinnacle Asmer Showcap March English Winter - Adams Early White	<u>r types</u> 300g 300g 300g 300g 300g 300g
Old English and Walcheren winte April Queen Asmer Juno Asmer Midsummer Asmer Pinnacle Asmer Showcap March English Winter - Adams Early White - Early March	<u>r types</u> 300g 300g 300g 300g 300g 300g 100g
Old English and Walcheren winte April Queen Asmer Juno Asmer Midsummer Asmer Pinnacle Asmer Showcap March English Winter - Adams Early White - Early March - June Supreme	<u>r types</u> 300g 300g 300g 300g 300g 300g 100g 300g
Old English and Walcheren winte April Queen Asmer Juno Asmer Midsummer Asmer Pinnacle Asmer Showcap March English Winter - Adams Early White - Early March - June Supreme - Leamington	r types 300g 300g 300g 300g 300g 300g 100g 300g 300g 300g
Old English and Walcheren winte April Queen Asmer Juno Asmer Midsummer Asmer Pinnacle Asmer Showcap March English Winter - Adams Early White - Early March - June Supreme - Leamington - Mid-June	<u>r types</u> 300g 300g 300g 300g 300g 100g 300g 300g

ntity

300g

300g

300g

300g

Germination

100% 95% 100% 100% 80% 100% 90% 95% 100% 95% 95% 95% 100% 100% 100% - 40 -

Progression	300g	100%
Royal Oak	30 0g	90%
St George	300g	100%
Thoday's Special late May	300g	95%
Walcheren Winter		
- Aprilex	30 0g	90%
- Armado April	300 g	85%
- Armado May	300g	85%
- Armado Quick	300g	100%
- Armado Tardo	300g	95%
- Asmer Bostonian	300g	90%
- Asmer Filgap 70	300g	95%
- Asmer Mayfare 7573	100g	90%
- Dutch May Heading 0581	300g	80%
- Late Adonis	325g	100%
- Manston	300g	95%
- Markanta	300g	85%
- Matterhorn	300g	100%
- March Past	300g	80%
- May star	300g	90%
- Zurmatt	300g	75%

Brassica oleracea L. convar botrytis (L) Alef. var botrytis - cauliflower continued

Deletions from National List

Walcheren Winter

- June Glory	300g	100%
- April Glory	100g	70%
- May Glory	300g	100%

Obsolete varieties

Jumbuk	100g (Southern Cross Seeds, Aus)	75%
Boomerang	100g (Southern Cross Seeds, Aus)	

100g
1 00 g
100g
100g
100g
0.4g

- 41 -

(Asmer Seeds Ltd) 85%
(Sakata, Japan) 95%
(Arthur Yates, Aus) 90%
(Nutting & Thoday) 70%
(Daehnfeld, Holland) 85%
(Henry Doubleday
Research Asso) -

3002864	Early Snowball 'A'	NIAB	BB1822	21.70	78.0
3002865	Eersteling	NIAB	BB1651	22,50	88.0
3002866	English Winter	NIAB	BB2006	24.70	85.0
3002867	English Winter	NIAB	BB1988	23.50	53.0
3002868	Focus	NIAB	BB1969	29.50	84.0
3002869	Snowball Improved	NIAB	BB1801	26.00	77.0
3002870	Kastrup Market	NIAB	BB1623/1569 mix	60.00	48.0
3002871	Kastrup Market Improved	NIAB	BB1621	25.50	67.0
3002872	January (Christmas)	NIAB	BB1666	4.50	69.0
3002873	Late Enterprise	NIAB	BB1465	29.50	68.0
3002874	Lumax	NIAB	BB1632	20.00	22.0
3002875	Magnificent	NIAB	BB1803	5.50	70.0
3002876	Maloutn no. 1	NIAB	BB2058	49.50	80.0
3002877	Malou£n no. 2	NIAB	BB2059	49.50	83.0
3002878	May Prince	NIAB	BB1805	21.50	83.0
3002879	Minicoli no. 110 Improved	NIAB	BB1755	27.20	11.0
3002880	Neve	NIAB	BB2051	49.50	92.0
3002881	Orgeval	NIAB	BB1430	26.00	2.0
3002882	Pax	NIAB	BB2097	51.50	94.0
3002883	Perfection	NIAB	BB1692	26.30	0.0
3002884	Perfection Improved	NIAB	BB1601	30.0	83.0
3002885	Petra	NIAB	BB2091	49.50	88.0
3002886	Primo	NIAB	BB1994	6.30	68.0
3002887	Primo	NIAB	BB1751	30.00	25.0
3002888	Primo	NIAB	BB1790	2.80	
3002889	Prince Blanc	NIAB	BB2084	24.90	85.0
3002890	Roscoff	NIAB	BB2093	54.20	57.0

1

43

1

1

42

ł

NVRS no. Cv. name seed germ source source no. wt g test % 3002837 Algromajo NIAB BB1799 1950 70.0 3002838 Algromajo no. 2 NIAB BB2066 50.00 89.0 3002839 NIAB April 60.0 00.0 3002840 April Prince NIAB BB1808 15.00 33.0 3002841 Arcturus NIAB BB1695 19.80 59.0 3002842 Augustcrop NIAB BB1678 23.00 17.0 3002843 Bianca NIAB BB1645 29.50 93.0 3002844 NIAB Carrington June BB18**06** 13.60 52.0 3002845 Clibran's Late Spring NIAB BB1807 17.60 33.0 3002846 NIAB Clibran's September Favourite BB1804 8.00 77.0 3002847 NIAB Codania BB1960/1625 mix 50.00 20.0 3002848 D' Albenga NIAB BB2056 50.00 25.0 3002849 NIAB BB2030 Dania 50.00 45.0 3002850 Danish Giant NIAB BB1902 13.00 87.0 3002851 Danish Giant NIAB BB1622 17.50 61.0

- 43

1

1

42

۱

3002852	Delfter Early	NTAB	BB16/2	34.90	89.0
3002853	Delfter Late	NIAB	BB1673	0.00	84.0
3002854	De Metz	NIAB	BB2019	49.50	96.0
3002855	Dr. Jensma	NIAB	BB1980	29.50	80.0
3002856	Dr. Jensma no. 5	NIAB	BB1714	29.50	70.0
3002857	Dryweather (New Sel'n)	NIAB	BB1671	29.50	69.0
3002858	Early April	NIAB	BB1826	9.50	73.0
3002859	Early Snowball	NIAB	BB1955	19.50	87.0
3002860	Early Snowball	NIAB	BB1961	7.40	74.0
3002861	Early Snowball	NIAB	BB1970	31.00	91.0
3002862	Early Snowball	NIAB	BB1680	7.00	46.0
3002863	Early Snowball	NIAB	BB1586	35.70	20.0

3002891	St. Malo Half Hatif	NIAB	BB2101	49.50	93.0
3002892	Stratos	NIAB	BB1934	22.30	56.0
3002893	Summer Snow	NIAB	BB1847/1761	46.50	60.0
3002894	Summer Wonder	NIAB	BB1654	29.50	88.0
3002895	Supermarket	NIAB	BB1894	22.90	81.0
3002896	Supermarket	NIAB	BB1800	28.00	91.0
3002877	Taro	NIAB	BB2174	46.50	80.0
3002898	Thoday Compact no. 3	NIAB	BB1759	20.00	87.0
3002899	Walcheren Winter	NIAB	BB2037	47.40	61.0
3002.900	Walcheren Winter	NIAB	BB1824	10.00	85.0
3002901	White Goal	NIAB	BB1675	17.10	81.0
3002902	White Heart	NIAB	BB1879	15.00	87 • 0
3002903	White Heart	NIAB	881977/882117	94.50	86.0
3002904	Wombat	NIAB	BB1794	36.60	87.0

Project CP4

Code No.

Species and Cultivar

<u>Brassica oleracea (Kales</u>)

CP4/1	Bittern
CP4/2	Condor
CP4/3	Dwarf Green Curled
CP4/4	Dwarf Thousand head
CP4/5	Gruner Angeliter
CP4/6	Marrow stem
CP4/7	Merlin
CP4/8	Tall Green Curled
CP4/9	Thousand Head

Brassica napus (Swedes)

CP4/10	Acme
CP4/11	Best of All
CP4/12	Magnificent
CP4/13	Mancunian
CP4/14	Ruta Otofte
CP4/15	Wilhelmsburger Prima

Raphanua sativus

CP4/16 Slobolt

Brassica oleracea (Cabbages)

CP4/17	Brunswick
CP4/18	Late Purple Flat Poll
CP4/19	Robinsons Champion Drumhead

- +7+7 -

Source of seed

Asmer	Wholesale	Ltd.
11	11	11
11		11
11	11	11
11	11	11
11	11	"
**	11	"
11	11	11
11	11	"

11		н.	11
11		"	11
11	ø	11	"
"		11	11
"		11	
11		"	11

11	11	11

н н н

**	11	11
**	17	11
11	11	11

- 47 -

Brassica oleracea (Kale)

- 46 -

Brassica campestris (Stubble-turnips)

CP4/20	Debra	Asmer Wholesa	le Ltd.	CP4/42	Merlin
CP4/21	Labra	" "	II.		
CP4/22	Ponda		II		Brassica napus (Swedes)
CP4/23	Vobra	11 · · · · · · · · · · · · · · · · · ·	H		
	· · · · · · · · · · · · · · · · · · ·			CP4/43	Balmoral
	Brassica napus (Forage rapes)			CP4/44	Bangholm
				CP4/45	Best of All
CP4/24	Crack	11 11	U	CP4/46	Conqueror
CP4/25	Giant English	11 11	11	CP4/47	Danestone
CP4/26	Rape Kale	II II	"	CP4/48	Magnificent
				CP4/49	Seefelder
	Brassica campestris (Traditiona.	l turnips)		CP4/50	Tipperary
CP4/27	Aberdeen Green Top Scotch		II	et a	Brassica napus (Rapes)
CP4/28	Green Globe	11 11	н		
CP4/29	Hardy Green Round		11	CP4/52	English Giant
CP4/30	Lincolnshire Red Globe	· · · · · · · · · · · · · · · · · · ·	11		
					Brassica oleracea (Cabbages)
	Brassica campestris (Traditional	turnips) (contd.)		
				CP4/53	Brunswick
CP4/31	Purple Top Mammoth		"	CP4/54	Late Purple Flat Poll
CP4/32	The Bruce	11 11	U .	CP4/55	Robinsons Champion
CP4/33	The Wallace		II .		
					Brassica campestris (Stubble to
	Brassica napus (Swedes)				,
001.101				CP4/56	Cyclon
CP4/34	Ashgrove P.T.	Barclay, Ross	& Hutchison Ltd.		
CP4/35	Balmoral P.T.	11 11	II		Brassica campestris (Traditiona
CP4/36	Danestone P.T.	11 11	H state		
CP4/37	Doon Major		11	CP4/57	Aberdeen Green Top
CP4/38	Scotia B.T.	11 11	· П	CP4/58	Challenger Golden
				CP4/59	Fosterton Hybrid
	Brassica campestris (Traditional	turnips)		CP4/60	Green Globe
00.15-				CP4/61	Green Top Yellow
CP4/39	Aberdeen G.T.Y.	11 11	Π		
CP4/40	Findlay G.T.Y.	11 11	11 -		
CP4/41	The Wallace G.T.Y.	11 11	n		

A. Cross

- 11
- 11
- 11
- 11
- 11
- 11

à

- 11
- 6
- 11
- н. П

urnips)

nal turnips)

- н н н
- 11

	Brassica oleracea (Cabbage)			Brassica oleracea (Kales)
CP4/62	Holland Late Winter	Deal-Cullen Seeds Ltd.	CP4/81	Proteor
CP4/63	January King 3	п п п	•	
CP4/64	Utility	п п п		Brassica napus (Rape)
	Brassica napus (Rape)		CP4/82	Bishop
CP4/65	Emerald	Dunns Seed & Grain Ltd.		Brassica oleracea (Cabbages)
	Brassica oleracea (Cabbages)		CP4/83	Early Drumhead
CP4/66	Amager Hoei Groen	Elsoms Seeds Ltd.		Brassica napus (Swedes)
CP4/67	January Prince	Hurst Gunson Cooper Taber Ltd.		
			СР4/84 «	Ruta Otofte
	<u>Brassica oleracea (Kales</u>)		CP4/85	Sator Otofte
CP4/68	Canson	Miln Marsters Group Ltd.		<u>Brassica oleracea (Kales</u>)
CP4/70	Falcon	. п. – п. – п.		
СР4/72	Vulcan	н	CP4/86	Dwarf Thousand head
			CP4/87	Maris Kestrel
	Brassica napus (Rape)		CP4/88	Marrow stem
			CP4/89	Proteor
CP4/74	Canard	п п п	CP4/90	Thousand Headed
	Brassica campestris (Stubble turr	nips)		Brassica napus (Swedes)
004 /75			001 /01	5
CP4/75	Appin	N.S.D.O.	CP4/91	Acme
			CP4/92	
	brassica oieracea (kales)		CP4/93	Doon Major
	Condon	н	CP4/94	Doon Spartan
CF4/76	Mania Kastral	n e e e e e e e e e e e e e e e e e e e	CP4/95	Harrietien
CF4/70	Maris Restrei		CP4/96	Laurentian
	Processo norma (Proc.)		CP4/97	magres
	prassica napus (kape)		LP4/98	Marriele
CD/L / 00	Novie		LP4/99	Merley d
LP4/80	Nevin	II.	CP4/100	Monkwood

CP4/101

CP4/102

Scotia

Sator Otofte

- 48 -

- 49 -

Nickersons Seed Specialist

Pope and Chapman Ltd.

Charles Sharpe & Co. Ltd.

8

S.A.I.

11

Sinclair McGill Ltd.

и и и и и и и и

- 50 -

Brassica napus (Rape) CP4/103 Ruta Otofte Sinclair McGill Ltd. 11 " CP4/104 Peerless CP4/128 Crack CP4/105 11 11 Victory ... 11 CP4/106 Wilhelmsburger Brassica oleracea (Kales) Brassica napus (Rape) CP4/129 Dwarf Thousand head CP4/130 Maris Kestrel 11 CP4/107 Broad leaf Essex ... Marrow Stem CP4/131 11 CP4/108 11 English Giant Lair CP4/132 Merlin CP4/109 11 Hungry Gap 11 CP4/133 Thousand Head CP4/110 " 11 Nevin ... CP4/111 " Winfred Brassica oleracea (Cabbages) Brassica campestris CP4/134 Flat Poll CP4/112 11 11 Appin Brassica napus (Rape) Brassica campestris (Stubble turnips) CP4/135 Giant Rape CP4/136 Hungry Gap CP4/113 Civasto 11 " CP4/137 Nevin CP4/114 11 11 Debra CP4/138 Rape Kale CP4/115 11 Tyfon ... ** " CP4/116 Vobra Brassica Napus (Swedes) Brassica campestris (Traditional turnips) CP4/139 Acme CP4/140 Marian CP4/117 Bruce 11 ... CP4/141 Ruta Otofte CP4/118 Green Globe White 11 11 CP4/142 Tuckers Devon Champion CP4/119 Green Top Scotch 11 11 CP4/120 ... Invincible 11 Brassica campestris CP4/121 = Wallace 11 CP4/143 Appin Brassica oleracea (Cabbages) CP4/144 Civasto CP4/122 Golden Acre 11 " Brassica campestris (Stubble turnips) CP4/123 11 Early Drumhead .. CP4/124 January King .. 11 CP4/145 Ponda CP4/125 Late Drumhead 11 .. CP4/146 Taronda CP4/126 New Alpha " " CP%/127 Utility 11 11

- 51 -

Twyford Seeds Ltd.

Edwin	Tucker	& Sons Ltd.
11	11	
**	11	
11	11	
11		
	· 11	
	,,	
"	11	
11	11	
11	11	
11	11	
, U	"	
11		

11 11 11 ...

Brassica campestris (Traditional turnips)

CP4/147	Green Globe	Edwin Tucker & Sons Ltd	CP4/163	Acme
CP4/148	Tuckers Champion G T Y		CP4/164	Bangholm
0 7/170			CP4/165	Magnificent
	Brassica oleracea (Kales, Cabbage	, etc.)	CP4/166	Wilhelmsburger
CP4/149	Tall marrow-stem populations (80	ex SCRI breeding programmes		Brassica campestris (Tradi
.,	constituent cultivars and lines)	5 Pr 632 2000 1		
CP4/150	Winter bardy population containing	1	CP4/167	Imperial Green Glope
	various kales, cabbages and winter		CP4/168	Lincolnshire Red Globe
	cauliflowers (225 constituents)		CP4/169	Manchester Market (Veg.)
CP4/151	Cabbage population (72 constituent	E Contraction of the second	CP4/170	Purple Top Mammoth
	cultivars)	- II II II	CP4/171	Purple Top Milan (Veg)
			CP4/172	Snowball (Veg.)
	Brassica campestris (Traditional	Turnips)	CP4/173	White Globe (Veg.)
CD/ /152	Abandaan Dumple Ten Vollow	Asmon Wholessle 1td		Brassica oleracea (Kales)
CD4/152	Colden Ball Verstable (Vers.)			
CD/(15/)	Manahastan Mankat (Vag.)		CP4/174	Dwarf thousand head
CP4/104	Purela Tan White Claba (Var.)		CP4/175	Dwarf Green curled
(P4/1)	Purple top white Globe (veg.)			
CP4/106	Snowball (Veg.)			Brassica napus (swedes)
	Brassica oleracea (Kale)			
			CP4/176	Acme
CP4/157	Debrine	Dunns Seed & Grain Ltd.	CP4/177	Champion
			CP4/178	Doon Major
	Brassica napus (Rape)		CP4/179	Laurentian
			CP4/180	Magnificent
CP4/158	Nunsdale	Gartons-Agram Ltd.	CP4/181	Wilhelmsburger
	Brassica oleraçea (Kales)			Brassica napus (rapes)
	blassica officiacia (kales)			
CP4/159	Dwarf Thousand Head	Hurst Cupson Cooper Taken 1+d	CP4/182	English Giant
CP4/120	Marrow Stem		CP4/183	Graffoe Giant
$CP_{4}/121$	Thousand Hoad		CP4/184	Hungry Gap
CD/1/1/2	Dwant Croon Cunlad			
UF4/162	Dwart Green Curted			

- 53 - ,

Brassica napus (Swedes)

Hurst	Gunson	${\tt Cooper}$	Taber	Ltd
11	**	11	11	
11	11	11	11	
11	11	11	11	

raditional Turnips)

. . . .

11	11	11	11
II .	11	11	11
11	"	"	"
11		11	"
Ħ	11		"
**	n ^s	"	"
**	11	"	11

Charles	Sharpe	&	Co.	Ltd.
---------	--------	---	-----	------

II .		11	
11	п	U.	
	11	11	
11	11	11	
11	11	**	
11	11	"	
11		11	
11	. 11	11	
n Hina an	11	11	
	11		

Brassica campestris (Traditional Turnips)

			004/230	NG 77
CP4/185	Fosterton Hybrid	Charles Sharpe & Co Ltd.	CP4/218	NC 77
CP4/186	Croppa	n n . n	CP4/219	NC 78
CP4/187	Purple Top Mammoth	u n u	CP4/220	NC 81
CP4/188	Imperial green globe	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	CP4/221	NC 82
CP4/189	Marteau		CP4/222	NC 83
CP4/190	Long d/Alsace	n n n	CP4/223	NC 84
CP4/191	Manchester Market (Veg.)	······································	CP4/224	NC 85
CP4/192	Milan White (Veg.)	11 11 11	CP4/225	NC 86
CP4/193	Petrowski (Veg.)	, H _ H _ H	CP4/226	NC 87
CP4/194	Pomeranian White Globe (Veg.)	II II II		
CP4/195	Purple Top Milan (Veg.)	ананананан алан алан алан алан алан ала		Brassica campestris (Trac
CP4/196	Red Tankard			
CP4/197	Snowball (Veg.)	и и и	CP4/227	Snowball (Veg.)
CP4/198	Teutoburger	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	CP4/228	Golden Perfection (Veg.)
CP4/199	Bruce		· ·	
CP4/200	Wallace			Brassica napus (Swedes)
CP4/201	Weseler			
CPW/202	Yellow Tankard	The second s	CP4/229	Crimson King
CP4/203	Colden Perfection (Veg.)	и и в	CP4/230	Essex Model
CP4/204	Spowball (Veg.)		CP4/231	Inverquhomery
	Showball (Veg.)		CP4/232	Nailstone
	Ranhanohrassica		CP4/233	Premier
	hapianoti assica		CP4/234	Tankard B.T.
CD/ /205		I H MoNaughton S C P I	CP4/235	The Bell
CP4/200	$\frac{1}{10} \frac{25}{4} \frac{4}{12} \frac{1}{10} \frac{1}{100}$		CP4/236	Viking Tankard
CP4/206	RD 25/4/15/D (1700)		CP4/237	Large White G.T.
CP4/207	RD 23/8/D (1980)		CP4/238	Bangholm Sahna Pajbjerg
CP4/208	RB 27/8/17/B (1980)		CP4/239	Bangholm Wilby Øtofte
CP4/209	RB 27/8/21/B (1980)		CP4/240	Bangholm Wilby
CP4/210			CP4/241	Broadlands
CP4/211	RB 30/9/HFB		CP4/242	Britannia
CP4/212	RB 26/12/HFB		CP4/243	Parkside
CP4/213	RB 31/10/10/B (1980)		CP4/244	Rewa
CP4/214	RB 35 med st B (1980)		CP4/245	Superlative
CP4/215	RB 35/2/B (1980)		CP4/246	Ne Plus Ultra
CP4/216	RB 35/5/B (1980)		CP4/247	Coxon Crofter
CP4/217	RB 35/15/B (1980)	11 II	CP4/248	Drummonds P.T.

Brassica napocampestris

CP4/249

Harrietfield

I.H.McNaughton, S.C.R.I.

*1	11
11	11
"	n
н	11
11	11
п	11
11 11	
11	н

4

(Traditional turnips)

Sutton Seeds Ltd.

S.C.R.I. Gene Bank

11	11
11	**
11	"
11	"
11	11
11	"
11	"
11	**
11	**
**	11
11	"
**	11
11	11
11	"
11	11
**	ų
11	"
11	"
H	"
**	11

- 56 -

Project CP5 S.C.R.I. Gene Bank CP4/250 Mancunian ... CP4/251 Monkwood Brassica oleracea L. var. capitata L f alba D.C. - White Cabbage ... CP4/252 Sensation 11 ... CP4/253 Viking ... 11 CP4/254 Wilhemsburger G.T. National List Varieties Quantity Brassica oleracea (Autotetraploid forms) Basic Seed OL412. Maris Kestrel: Canson: Extra CP4/225 Avon Crest 300g Curled Scotch kale, complex hybrid I.H.McNaughton, S.C.R.I. 11 " CP4/256 OL413. Maris Kestrel: Canson hybrid Standard Seed OL415. Marrow-stem kale; cabbage CP4/257 hybrid, (originally ex. The Swedish 300g April . 11 11 Seed Association, Swalöf) - April Monarch 300g " " OL416. Maris Kestrel (marrow-stem kale) CP4/258 300g/3 Asmer Persista/Wiam CP4/259 0L417. Maris Kestrel: Futterkohlrabi 300g/6 Aquila " 11 hybrid Brunswick 300g OL419. Pentland Brig (Thousand-head; CP4/260 Buderich 100g " 11 curled kale hybrid) 300g Christmas Drumhead Ĥ. " OL420. Purple Sprouting Broccoli CP4/261 300g - Monarch ... CP4/262 OL422. Canson (Thousand-head kale) ... 300q - Monarch Marvel - Monarch Peerless 300g Brassica campestris (autotetraploid form) Clipper 300g Copenhagen Market 100g Ballater (ssp. oleifera: ssp. nipposinica CP4/263

hybrid)

Definitive stock, ex. NSD0

- 57 -

Cotswold Queen

- Boston Ballhead

(H) Emerald Cross - Summer Monarch

First Early Market 218

Enkhuizen Glory

Delicatesse - Babyhead

- Succession

Durham Early

Durham Elf

Derby Day

Dorade

Germination

100%

300g	100%
300g	100%
300g/300g/100g	85%/100%/95%
300g/67.5g	95%/100%
300g	90%
100g	95%
300g	90%
300g	100%
300g	95%
300g	100%
300g	90%
100g	90%
300g	85%
148,5g	80%
350g	90%
300g	100%
300g	95%
300g	100%
300g	100%
300g	100%
340g	95%
300g	50%
100/300g	100%/95%

- Early Giant	300g	85%
- Early Market	100g	
First of June	100g	80%
Golden Acre	100g	100%
- Ditmarscher Forcing	300g	75%
- June Giant	100g	95%
- Primo	300g	95%
- Asmer Extra Earlihead	300g	90%
- Baseball	300g	100%
- Ditmarsch Extra Early Forcing	300g/100g	90%/95%
- Earliana	300g	90%
- Earlibird	140g	
- Extra Early	300g	95%
- Progress	300g	95%
Greyhound	300g	90%
- Express	300g	100%
Harbinger	300g	100%
Jersey Wakefield	300g	90%
Langedijk 3		
- Holland Late Winter	300g	80%
- Holland Winter EO	300g/100g	100%/100%
- Winter White III	300g	85%
Langedijk 4		
- Holland Winter E50	300g	100%
- Holland Winter White Extra Late	(14 pkts)	95%
- Asmer Late Winter Special	100g	100%
Late Purple Flat Poll	300g	85%
Noblesse	300g	100%
Nonpareil	300g	90%
Offenham		
- Evesham Special	100g	85%
- First and Best	100g	85%
- Myatts Early Offenham	300g	95%
- BG 283	300g	95%
- Evesham	300g	100%
- Flower of Spring	300g	100%
- Fowlers Early Spring	300g	70%
- Hardly Offenham	300g	90%

300g 300g - Myatt's Offenham Compacta **30**0g 300g - Scarisbrick Special **300**g

- Winter green	300g/300g
Robinson's Champion	340/300g
Standby	300g
Wheelers Imperial	300g/300g
- Ellams Early Dwarf	300g
- Lincoln Imp	100g
Winnigstadt	300g
Witham Wonder	300g
- Springtime	100g/300g

Deletions from National List

- Kempsey

- Little Kempsey

- Monarch Strain

Golden Acre Springtide	300g/
Golden Acre No 84	100g
Golden Acre No 409	100 g
Delicatesse Prepak	300 g
Autumn Victory	100g
Collards	100g
Prim and Proper	100g
Premium Late Dutch	100g
Brunswick Large Flat	100g
Holland Winter Export	100g
Premium Late Flat Dutch	100g
Evesham (Special Reselection)	100g
Offenham Evesham Haines	100g
Holland Winter White Extra Late	210g
Ostara	40g

Varieties not on National List

Asmer Early Ironside	100g
Golden Acre Cannonball	100g
Ellams Early	340 g

100% 75% 100% 100% 90% 85%/85% 90%/100% 100% 95%/90% 95%

> 95% 100% 85%/70%

100% 75% 95% 100% 100% 70% 55% **9**5% 95% 95% 100% **90**% 80%

80%

(Asmer Seeds Ltd) 100% (D T Brown & Co Ltd) 90% (J W Boyce) 80%

/100g

De Louviers Isa	300g	(Clause UK Ltd)	90%
Golden Acre Pride of the Market	700 g	(Clause UK Ltd)	95%
Vaugirad	100g	(Clause UK Ltd)	95%
Wakker	30 g	(S Dobie & Son Ltd)	100%
(H) Darkin	300g	(Finney Lock Seeds Ltd)	100%
Autumn Supreme	100g	(Nutting & Thoday)	95 %
Eersteling	300g	(Pinetree Vandenberg)	100%
Marner Allfruh	400g	(C Sharpe & Co Ltd)	100%
Pixie (new)	300g	(A L Tozer Ltd)	95%
Vertus Early Drumhead	254	(W J Unwin)	100%

Brassica oleracea L. var capitata L f rubra (L.) Thell - Red Cabbage

Mammoth Red Rock	300g	100%
Niggerhead (Niggy)	300g/60g	100%/90%
- Red Drumhead	340g	90%
- Red Dutch	100g/300g	90%/95%
Red Meteor	200g	95%

Varieties not on National List

Kissendrup

300g (A L Tozer Ltd)

100%

100%

90%

Brassica oleracea L. var bullata DC. et var. sabauda L. - Savoy cabbage

300g

300g

300g

300g

300g

National List Varieties

Basic Seeds

Avon Coronet

Standard Seed

Alexanders No 1 - Lincoln Late Best of All Dwarf Green Curled

January King	
- Asmer Special	300 g
- Cergy Strain	300g
- Improved Late	3 00g
- Extra Late	30 0g
- Hardy Late Stock 3	300g
- January Prince	30 0g
- January Queen	300g
- Stock 2	100g
Novum (original)	100g
0rmskirk	
- Ormskirk Medium	100g
- Ormskirk Late	600g
- Ormskirk Extra Late	300 g
- Rearguard	100g
Winterking	1 3 2g
- Asmer Shortie	300 g

Dwarf Ulm

Deletions from National List

Cambridge Extra Late Drumhead 100g

Varieties not on National List

Pointed Winter	300g (Clause UK Ltd)	90%
Dark Green Autumn	300g (Pinetree Vandenberg)	100%
Dark Green Winter	300g (Pinetree Vandenberg)	100%
January King Maurecourt Strain	300g (Clause UK Ltd)	100%

Obsolete varieties

Green Monarch

Raphanus sativus L. - radish

100g

100% 90% 80% 85% 85% 95% 100%

J/300g 1/300g

100%/90%

100% 95% 100% 90% 95% 100%

100%

100g (Nutting & Thoday) 95%

National List Varieties

Basic Seed

Beacon	300g	100%
Chrystal Ball	300g	100%
Flamenco	300g	100%
Standard Seed		
Black Spanish Long	300g	100%
Black Spanish Round	300g	100%
Champion	100g	90%
Cherry Belle	300g	100%
China Rose	300g	100%
French Breakfast	300g	95%
- Flamboyant	300g	100%
- Asmer Tip Top	100g	65%
- Crimson	300g	90%
- Fusilier	300g	95%
- Large White Tipped	300g	100%
- Small White Tipped	300g	100%
French Breakfast Forcing	200g	80%
Long White Icicle	300g	100%
Round Red Forcing	100g	90%
- Novired	300g	80%
- Flevo	350g	75%
Saxa	300g/100g	75%/100%
Scarlet Globe	300g	70%
Sparkler	300g	100%
- Round Red Small White Tip	300g	95%
White Turnip	300g	100%
Wood's Frame	300g	90%
Deletions from National List		
Revosa	300g	95%
Robino	300g	100%
Gaudry	300g	100%

- 63 -

Rota	300g
Rondeel	300g
Salido	300g

Varieties not on National List

Verano		300g	(Pinetree Vandenberg)	100%
Verano		100g	(Asmer Seeds Ltd)	
Minita s		100g	(D T Brown & Co Ltd)	100%
Saxerre		300g	(Clause UK Ltd)	100%
Serra		300g	(Clause UK Ltd)	100%
Pink Beaut	су.	15g	(S Dobie & Son Ltd)	100%
Round Red	Forcing Americano		(Pinetree Vandenberg)	100g
Round Bril	liant Red	100g	(Pinetree Vandenberg)	100%
Round Red	Forcing Real		(C Sharpe & Co Ltd)	95%
Qum Kader		300g	(A L Tozer Ltd)	100%
Scharo		100g	(W J Unwin)	100%
Kutara		100g	(Thompson & Morgan)	100%
Prinz Roti	n	100a	(Thompson & Morgan Ltd)	85%

Prinz Rotin	100g (Thompson & Morgan Ltd)	85%
French Breakfast Pontvil	300g (Thompson & Morgan Ltd)	100%
French Breakfast Early Forcing	200g (Asmer Wholesale Ltd)	65%

Obsolete Varieties

Crimson Giant	100g (C Sharpe & Co Ltd)	100%
Wood's Early Frame	100g (Nutting & Thoday)	100%
French Breakfast	200g (Asmer Seeds Ltd)	100%

Brassica rapa L. var rapa (L) Thell - Turnip

National List Varieties

Basic Seed

Lincolnshire Red Globe

100g

100% 100%

100%

Standard Seed

Golden Ball	300g	95%
- Orange Jelly	300g	100%
Golden Perfection	300g	90%
Imperial Green Globe		
- Green Globe	100g	100%
Manchester Market	300g	85%
- Green Top Stone	300g	70%
- Marble Top Green	100g	100%
Milan Purple Top Forcing		
- Sprinter	300g	100%
Milan White	300g	90%
Milan White Forcing	300g	100%
Purple Top Milan	300g + 300g	90%/100%
Purple Top White Globe	300g	100%
- Veitch's Red Globe	300g	100%
Snowball	300g	100%
- Early White Stone	300g	100%
- Model White	300g	95%

Varieties not on National List

Improved Green Globe	300g (Clause UK Ltd)	90%
Milan Early White	340g (J W Boyce)	90%
Arca	142g (S Dobie & Son Ltd)	100%

Obsolete varieties

Early Purple Top Globe	100g (C Sharpe & Co Ltd)	100%
Hardy Green Round	12.7g (Lackham College of Agric)	20%

Brassica napus L. var napobrassica Peterm - Swede

Agricultural Varieties

Acme	300g	95%
- Peerless	300g	90%
Champion		

- Best of All	300g
- Champion Purple Top	300g
Doon Major	500g
Laurentian	300g
Magnificent	
- Eclipse	300g
- Victory	100g
Marian	500g
Ruta Otofte	300g
Wilhelmsburger	300g

Deletions from National List

Vogesa	100g
Perfection	100g
Chigneclo	100g
Augbiny Green Top	100g
Conqueror Green Top	300g

Obsolete Varieties

Sharpes Yellow Garden	100g (C Sharpe & Co Ltd)	100%
Garden Purple Top	100g (C Sharpe & Co Ltd)	100%
Ne Plus Ultra	100g (C Sharpe & Co Ltd)	15%
Premier	100g (C Sharpe & Co Ltd)	85%

Brassica oleracea var italica L - Sprouting Broccoli (Crop not on National List)

Purple	Sprouting	Xmas	340g
Purple	Sprouting	Xmas	300g
Purple	Sprouting	Xmas	300g
Purple	Sprouting	Xmas	300g
Purple	Sprouting	Xmas	300g
Purple	Sprouting	Xmas	300g
Purple	Sprouting	Xmas	300g
Purple	Sprouting	Early	340g
Purple	Sprouting	Early	100g
Purple	Sprouting	Early	315g

65%
70%
85%
100%
85%
100%
95 %
9 5%

95%
100%
65%
9 5%
9 5%

J W Boyce)	60%
D T Brown & Co Ltd)	100%
Asmer Wholesale Ltd)	100%
Asmer Seeds Ltd)	90%
Nutting & Thoday)	90%
Thompson & Morgan Ltd)	85%
Speed Harrison)	100%
J W Boyce)	90%
D T Brown & Co)	100%
S Dobie & Son Ltd)	95%
- 66 -

Purple Sprouting Early	300g (Asmer Wholesale Ltd)	100%	White Sprouting Late	300g (Asmer Wholesale Ltd)	70%
Purple Sprouting Early	300g (Asmer Seeds Ltd)	100%	White Sprouting Late	300g (Asmer Seeds Ltd)	100%
Purple Sprouting Early	300g (Nutting & Thoday)	90%	White Sprouting Late	300g (Nutting & Thoday)	80%
Purple Sprouting Early	300g (C Sharpe & Co Ltd)	90%	White Sprouting Late	300g (C Sharpe & Co Ltd)	80%
Purple Sprouting Early	300g (Sinclair McGill)	100%	White Sprouting Late	300g (Clause UK Ltd)	100%
Purple Sprouting Early	300g (Claus UK Ltd)	90%	White Sprouting Late	212g (S E Marshall & Co Ltd)	70%
Purple Sprouting Early	300g (Thompson & Morgan)	80%	White Sprouting Late	300g (Sinclair McGill)	75%
Purple Sprouting Early	300g (A L Tozer Ltd)	90%	White Sprouting Late	300g (Finney Lock Seeds Ltd)	90%
Purple Sprouting Early	205g (S E Marshall & Co Ltd)	90%	White Sprouting Late	300g (Elsoms Seeds Ltd)	100%
Purple Sprouting Early	300g (Finney Lock Seeds Ltd)	80%	White Sprouting Late	300g (Speed Harrison)	55%
Purple Sprouting Early	285g (Samuel Yates Ltd)	75%	White Sprouting Late	250g (W J Unwin)	80%
Purple Sprouting Early	300g (Elsoms Seeds Ltd)	95%	Improved White Sprouting	300g (Clause UK Ltd)	95%
Purple Sprouting Early	300g (Speed Harrison)	85%	White Sprouting	300g (Thompson & Morgan)	70%
Purple Sprouting Early	250g (W J Unwin)	100%	White Sprouting	300g (Pinetree Vandenberg)	95%
Purple Sprouting Late	340g (J W Boyce)	85%	Purple Sprouting	200g (Pinetree Vandenberg)	70%
Purple Sprouting Late	300g (D T Brown & Co Ltd)	100%	Purple Sprouting	300g (Clause UK Ltd)	90%
Purple Sprouting Late	300g (Asmer Wholesale Ltd)	90%	Nine Star Perennial	340g (J W Boyce)	60%
Purple Sprouting Late	300g (Asmer Seeds Ltd)	95%	Nine Star Perennial	300g (Nutting & Thoday)	90%
Purple Sprouting Late	300g (Nutting & Today)	80%	Nine Star Perennial	300g (Speed Harrison)	85%
Purple Sprouting Late	300g (C Sharpe & Co Ltd)	100%	Purple Cape	300g (Asmer Seeds Ltd)	100%
Purple Sprouting Late	300g (Sinclair McGill)	90%	Purple Cape	300g (Nutting & Thoday)	100%
Purple Sprouting Late	300g (A L Tozer Ltd)	100%	Purple Cape	300g (A L Tozer Ltd)	100%
Purple Sprouting Late	300g (Finney Lock Seeds Ltd)	85%	Purple Cape	100g (S E Marshall & Co Ltd)	90%
Purple Sprouting Late	300g (Elsoms Seeds Ltd)	80%	Purple Cape	300g (Speed Harrison)	100%
Purple Sprouting Late	300g (Speed Harrison)	90%			
Purple Sprouting late	250g (W J Unwin)	75%	Obsolete Varieties		
White Sprouting Early	340g (J W Boyce)	100%	3		
White Sprouting Early	300g (Samuel Yates)	100%	Late Purple Sprouting	100g (Pinetree Vandenberg)	
White Sprouting Early	300g (Asmer Wholesale Ltd)	100%			
White Sprouting Early	300g (Asmer Seeds Ltd)	90%	Lonidium cativum - Cress	Barbarea sativus - Americ	an cres
White Sprouting Early	300g (Nutting & Thoday)	90%	Lepidium Sativum - cress		un erec
White Sprouting Early	300g (C Sharpe & Co Ltd)	95%	Species not on National list		
White Sprouting Early	300g (Sinclair McGill)	95%	Species not on National List		
white Sprouting Early	125g (S E Marshall & Co Ltd)	85%		300σ (1 W Boyce)	100%
White Sprouting Early	300g (Finney Lock Seeds Ltd)	100%		300a (D T Brown & Co Ltd)	100%
White Sprouting Early	300g (Elsoms Seeds Ltd)	90&		300g (Asmer Wholesale Ltd)	100%
White Sprouting Early	300g (Speed Harrison)	95%		100a (Asmer Seeds 1td)	100%
White Sprouting Early	225g (W J Unwin)	90%	Dlain	300g (Nutting & Thoday)	95%
White Sprouting Late	340g (J W Boyce)	100%	1 1011	Joog (natoring & moday)	0/ فر م
White Sprouting Late	300g (D T Brown & Co Ltd)	100%	•		

- 67 -

s

- 68 -

Plain	300g (C Sharpe & Co Ltd)	100%	Obsolete Varieties	
Plain	300g (Sinclair McGill)	100%		
Plain	lkg (Finney Lock Seeds Ltd)	100%	Italian Water	100g (C S
Plain	300g (Elsoms Seeds Ltd)	100%		
Plain	100g (W J Unwin)	100%	Brassica oleracea L. var gong	vlodes L
Curled	300g (Asmer Wholesale Ltd)	100%		
Curled	300g (C Sharpe & Co Ltd)	100%	National List Varieties	
Curled	500g (Clause UK Ltd)	100%		
Curled	300g (S E Marshall & Co Ltd)	100%	Standard Seed	
Curled	lkg (Finney Lock Seeds Ltd)	100%		
Curled	300g (Elsoms Seeds Ltd)		Delicacy Purple	300a
Curled	300g (Speed Harrison)	100%	jp=-	
Extra Curled	300g (Thompson & Morgan Ltd)	100%	Varieties not on National Lis	t
Extra Curled	250g (W J Unwin)	100%		
Fine Curled	lkg (Samuel Yates Ltd)	100%	Lanro	300a (C S
Extra Double Curled	360g (S Dobie & Son Ltd)	100%	Primavera White	100g (The
Broad Leaved	lkg (Finney Lock Seeds Ltd)	80%		g (
Common Leaved	300g (Pinetree Vandenberg)	100%		
Large Leaved	300g (Pinetree Vandenberg)	100%	Brassica oleracea L. var acep	<u>hale</u> – kale
American	340g (J W Boyce)	100%		
American	300g (Asmer Wholesale Ltd)	10%	National List Varieties	
American	130g (S Dobie & Son Ltd)	75%		
Super Salad	240g (S Dobie & Son Ltd)	85%	Basic Seed	
Reform	300g (C Sharpe & Co Ltd)	100%		
Mega	300g (Thompson & Morgan Ltd)	95%	Pentland Brig	340g
Obsolete varieties			Standard Seed	
Curled	100g (C Sharpe & Co Itd)	90%	Cottagers	340g
			Dwarf Green Curled	300g
			- Dwarf Green Curled Scotch	100g
Rorippa nasturtium aqua	ticum - Watercress		Tall Green Curled/A ₁	300g/300g
			Westland Autumn	160g
Water	340g (J W Boyce)		Westland Winter (Verdura)	298g

.

Water	340g (J W Boyce)	
Water	300g (Asmer Wholesale Ltd)	85%
Water Large Leaved	300g (Finney Lock Seeds Ltd)	100%
Water Broad Leaved	300g (Elsoms Seeds Ltd)	20%

340g

Agricultural varieties

Thousand Head

- 69 -

100g (C Sharpe & Co Ltd)

30%

odes L. - Kohl Rabi

70%

ð

300g	(C Sharpe	&	Co Ltd)	100%
100g	(Thompson	&	Morgan Ltd)	9 0%

95%

85% 85% 100% 100% **90**% 90%

90%

300g/300g

Varieties not on National List

Spurt	300g (Thompson & Morgan Ltd)	100%
Hungry Gap	340g (J W Noyce)	90%
Dwarf Curled Scotch	340g (J W Boyce)	80%

160g

95%

Obsolete varieties

Dwarf Green Curled	100g (C Sharpe & Co Ltd)	70%
Curly Kale	1.4g (East of Scotland College	
	of Ag)	
Hardy Green Curled Dwarf	100g (A L Tozer Ltd)	

Additional stocks acquired during 1983

B. oleracea

Brussels sprouts: cv. Dublin Cropper Kales: cvs. Old Fashioned Greens Jerusalem Scotch German Black Russian (2 samples)

B. napus (presumed)

Rape-kale: cvs. Giant Salad Asparagus (4 samples)) Ragged Jack

r	300 g
)	
)	
)	less than 1 g
)	of each
)	

217 g 182 g less than 1 g of each

)

CRUCIFEROUS HORTICULTURAL CROPS IN THE NETHERLANDS - CP2.

Q.P. van der Meer and Liesbeth de Groot, IVT, P.O. Box 16, 6700 AA Wageningen

1.1. Common names and their scientific synonymes

Table 1. Cruciferous horticultural crops in the Netherlands

Black radish	Raphanus sativus var. niger (Mill) S. Kerner
Broccoli	Brassica oleracea L. var. italica Plenck
Brussels sprouts	B. ol. var. bullata subvar. genmifera (DC.) Léveillé
Cauliflowers	B. ol. L. var. botrytis L.
Chinese cabbage	B. pekinensis (Lour.) Rupz.
Cress	Lepidium sativum L.
Curly kale	B. ol. L. var. laciniata (L.) Schulz
Kohlrabi	B. ol. L. var. gongylodes L.
Pak-Choi	B. chinensis L.
Pointed-headed cabbage	B. ol. L. convar. capitata (L.) Alef. var. conica DC.
Radish	Raphanus sativus L. var. radicula Pers.
Rat-tail radish (white)	R. sativus L.
Red cabbage	B. ol. L. convar. capitata (L.) Alef. var. rubra DC.
Savoy cabbage	B. ol. L. convar. capita (L.) Alef. var. sabauda L.
Swedes	B. napus var. napobrassica (L.) Rehb,
Turnips	B. rapa L. var. rapa (L.) Thell.
Turnip tops	B. sp. (several species)
White cabbage	B. ol. L. convar. capitata (L.) Alef. var. alba DC.

Black radish, formerly a minor crop in the Netherlands, has now completely passed out of cultivation.

Radish has been collected by the Foundation for Agricultural Plant Breeding. Besides cruciferous crops, one wild Brassica species can be found in the Netherlands viz. Brassica elongata Ehrh. ssp. armoracioides (Czern.) A. et G. 1.2. Utilization (see table 2)

Table 2

1.3. Cultural practices and crop rotations Most of the cruciferous horticultural crops are mainly grown in the open. Only some of them (kohlrabi and radish) are important greenhouse crops. Therefore only information on growing in the open is given (Table 3).

Table 3

Crop rotation is necessary because of nematodes and fungal diseases. Cruciferous crops must be followed by non-cruciferous crops. Growing cruciferous crops after Phaseolus beans, beets and spinach is risky because of nematodes. Growing them after grass can give extra problems with fungal diseases.

1.4. Main problems of cultivation Clubroot is the most severe problem of almost all cruciferous crops. Several other diseases and also pests threaten these crops. Nevertheless failures are very rare. The growers are skilful, alert and active.

1.5. Localities and acreages

Most of the cruciferous horticultural crops are grown (on clay and sandy clay) in the coastal provinces of the Netherlands (Zuid-Holland, Noord-Holland, Friesland and Groningen). An increasing acreage of Brussels sprouts is grown (ON SANDY SOILS) in the south of the country (Noord-Brabant). The 1984 acreages are given in Table 4.

Table 4

1.6 Economic value

The values of the crops are given in Table 4 as well. For small crops no figures are available.

2. Varietal situation

Land races of cruciferous horticultural crops are no longer available. Of same crops (Brussels sprouts, curly kale, red cabbage and white cabbage) a number of farmers strains could be collected.

The varieties given in the 1984 variety list for vegetables in the open are specified in Table 5.

Table 5

3. Regional working and/or gene bank collections

The Gene Bank Netherlands possesses a large number of recently collected accessions of cruciferous horticultural crops (Annex 1). In addition between 5 and 10 seed firms have rather large to very large working collections.

4. Collecting strategy

The above seed firms were asked to make their working collections available to the Gene Bank Netherlands. A large number of varieties were generously donated (see 6).

Moreover a number of horticultural extension officers were requested to look for local strains (farmer's strains). With their help a number of such strains were collected in Noord-Holland, Groningen and Zuid-Limburg (see Annex 1: tuindersselecties).

5. Collection localities

All known growing localities were searched for genotypes of the most important cruciferous horticultural crops.

6. Collection results

The results are given in Annex 1.

7. Degree to which genetic variation has been collected Very probably the great majority (more than 90 %) of the available old genotypes of the following leading Dutch cruciferous horticultural crops have been collected and, subsequently stored at optimal conditions:

Brussels sprouts	(147	accessions)
Cauliflowers	(183	**)
Curly kale	(36	11)

Pointed-headed cabbage}		
White cabbage	(128 ac	cessi
Red cabbage	(47	11
Savoy cabbage	(55	11

Hybrids have not been collected. This was an essential limitation of the collection programme.

Very few or no genotypes have been collected of the following less important indigenous cruciferous horticultural crops: Chinese cabbage

Cress

Swedes

Turnips

Turnip tops.

Addition of available genotypes of these less important crops to the Gene Bank Netherlands seems very worthwhile.

ons)

March 1984

Table 2. Uses of cruciferous crops in the Netherlands

	Growing conditions		Direct consumption		Charles		Exported (1982)
	under glass	in the open	fre s h	cooked	Stored	Processed	tons/ guilders
Broccoli	+	+		+			
Brussels sprouts		+		+		+	50,000/62.500.000
Cauliflowers	(+) ¹	+		+			4000/6.000.000
Chinese cabbage	+	+	+	+	+		
Cress	+	(+)	+				
Curly kale		+		+		+	
Kohlrabi	+	+		+			
Pak-Choi	+	+		+			
Pointed-headed cabbage		+		· + ·			
Radish	+	+	+				17.500/51.500.000
Rat-tail radish	+	(+)	+				
Red cabbage		+		+	+	+	
Savoy cabbage		+		+	+	+	
Swedes		+		⁶ +	+		
Turnips		+		+			
Turnip tops	+	+	+	+			
White cabbage		+		+	+	+	68000/40.500.000
					1	1	

76

l(+) = very small acreage

Table 3. Cultural practices for cruciferous horticultural crops in the Netherlands

	Planting time ¹	Direct seeding	Transplants	Seed (g)/ha	Plants/ha	Harvest season
brocolli	4, 5, 6, 7, 2		+	400	50,000	6, 7, 8, 9, 10, 11 ²
russels sprouts	4, 5, 6		+	300	30,000	8, 9, 10, 11, 12, 1, 2
auliflowers	3, 4, 5, 6, 7, 8	4	+	250	28,000	5, 6, 7, 8, 9, 10, 11, 12, 1, 2, 3, 4
h ines e cabbage	3, 4, 5, 6, 7, 8		+	400	60,000	5, 6, 7, 8, 9, 10, 11
ress	3, 4, 5, 6, 7, 8, 9	+		100 kg		4, 5, 6, 7, 8, 9
Curly kale	5, 6, 7, 8	+	+	300 ³	30,000	8, 9, 10, 11, 12, 1, 2, 3
ohlrabi	3, 4, 5, 6, 7, 8		+	800	100,000	5, 6, 7, 8, 9, 10
ak-Choi			+	400	60,000	
ointed-headed cabbage	3, 4, 5, 6, 7		+	400	50,000	5, 6, 7, 8, 9, 10
adish	2, 3, 4, 5, 6, 7, 8	+		70 kg		4, 5, 6, 7, 8, 9
at-tail radish	2, 3, 4, 5, 6, 7	• •	+ .	8000	200,00	5, 6, 7, 8, 9, 10, 11
ed cabbage	3, 4, 5		+	300	30,000	6, 7, 8, 9, 10, 11
avoy cabbage	3, 4, 5, 6,		+	400	40,000	5, 6, 7, 8, 9, 10, 11
wedes	5, 6, 7	+	+ 3:00		50,000	10, 11, 12
urnips	3, 4, 5, 6, 7		1	1500	500,000	5, 6, 7, 8, 9, 10, 11
urnip tops	2, 3, 4	+		30 kg		4, 5
hite cabbage	4, 5, 6		+	300	30,000	7, 8, 9, 10, 11

Of direct seeded crops the sowing time (if relevant together with the planting time) is given. ² January = 1 etc.

For direct seeding 1250

For direct seeding 8500

Table 4. 1982 acreages in the open of cruciferous horticultural crops in the Netherlands

	ha	value (x f 1000.000)
Broccoli	50	1.5
Brussels sprouts	6700	78
Cauliflowers	750	43.5
Chinese cabbage	50	1.5
Cress		
Curly kale	500	3
Kohlrabi	100	
Pak.Choi		
Pointed-headed cabbage	300	4
Radisch	50	
Rat-tail radish		
Red cabbage ,	900	10,5
Savoy cabbage	350 ,	3.5
Swedes	100	
Turnips		
Turnip tops	50	2
White cabbage	1850	33.5

Table 5. Origin and breeding level of the varieties given in the 1984 variety list for vegetables in the open

	Ori	gin	Breeding lev	el
	Imported Indigenous cultivars cultivars		Open pollinated cultivars	Hybrids
Brocolli	1	з	0	4
Brussels sprouts	0	20	0	20
Cauliflowers	0	15	15	0
Chinese cabbage	3	1	1	3
Cress	0	6	6	0
Curly kale	1	8	8	1
Kohlrabi	5	1	5	1
Pak-Choi				
Pointed-headed cabbage	1.	5	1	5
Radish	0	9	9	0
Rat-tail radish	5	0	5	0
Red cabbage	0	6	4	2
Savoy cabbage	0	11	6	5
Swedes	0	2	2	0
Turnips	1	3	4	0
Turnip tops	0	2	2	0
White cabbage	1	20	1	20

80 Cauliflowers

Annex I

	Cauliflowers					81						
Column	1	2	3	4			Cauliflowers	1	1			
			weight		Column	1	2	3	4	\downarrow		
Acc.nr.	Donor name	Cultivar name	grams	germ %	100.00	Donor name	Cultivar name	weight grams	aerm %			
1	Enza	75312	3	78	Accente	Revel Cluie		100	9.5	+		
2	Enza	75313	3	76	40	Royal Sluis		100	96			
2	Fnza	Alto	7	86	41	Royal Sluis	Parnas	100	53			
L L	Enza	Eriomek	103	83	42	Royal Sluis	Urgon	100	89			
5	Enza	Sel. Butts	100	96	43	Royal Sluis	Herrstreuzen Kibo Reuzen	100	94			
6	Beio	Alvita	100	84	44	Royal Shuis	Walcheren Winter Preminda	100				
7	Beio	Marva	100	82	45	Royal Sluis	Walcheren Winter Armado Mei	100	0/			
8	Beio	Lecerf	100	79	46	Royal Sluis	Walcheren Winter Armado Arpii	100	96			
9	Beio	Formana	100	86	4/	Royal Stuis	Walcheren Winter Armado Quick	100	91			
10	Beio	Torina	100	92	48	Royal Sluis	Walcheren winter Armado Tardo	100	93			
11	Beio	Heralda	100	90	49	Royal Siuis	Walcheren Winter Armado Clio	100	83			
12	Beio	Markanta	100	95	50	Royal Sluis	Walcheren Winter Arminda	100	83			
13	Beio	Maya	100	78	51	Royal Sluis	Extra tardif d'Angers Mirado	100	85 /	dominion de la competition		
14	Leen de Mos	Godyne	25	86	52	Royal Sluis	Jura	100	85			
15	Nederlandse Zaadcentral	le Fureka	50	93	53	Royal Sluis	Cervina	100	90			
16	Nederlandse Zaadcentral	e Expressor	50	86	54	Royal Sluis	Atos	100	82			
17	Holland Select	Walcheria Vroeg	103	86	55	Royal Sluis	Fermalba	100	81			
18	Holland Select	Walcheria Middenvroeg	93	91	56	Royal Sluis	Erfurter Fartomax/Erfurter Deense Export					
19	Holland Select	Walcheria Laat	94	93	57	Royal Sluis	Blancato	101				
20	Royal Sluis	Alpha Primura	100	82	58	Royal Sluis	Condora	7	39			
21	Royal Sluis	Frfurter 14 Duromax	100	92	59	Royal Sluis	Erfurter Helios	100	62			
22	Royal Sluis	Durato	100	95	60	Royal Sluis	Perfecto	10				
23	Royal Sluis	Paloma	100	91	61	Royal Sluis	Andes	100	91	No.		
24	Royal Sluis	Fortades	100	68	62	Royal Sluis	Vernon	100	84			
25	Royal Sluis	Erfurter Suprimax	100	93	63	Royal Sluis	RS 1836 / Alpha Tasma	100	91			
22	Royal Sluis	Erfurter 14 Matra	100	93	64	Royal Sluis	Telva	106		Annotan Cont		
20	Royal Sluis	Pindus	100	91	65	Royal Sluis	RS 1849	100	94			
28	Royal Sluis	Astoria	100	77	66	Royal Sluis	Herfstreuzen Meru	100	95			
29	Royal Shuis	Pandora	100	76	6/	Sluis en Groot	Mechelse Carillon	100	9 0			
30	Royal Sluis	Lecerf B	100	92	68	Sluis en Groot	Alpha	100	95			
31	Royal Sluis	Mechalse Merita	100	87	69	Sluis en Groot	Alpha Raket	100	85			
32	Royal Sluic	Maghalise Merano	100	94	10	Sluis en Groot	Progress	100	97			
32	Royal Sluis	Alpha Veralto	100	93		Sluis en Groot	Spar-To	100	74			
34	Royal Sluis	Mayor	100	96		Sluis en Groot	Bravo	100	95			
35	Roval Shuis	Céant de Naples tardif Rubaco	100	97	/3	Sluis en Groot	Broei D	133	95			
36	Roval Sluie	Ceant de Manles tardif Prebaca	100	96	74	Sluis en Groot	Erfurter Remme	100	95			
ט כ	Royal Sluis	Prom Lagen	100	95	15	Sluis en Groot	Snowball y /Erfurter 14	100	90			
38	Royal Shuic	Elgon Prio	100	63	76	Sluis en Groot	Erfurter 13	100	86			
20	Pougl Cluic		100	60	70	Sluis en Groot	Dominant	100	55			
57		DOK EIGON	100	, ,,	15	Sluis en Groot	Lecerf	100	97			
					/9	' Sluis en G ro ot	Walcheren Winter Aprilex	100	84	1		

Cauliflowers

		Cauliflowers					Lauin lowers		-
Column	1	2	3	4	Column	1	2	T 3	4
			weight					weight	
Acc.nr.	Donor name	Cultivar name	grams	germ %	Acconto	Donor name	Cultivar name	grams	germ %
80	Sluis en Groot	Walcheren Winter Maystar	100	87			llamado	50	96
81	Sluis en Groct	Petra	100	98	120	Broersen	Hormade	50	20
82	Sluis en Groct	Herfstreuzen Algro Mayo	100	95	121	Broersen		100	01
83	Sluis en Groot	Herfstreuzen Lawyna	100	85	122	J.P. Rood	Lecert Lero	100	10
84	Sluis en Groot	Giganti di Napoli	100	96	123	J.P. Rood	Romax Extreem Vroeg	10	
85	Sluis en Groot	Oze/White Top	100	84	124	J.P. Rood		10	100
86	Sluis en Groot	Orco/Talbion	100	82	125	J.P. Rood	Alpha Natuur Climax	10	57
87	Sluis en Groot	Ims/Talmira	100	70	126	J.P. Rood	Winter Bloemkool	10	
85	Sluis en Groot	White Summer	100	98	127	Bejo	Septora	10	21
89	Sluis en G ro ot	SG 109 While Fox	100	96	128	Bejo	Bejo 1035/Inka	10	00
90	Sluis en Groot	Detso	100	85	162	ZCO	В	25	37
91,	Sluis en Groot	Walcheren Winter Maschpast	100	88	163	ZCO	C	36	70
92	Van den Berg	Mechelse Abundantia	100	93	164	ZGO	ZL	33	81
93	Van den Berg	Mechelse Delta	100	92	165	ZGO	Α	35	84
94	Van den Berg	Herfstreuzen Jqea	100	86	166	ZCO	Witte Pater	41	0
95	Van den Berg	Alpha Kassa	100	96	167	ZGO	B37	39	0
96	Van den Berg	Mechelse Panda	100	79	168	ZCO	A26	68	0
97	Van den Berg	Alpha Roberna	100	96	169	ZGO	A13	61	21
98	Van den Berg	Subrassa/Erfurter 14	100	92	170	Rijk Zwaan	Lukra	100	
99	Van den Berg	Erfurter Supra/Holdan	100	98	171	Rijk Zwaan	Birka	100	
100	Van den Berg	Brittania	100	82	172	Rijk Zwaan	Escorva RZ	100	
101	Van den Berg	Walcheren Winter June Glory	100	88	173	Rijk Zwaan	Delira RZ	100	-
102	Van den Berg	Walcheren Winter May Glory	100	97	174	Rijk Zwaan	Flora Blanca	100	
103	Van den Berg	Walcheren Winter Pronto	100	64	175	Rijk Zwaan	Nevada	100	
104	Van den Berg	Blenda	100	40	176	Rijk Zwaan	Celesta RZ	100	
105	Van den Berg	Mechelse Vroege Delta	100	85	177	Rijk Zwaan	Opaal RZ	100	
106	Van den Berg	Lecerf Selectie	100	88	178	Rijk Zwaan	Verb.Mechelse	100	
106	Van den Berg	Rekord 22	2		179	Rijk Zwaan	Dualba RZ	100	
108	Broersen	Mechelse Primeur A	50	88	180	Rijk Zwaan	Fortuna RZ	100	
109	Broersen	Alpha Begum	50	77	181	Rijk Zwaan	Walcheren Winter Middelvroeg	100	
110	Broersen	Pionier	50	85	182	Rijk Zwaan	Walcheren Winter Laat	100	
111	Broersen	Hornstar	50	58	183	Rijk Zwaan	Star Light RZ	100	
112	Broersen	Alpha Prekasa	50	90					
113	Broersen	Alpha Venus	50	83					
114	Broersen	Mavoron	50	93					
115	Broersen	Alpha Balanza	50	96					
116	Broersen	Sesam	50	87					
117	Broersen	Solo Crop	50	89					
115	Broersen	Walcheren Winter	50	89					
119	Broersen	Lecerf	50	77					
						ŧ	1	1	Ŧ

Brussel	ls sprouts	
-		

Colump 1 2			3	4	.				
			weight				Brussels sprouts	1	
Accanra	Donor name	Cultivar name	grams	germ %	Column	1	2	3	4
,		Sanda	85	74	Accupto	Dopor name		weight grams	germ %
1	IVI Bejo	Vinosa	92	93	Acconte		Cultivar name	gramo	yerni xu
2	IVT Bejo		85	93	41	IVT Broersen	Brusselse Markt	91	96
3	IVT Rijk Zwaan B ₄ V.	Talada P7	26	94	42	IVT Broersen	Verbeterde Brusselse Markt	108	87
4	IVT Rijk Zwaan B.V.			86	43	IVT Turkenburg	Halfhoge Westlandse of Lierse	8	94
5	IVT Rijk Zwaan B.V.		90	97	44	IVT Turkenburg	Roem van Castricum	99	96
6	IVT Sluis en Groot	Polar Star	102	85	45	IVT Gebr.Eveleens	Roem van Barendrecht	2	
7	IVT Sluis en Groot	Некка	102	91	46	IVI Gebr Eveleens		96	96
8	IVT Sluis en Groot	Gemma	101	37	47	IVI Gebr Eveleens	Lierse of Westlandso	109	96
9	IVT Sluis en Groot	Orion	15	86	49	IVI Cobr. do Jonat			
10	IVT Sluis en Groot	Ny Kastrupgaard	10	00	40	IVI Gebr. de Joant	verbeterde koodnerf	85	95
11	IVT Sluis en Groot	Glenaegles	101	94	47 50	IVI Gebr. de Jongh	westlandse of Lierse	71	94
12	IVT Sluis en Groot	Zavitkova	100	20	20	IVI Gebr. de Jongn	Scaldis	1	
13	IVT Sluis en Groot	Early Half Tall	96	00	51	IVI Gebr. de Jongh	Arno		
14	IVT Nunhem	Stabilo	85	24	52		Westlandse of Lierse	30	80
15	IVT Nunhem	Tribune	106	94	53	IVI L.I.B.	Kennemer Roofnerf	24	00
16	IVT Bejo	Vrosa	//	92	54	IVI NUNNEM	Ideal	20	20
17	IVT Unilever	Gemma	//	98	55	IVI Nunnem	Bredase Atlanta	20	20
18	IVT Unilever	Stiekema no.l	97	95	57	IVI Nunhem	Stabilo	57	26
19	IVT Rijk Zwaan B.V.	Prominent	93	92	58	IVI Nunhem	Gravendeel	23	98
20	IVT Rijk Zwaan B.V.	Toledo	83	99	59	1VT J.H. Deicke	Hilds Ideal	99	87
21	IVT Nunhem	Stabilo	82	90	60	IVT Enza	Verbeterde Roodnerf	84	86
22	IVT Asmer Seeds	Stiekema no.l	107	96	61	IVT Enza	Groningse Laat	101	96
23	IVT Asmer Seeds	Roem van Koosterburen	105	95	62	IVT Walter und Karl Hild	Hilds Ideal	52	84
24	IVT Asmer Seeds	Monitor	88	72	63	IVT Walter und Karl Hild	Neuzucht Hild 51		
25	IVT Thomas Cullen	Bedforshire Prize	97	67	64	IVT Walter und Karl Hild	Huizer's Abunda		
26	IVT Hansen Denmark	Amager Tagenshew	105	82	65	IVT J.E. Ohlsens Enke	Original	100	91
27	IVT Vilmorin-Andrieux	De Rosny	109	94	66	IVT J.E. Ohlsens Enke	Fest und Viel	24	78
28	IVT A.R. Zwaan	Early Morn	91	87	67	IVT J.E. Ohlsens Enke	Long Island Enkona P 69	86	92
29	IVT A.R. Zwaan	Electra	107	93	68	IVT J.E. Ohlsens Enke	Wilhemsburger	55	
30	IVT Nunhem	Gravendeel	84	92	69	IVT J.E. Ohlsens Enke	Odenser Markt	77	92
31	IVT Broersen	Harola Expert Laat	71	87	/0	IVT L.Daenfeldt Seeds Ltd	de la Halle L.D.	108	92
32	IVT Vreeken	Rubine	77	87	/1	IVT Rijk Zwaan B.V.	Prominent	100	94
34	IVT Tézier Frères	Bleu Green	1	92	12	IVT Rijk Zwaan B.V.	Toledo	63	91
35	IVT Unilever	De Westland	58	92	73	IVT Blain Fils Aîné	Demi Nain de la Halle	95	86
36	IVT Jac Jong	Lierse of Westlandse	107	82	74	Enza	Groningse	1	
37	IVT Jac Jong	Kenor	13	95	15	Jos Huizer	Abunda	10	89
38	IVT Zandbergen	Roodnerf Groningen Type	117	97	76	Bejo	Groninger Vrosa	100	90
39	IVT Beemsterboer	Sanda	4	94	77	Bejo	Roem van Castricum Sanda	100	55
40	IVT Beemsterboer	Vrosa	92	96	78	Bejo	Gemma	10	99
	,	•	-		79	Bejo	Kenor	10	91

Brussels sprouts

Column	1	2	3	4	Column	1	2	3	4
Accanta	Donor name	Cultivar name	weight grams	germ %	And DR			weight	*
		D. Nama			ACC.III.	<u>Denor</u> name	Cultivar name	grams	germ %
80	Bejo	Roem van voorne	2	74	119	Johan Kats	Labo	7	2
81	Leen de Mos	Groninger Lindo	25	/9	120	Stiekema	Stiekema	21	ر ٦٥
82	Leen de Mos	Roodnert Rido	25	89	121	IVT	Orion		75
83	Leen de Mos	Tuindersselectie	25	95	122	IVT Broersen	Harola Laat Export	63	76
84	Leen de Mos	Roodnerf Vremo/Ostar	25	80	123	IVT	Groninger	/4	92
85	Leen de Mos	Roodnerf Vremo/Nectar	25	72	124	IVT	Mauser Ausleso		
86	Holland Select	Roodnerf Seven Hills	96	59	125	IVT Altorfer Samen	Markthebernschon	95	96
87	Holland Select	Rubine	93	87	126	IVT		105	95
88	Royal Sluis	Laro	90		127	IVT	Seven hills	1	
89	Royal Sluis	Frigo	92		128	IVT	Cambridge special	105	94
90	Royal Sluis	Gronalto	95		129	IVT		25	93
91	Van den Berg	Roodnerf Kampioen	100	78	130	IVT «		16	95
92	Nunhem	Tribune	33		131	IVI Broersen		61	69
93	Nunhem	Roodnerf Stabilo/Gravendeel	50	72	132	IVI Falter Born	Groninger Rola Cross	3	90
94	J. Bode	Tuindersselectie			133	IVI Falter Dern	Berner Makrt	1	
95	Johan Kats	Gloria AB	92	83	134	IVI Agree	Zwerg Special	91	88
96	Johan Kats	Roem van Kloosterburen	1000	15	135	IVI Asher	Roodnerf Vremo/Ostar	93	99
97	Mevr.Groenenboom	Sel.Groenenboom	20	73	134	IVI ASmer	Yater Dark Crop	97	81
98	Sluis en Groot	Roodnerf Vroeg	100	99	137	IVI Correction D	Champion Original	83	84
99	Sluis en Groot	Roem van Kloosterburen	100	94	138	TVT COTINS V. Beusekom	Westlandse	1	
100	Sluis en Groot	Herka	100	97	130		Raya	1	
101	Sluis en Groot	Gemma	100	100	140		Gloria AB	13	81
102	Sluis en Groot	Gloria AB	100	95	141	IVI Supergran	Mechelse Markt	115	86
103	Sluis en Groot	Labo	100	99	141	IVI J.W. Unwin Ltd	Roodnerf Rollo	19	96
104	Broersen	Selectie W.van Iperen	36		142	IVI Elsoms Seeds	Gronalto	72	88
105	Broersen	Gloria AB	39		145	IVI W.Deal + Sons Ltd	Ashwells Strain	1	
106	Broersen	Elektra	13	-	144		Blauwtje	106	92
107	Broersen	Broersen Export	55		145	IVI Elsoms Ltd	Roem van Kloosterburen	4	79
108	Broersen	Groninger Rola Cross	24		147	Rijk Zwaan	Groninger Prominent	100	
109	Broersen	Selectie W.Sol	5		147		Tuindersselectie van Prooien	104	
110	Broersen	Tuindersselectie	22						
111	Broersen	Roem van Castricum	10						
112	Broersen	Selectie vr. J. Bode	24					1	
113	Broersen	Verbeterde Stiekema	14						
114	Broersen	Selectie Groenenboom	47						
115	Broersen	Harola	50	92					
116	Broersen	Groninger Bola Cross	50	80					
117	Broersen	Aurora	50	95					
119	Vincen Zadar (W. 1.)			0/1					
110	. ATRREL TAGEU (MONG9)	. STIEKEWA NO'T	· 100 ·	• 04		I			

Brussels sprouts

<u>White cabbages</u>

between tableDetermaneCultiver nameCultiver nameCulti	Column	1	2	3	4			White cabbages			
Owner, Barton Data Series Data Series <thdata series<="" th=""> <thdata series<="" th=""></thdata></thdata>			Cultivar pame	weight	derm %	Column	1	2	3	4	
Increase Discreptor Discreptor <thdiscreptor< th=""> Discreptor Discreptor</thdiscreptor<>	Acc.nr.	Donor name		yr ans	germ 76	-			weight		-
J Keen Innorman Langedlyne benar Statut 33 97 all Royal Langedlyne benar Statut 100 62 Korl Langedlyne benar Statut 100 63 C Korl Langedlyne benar Statut 100 64 G Korl Statut Langedlyne benar Statut 100 93 6 Bejo Langedlyne Venege Ntft Julia 100 92 40 Royal Statut Ottan Akker Colors 100 94 40 Royal Statut Ottan Akker Colors 100 94 47 Royal Statut Ottan Akker Colors 100 94 97 Statut on Consot Auget Rowar Colors 100 92 Statut on Consot Buder Ahran 100 101 103 Statut on Consot Buder Ahran 100 103 Statut on Consot Buder Ahran 100 101 103	1	Enza	Ditmarscher D141	4	89	Acc.nr	Donor name	Cultivar name	grams	germ %	
3 Bejo Laperal lace laces laket 100 90 90/11 Statis Langentijker Desar Laces 100 50 5 Bajo Couden Alker/Jollack 100 64 90/11 Noval Suis Noval Suis Noval Suis Noval Suis Noval Suis Noval Suis Outschluter Remember 100 92 7 Bajo Langedijker Veorge Mitte Julus 100 92 46 Royal Suis Outschlut d'Alsono 100 93 7 Bajo Langedijker Veorge Mitte Julus 100 92 46 Royal Suis Outschlut d'Alsono 100 93 8 Bajo Langedijker Veorge Mitte Julus 100 64 46 Suis en Groot Anager Kortstrock 100 95 Suis en Groot Bajot Bajot Bagot Doots 100 95 Suis en Groot Bajot Bajot Langedijker Beaar Sona 100 95 Suis en Groot Bajot Hawat 100 95 10 Bojo Langedijker Beaar Sona	2	Kees Broersen	Langedijker Bewaar Starski	53	69	41	Royal Sluis	Langedijker Late Herfstwitte	100	87	
6 Boje Vreep Erminger 100 84 10 800 100 800 100 800 100 800 100 800 100 800 800 800 800 800 800 800 800 800 800 800 800 800 800 800 800 800 800 800 800 800 800 800 800 800 800 800 800 800 800 800 800 800 800 800 800 800 800 800 800 800 800 800 800 800 800 800 800 800 800 800 800 800 800 800 800 800 800 800 800 800 800 800 800 800 800 800 800 800 800 800 800 800 800 800 800 800 800 8000 8000 <	3	Bejo	Express Raket	100	90	42	Royal Sluis	Langedijker Bewaar Lares	100	85	
b Bejo Condent Akter (Schlack 100 94 44 Royal Stuis Spontagener Narkt B 100 93 7 Dejo Langedijter Vroege Nitte Augusta 100 94 66 Royal Stuis Dintal Allance 100 66 0 Roin None van Enkluizen 100 94 47 Royal Stuis Binderitor 100 69 9 Icio Langedijter Vroege Nitte Augusta 100 61 48 Stuis en Croot Anager Kortstronk 100 70 10 Deto Branserijter 100 97 50 Stuis en Croot Anager Kortstronk 100 73 12 Bejo Scoses 100 97 53 Stuis en Croot Bidericher 100 70 13 Bejo Langedijter Bewar Decoma Line 100 97 53 Stuis en Croot Langedijter Bewar Casea 100 100 100 14 Bejo Langedijter Bewar Decoma Line 100 97 Stuis	4	Bejo	Vroege Groninger	100	86	43	Royal Sluis	Roem van Enkhuizen Romenco	100	87	
6 Bejo Langedijker Vecege Nitte Julia 100 93 65 Royal Sluis Ditmatenter freib 100 66 8 Bejo Roman Exkluizen 100 94 47 Royal Sluis Didarinher 13 9 Bejo Roman Exkluizen 100 94 47 Royal Sluis Didarinher 13 10 Roja Sluis en Groot Anager Kortstronk 100 92 10 Roja Beunstijker 100 92 90 Sluis en Groot Beunstijker 100 92 11 Roja Beunstijker Decema 100 92 93 Sluis en Groot Beunstijker 100 92 13 Roja Bego Beunstijker Beasar Decema 100 92 Sluis en Groot Express 100 92 15 Bejo Decema Decema Exta 100 93 Sluis en Groot Langedijker Beasar Decema 100 66 17 Bejo Norger Kor	5	Bejo	Gouden Akker/Goldack	100	84	44	Royal Sluis	Kopenhagener Markt B	100	92	
7 Boto Langedifier treese filts Augusta 100 92 act Royal Sulis Duintal AtLasse 100 64 9 Boto Langedifier treese filts Augusta 100 64 93 Sulis en Groot April 100 94 9 Boto Langedifier treese filts Augusta 100 64 93 Sulis en Groot Anger Korlstronk 100 94 10 Boto Botos Botos Botos Botos Botos Benand Socos 100 94 93 Sulis en Groot Botos Botos Benand Socos 100 91 93 Sulis en Groot Durhan Lif Hearting 100 91 14 Boto Langedifier Beear Decema 100 91 53 Sulis en Groot Coucha Lif Hearting 100 92 15 Boto Langedifier Beear Decema Extra 100 97 Sulis en Groot Langedifier Beear Tai Orig 100 60 16 Boto Aeage Kortstronk 100 94 <td< td=""><td>6</td><td>Bejo</td><td>Langedijker Vroege Witte Julia</td><td>100</td><td>93</td><td>45</td><td>Royal Sluis</td><td>Ditmarscher Treib</td><td>100</td><td>93</td><td></td></td<>	6	Bejo	Langedijker Vroege Witte Julia	100	93	45	Royal Sluis	Ditmarscher Treib	100	93	
SDerjoNorwan Arn Endwülzern1009247Royal SluisDöderliner130BeijaLangedijker Voreme Merfstrutte Septa1006449Sluis en CrootAmager Kortstronk1009210BeijaDotomanijker1006449Sluis en CrootManager Kortstronk1009311BeijaSucces1009250Sluis en CrootBiddericher1009313BeijaBenari J1009352Sluis en GrootDirtherer1009314BeijaLangedijker Bewara Decoma1009554Sluis en GrootExpress1009315BeijaLangedijker Bewara Decoma1009554Sluis en GrootExpress1009616HeijaLangedijker Bewara Decoma1009554Sluis en GrootLangedijker Bewara Token1009617BeljaNovema Sritt1086Sluis en GrootLangedijker Bewara Taal Orig grijsvij1004018BeljaAnager Kortstronk10959Sluis en GrootLangedijker Bewara Taal Orig grijsvij1004019BeljaNark10959Sluis en GrootLangedijker Bewara Taal Orig grijsvij1004019BeljaNark1064Sluis en GrootLangedijker Bewara Taal Orig grijsvij1004019BeljaSluis en Groot<	7	Bejo	Langedijker Vroege Witte Augusta	100	92	46	Royal Sluis	Quintal d'Alsace	100	68	
9 Baja Langdilker Vroeg Herfswilte Septa 100 61 48 Stuis en Groot Avenue Kortstonk 100 95 11 Baja Denomijker 100 92 50 Stuis en Groot frumsrijker 100 82 11 Baja Denomijker 100 92 50 Stuis en Groot frumsrijker 100 82 12 Maja Bena Densa J 100 93 Stuis en Groot Durha Elf Hearting 100 91 14 Beja Langdijker Bewar Decema 100 91 53 Stuis en Groot Express 100 91 16 Beja Langdijker Bewar Decema Extra 100 87 55 Stuis en Groot Express 100 100 100 17 Beja Novem Snit 10 88 54 Stuis en Groot Langdijker Bewar Taal Orig 100 40 18 Beja Novem Snit 10 94 50 Stuis en Groot Lang	8	Bejo	Roem van Enkhuizen	100	94	47	Royal Sluis	Büdericher	13		
10BrigoBri	9	Bejo	Langedijker Vroege Herfstwitte Septa	100	81	48	Sluis en Groot	April	100	95	
11Be joOtomaOtomaIoo9290Sluis en GrootBudsriker100939313te joBewaar JIoo9552Sluis en GrootDifenhamIoo919314Be joBewaar JIoo9153Sluis en GrootOffenhamIoo929314Be joLangedijker Bewaar DecemaIoo9153Sluis en GrootOffenhamIoo9216Be joLangedijker Bewaar DecemaIoo9753Sluis en GrootErgensaIoo9316Be joLangedijker Bewaar DecemaIoo9753Sluis en GrootCouden AkkerIoo9017Be joNovess sittIoo86Sluis en GrootLangedijker Bewaar Taid Orig grijavriIoo6019Be joNovess futIoo9460Sluis en GrootLangedijker Bewaar Taid Orig grijavriIoo8620Be joNoraIoo9460Sluis en GrootLangedijker Bewaar Taid Orig grijavriIoo8621Be joJoniaIoo9460Sluis en GrootLangedijker Bewaar Taid Orig grijavriIoo8622Be joNoraNataIoo9460Sluis en GrootLangedijker Merekutte OrigIoo8623Bio forNataNataIoo75Sluis en GrootLangedijker Merekutte OrigIoo8024	10	Bejo	Brunswijker	100	64	49	Sluis en Groot	Amager Kortstronk	100	72	
12bejoSucces1009091S10Sluis en GrootBudericher100939313BejoBesnan1009153Sluis en GrootDurham Elf Hearting1009115BejoLangedijker Bewar Decema1009553Sluis en GrootExpress1009215BejoLangedijker Bewar Decema1009553Sluis en GrootEupress1009216BejoLangedijker Bewar Decema Extra101086Sluis en GrootCoulen Akker1006017BejoNovema Snit10104753Sluis en GrootLangedijker Bewar Graog Orig1006018BejoAnager Kortstronk101055Sluis en GrootLangedijker Bewar Taal Orig orijavrij1006020BejoJunia101040Sluis en GrootLangedijker Bewar Taal Orig orijavrij1006021BejoJunia101040Sluis en GrootLangedijker Bewar Taal Orig orijavrij1006022BejoVecegi Herfsbritte100401040Sluis en GrootLangedijker Bewar Stal Orig1008023BejoVecegi Herfsbritte1064Sluis en GrootLangedijker Bewar Stal Orig1009024BejoSluis en GrootKakeb1007166Sluis en GrootKakeb10090 <td>11</td> <td>Bejo</td> <td>Octoma</td> <td>100</td> <td>92</td> <td>50</td> <td>Sluis en Groot</td> <td>Brunswijker</td> <td>100</td> <td>88</td> <td></td>	11	Bejo	Octoma	100	92	50	Sluis en Groot	Brunswijker	100	88	
13BejoBewar J100959251.11 sen GrootDarham Elf Hearting100939316BejoLangedijker Bewar Decema1009153Sluis en GrootOffenham1009116BejoLangedijker Bewar Decema1009753Sluis en GrootFirst Early Market1009316BejoLangedijker Bewar Decema Extra1009755Sluis en GrootFirst Early Market1009816BejoNoveas Shit109757Sluis en GrootLangedijker Bewaar Taid Orig1006019BejoNoveas Shit104757Sluis en GrootLangedijker Bewaar Taid Orig grijvet ji1006019BejoJonia101058Sluis en GrootLangedijker Lewaar Taid Orig grijvet ji1006020BejoVoroge Herfswilte1059Sluis en GrootLangedijker Lewaar Taid Orig grijvet ji1009023BejoVoroge Herfswilte1061Sluis en GrootLangedijker Uroge Mitte Orij1009024BejoVezufa1064Sluis en GrootKasko100939324BejoSluis Karsten107463Sluis en GrootKasko1009325BejoSluis Karsten107464Sluis en GrootKasko1008326BejoSluis Karsten1	12	Bejo	Succes	100	90	51	Sluis en Groot	Büdericher	100	75	
14BejonBemana1009153Sluis en GrootOffenham1009115BejonLangedijker Bewaar Decema1009554Sluis en GrootExpress1009216BejonLangedijker Bewaar Decema Extra1009755Sluis en GrootFirst Early Market10010017BejonNovema Snit10108856Sluis en GrootLangedijker Bewaar Craag Orig10010018BejonAmager Kortstronk1057Sluis en GrootLangedijker Bewaar Tai Orig1006020BejonNora1059Sluis en GrootLangedijker Bewaar Tai Orig origing 1006020BejonNora1059Sluis en GrootLangedijker Let Herfawitte Origing 1006021BejonVroege Herfswitte1064Sluis en GrootLangedijker Vroege Witt Orig1006323BejonYroege Herfswitte1064Sluis en GrootLangedijker Vroege Witt Orig1009325BejonSeil, Muis164Sluis en GrootKasko1009226BejonSeil, Karsten265Sluis en GrootKasko1009327Holland SelectGouden Akker1017467Sluis en GrootKasko1009328BejonSeil, Karsten265Sluis en GrootKasko10093 <t< td=""><td>13</td><td>Bejo</td><td>Bewaar J</td><td>100</td><td>95</td><td>52</td><td>Sluis en Groot</td><td>Durham Elf Hearting</td><td>100</td><td>93</td><td></td></t<>	13	Bejo	Bewaar J	100	95	52	Sluis en Groot	Durham Elf Hearting	100	93	
15BejoLangedijker Benaar Decena1009794Sluis en GrootExpress1009216BejoLangedijker Benaar Decena Extra1006755Sluis en GrootGouden Akker1009317BejoNovena104757Sluis en GrootCaugedijker Benaar Graag Orig1006019BejoAnager Kortstronk104757Sluis en GrootLangedijker Benaar Caag Orig1006019BejoMorea109450Sluis en GrootLangedijker Benaar Taai Orig grijsvij1008620BejoJunia109460Sluis en GrootLangedijker Late Herfstwitte Orig1008021BejoJunia109460Sluis en GrootLangedijker Vreege Witte Orig1008022BejoVroege Herfstwitte109460Sluis en GrootCarcot Oschart1009023BejoVroege Herfstwitte109463Sluis en GrootKarcot Kako1009024BejoVezufa109463Sluis en GrootKanopatiker Tresse1009025BejoSel. Muls107464Sluis en GrootKanopatiker Tresse1007625BejoSel. Arsten207266Sluis en GrootKanopatiker Tresse1007626Holand SelectGouden Akker104<	14	Bejo	Bewama	100	91	53	Sluis en Groot	Offenham	100	91	
16BejoLangedijker Bewaar Decema Extra1008755Sluis en GrootFirst Early Market1009017BejoNovema Snit104056Sluis en GrootGuden Akker10010018BejoNager Kortstronk104757Sluis en GrootLangedijker Bewaar Graag Orig1006019BejoAmager Kortstronk104755Sluis en GrootLangedijker Bewaar Graag Orig1006020BejoNora109455Sluis en GrootLangedijker Latwar Graag Orig1006021BejoJonia109460Sluis en GrootLangedijker Latwerfestuitte Orig1006422BejoVroege Herfsbritte1064Sluis en GrootLangedijker Latwerfestuitte Orig1009523BejoVroege Herfsbritte1064Sluis en GrootGroot Oseshart1009324BejoVezufa1064Sluis en GrootKasko1009225BejoSei NuisNarsen1064Sluis en GrootKasko1009325BejoSei NuisSluis en GrootKasko100939426BejoSluis en GrootKasko100939627Holland SelectBrunsajker1017465Sluis en GrootKasko1009328Holland SelectGoud	15	Bejo	Langedijker Bewaar Decema	100	95	54	Sluis en Groot	Express	100	82	
17BejoNovema Snit106856Sluis en GrootCouden Akker10010018BejoNovema104757Sluis en GrootLangedijker Bewaar Graag Orig1006020BejoAnager Kortstronk10455Sluis en GrootLangedijker Bewaar Taal Orig1006020BejoNora101055Sluis en GrootLangedijker Bewaar Taal Orig1006021BejoJunia10960Sluis en GrootLangedijker Dewaar Taal Orig1006022BejoYoege Herfstwitte1062Sluis en GrootLangedijker Vreege Witte Orig1006023BejoVezafa106453Sluis en GrootLangedijker Vreege Witte Orig1009324BejoVezafa1064Sluis en GrootKasko1009325BejoSei.Nais265Sluis en GrootWinlingstädter1009026BejoSei.Nais737266Sluis en GrootWinlingstädter1009727Holland SelectBersey Wakefield1146666Sluis en GrootCoudshloem451529Holland SelectGerey Hound1049769BroersenAntiplof441529Holland SelectGerey Hound1049769BroersenAntiplof4415 </td <td>16</td> <td>Bejo</td> <td>Langedijker Bewaar Decema Extra</td> <td>100</td> <td>87</td> <td>55</td> <td>Sluis en Groot</td> <td>First Early Market</td> <td>100</td> <td>98</td> <td></td>	16	Bejo	Langedijker Bewaar Decema Extra	100	87	55	Sluis en Groot	First Early Market	100	98	
18BeloNovema1004757Sluis en GrootLangedijker Bewaar Graag Orig1006619BejoMaager Kortstronk1058Sluis en GrootLangedijker Bewaar Taal Orig grijsvrij1006620BejoJunia109460Sluis en GrootLangedijker Bewaar Taal Orig grijsvrij1006421BejoJunia109460Sluis en GrootLangedijker Lewaar Taal Orig grijsvrij1006422BejoVroege Herfsbritte1064Sluis en GrootLangedijker Lewaar Taal Orig grijsvrij1008023BejoNark1064Sluis en GrootCroot Osschart1009524BejoVezufa1064Sluis en GrootKasko1009525BejoSei. Karsten266Sluis en GrootWinningstüdter1009526BejoSei. Karsten266Sluis en GrootWinningstüdter1009027Holland SelectDouenskijker1017467Sluis en GrootWinningstüdter1006329Holland SelectDerse Wachfeld1146668Sluis en GrootContinental507531Holland SelectGoeen Akker104974767Sluis en GrootSel. 0. Godsbloem457533Holland SelectNem was Irkhuizen97471Broersen <td>17</td> <td>Bejo</td> <td>Novema Snit</td> <td>10</td> <td>88</td> <td>56</td> <td>Sluis en Groot</td> <td>Gouden Akker</td> <td>100</td> <td>100</td> <td></td>	17	Bejo	Novema Snit	10	88	56	Sluis en Groot	Gouden Akker	100	100	
19BejoAnager Kortstronk1058Sluis en GrootLangedijker Bewaar Taal Orig1004020BejoNora10959Sluis en GrootLangedijker Bewaar Taal Orig grijsvrij1004021BejoJonia10960Sluis en GrootLangedijker Bewaar Taal Orig1008422BejoVroege Herfsbritte1061Sluis en GrootLangedijker Late Herfstwitte Orig1008023BejoHark1064Sluis en GrootGroot Ossehart1009524BejoVezufa1064Sluis en GrootKasko1009525BejoSel. Muis164Sluis en GrootKasko1009026BejoSel. Karsten265Sluis en GrootKasko1009027Holland SelectBrunsvijker937266Sluis en GrootKasko1007828Holland SelectGouden Akker1017467Sluis en GrootKintengreen1008329Holland SelectGouden Akker1017467Sluis en GrootContinental507530Holland SelectGouden Akker/Larly Bird916572BroersenSel. J. Goudsbloem444531Holland SelectRoem van Enkhuizen906572BroersenBlankora522934Ho	18	Bejo	Novema	10	47	57	Sluis en Groot	Langedijker Bewaar Graag Orig	100	60	
20Be joNora109959Sluis en GrootLangedijker Bewaar Taal Orig grijsvrij1004021Be joJunia109460Sluis en GrootLangedijker Late Herfstwitte Orig1006423Be joHark1061Sluis en GrootLangedijker Voege Witte Orig1006924Be joHark1062Sluis en GrootGroot Oseshart1009526Be joSel. Mais108463Sluis en GrootKasko1009925Be joSel. Karsten265Sluis en GrootKasko1009926Be joSel. Karsten265Sluis en GrootKasko1009027Holland SelectGouden Akker1017467Sluis en GrootKasko1009528Holland SelectGouden Akker1017467Sluis en GrootKintergreen1008329Holland SelectGouden Akker1049769BroersenSel. D. Goudshloem4531Holland SelectLangedijker Bewaar818570BroersenAntiplof41534Holland SelectGouden Akker/Early Bird898072BroersenAntiplof41534Holland SelectGouden Akker/Early Bird898073BroersenBlankora55522935Royal Sluis<	19	Bejo	Amager Kortstronk	10		58	Sluis en Groot	Langedijker Bewaar Taai Orig	100	86	
21BejoJunia109460Sluis en CrootLangedijker Late Herfstwitte Orig1006422BejoVroege Herfstwitte1061Sluis en CrootLangedijker Vroege Witte Orig1008023BejoHark1062Sluis en CrootGroot Ossehart1009524BejoVezufa108463Sluis en CrootRoem van Enkhuizen1009525BejoSel. Muis164Sluis en CrootKasko1009926BejoSel. Karsten265Sluis en CrootKasko1009027Holland SelectGouden Akker1017466Sluis en CrootCapata1007628Holland SelectOcuden Akker1017467Sluis en CrootContinental507530Holland SelectDersey Wakefield1049769BroersenSel. D. Goudsbloem454531Holland SelectLangedijker Bewaar618570BroersenHankora507530Holland SelectGouden Akker/Carly Bird895073BroersenHankora507533Holland SelectGouden Akker/Early Bird895073BroersenBlankora507534Holland SelectGouden Akker/Early Bird895073BroersenEarstling4090 <t< td=""><td>20</td><td>Bejo</td><td>Nora</td><td>10</td><td></td><td>59</td><td>Sluis en Groot</td><td>Langedijker Bewaar Taai Orig grijsvrij</td><td>100</td><td>40</td><td></td></t<>	20	Bejo	Nora	10		59	Sluis en Groot	Langedijker Bewaar Taai Orig grijsvrij	100	40	
22BejoVroege Herfstwitte1061Sluis en GrootLangedijker Vroege Witte Orig1008023BejoHark1062Sluis en GrootGroot Ossehart1009524BejoVezufa1064G3Sluis en GrootRoem van Enkhuizen1009325BejoSel. Muis164Sluis en GrootRoem van Enkhuizen1009326BejoSel. Karsten265Sluis en GrootWinningstädter1009027Holland SelectBrunswijker937266Sluis en GrootCapata1007828Holland SelectOuden Akker1047467Sluis en GrootContinental1008330Holland SelectGuden Akker1049769BroersenSel. D. Godsbloem4531Holland SelectLangedijker Bewaar618570BroersenHerfstden Snitkolos4432Holland SelectRoem van Enkhuizen976472BroersenAntiplof41533Holland SelectRoem van Enkhuizen976473BroersenBlankora507334Holland SelectRoem van Enkhuizen976472BroersenHerfstden Snitkolos444534Holland SelectCouden Akker/Early Bird698073BroersenBlankora509335R	21	Bejo	Junia	10	94	60	Sluis en Groot	Langedijker Late Herfstwitte Orig	100	84	
23BejoHark1062Sluis en GrootGroot Ossehart1009524BejoVezufa108463Sluis en GrootRoem van Enkhuizen1009325BejoSel. Muis164Sluis en GrootKasko1009926BejoSel. Karsten265Sluis en GrootKasko1009027Holland SelectBrunswijker937266Sluis en GrootCapata1007828Holland SelectGouden Akker1017467Sluis en GrootContinental507530Holland SelectGrey Hound1049769BroersenSel. Suis en GrootContinental507530Holland SelectLangedijker Bewaar815570BroersenHefstdeen Slukolos444431Holland SelectRoem van Enkhuizen97471BroersenAntiplof415509333Holland SelectGouden Akker/Early Bird696572BroersenBlankora50939335Royal SluisWinningstädter1009474BroersenExpress/Spiko509335Royal SluisKopenhagener Markt Coverno1006375BroersenLangedijker Bewaar Harwin509036Royal SluisBrunsijker1006375BroersenLangedijker Bew	22	Bejo	Vroege Herfstwitte	10		61	Sluis en Groot	Langedijker Vroege Witte Orig	100	80	
24BejoVezufa108463Sluis en GrootRoem van Enkhuizen1009325BejoSel. Muis164Sluis en GrootKasko1009926BejoSel. Karsten265Sluis en GrootWinningstädter1009027Holland SelectBrunswijker937266Sluis en GrootCapata1007828Holland SelectGouden Akker1017467Sluis en GrootWintergreen1008329Holland SelectJersey Wakefield1148668Sluis en GrootContinental507530Holland SelectGrey Hound1049769BroorsenSel. O. Goudsbloem4531Holland SelectLangedijker Bewaar818570BroersenAntiplof41532Holland SelectRoem van Enkhuizen97471BroersenBlankora522934Holland SelectGouden Akker/Early Bird898073BroersenEarsteling409035Royal SluisWinningstädter1009474BroersenEarsteling409035Royal SluisWinningstädter1009474BroersenEarsteling409036Royal SluisWinningstädter1009474BroersenEarsteling409036Royal Sluis<	23	Bejo	Hark	10		62	Sluis en Groot	Groot Ossehart	100	28	
25BejoSel. Muis164Sluis en CrootKasko1009926BejoSel. Karsten265Sluis en GrootWinningstädter1009027Holland SelectBrunswijker937266Sluis en GrootCapata1007628Holland SelectCouden Akker1017467Sluis en GrootWintergreen1008329Holland SelectDersey Wakefield1049769BroersenContinental507530Holland SelectGrey Hound1049769BroersenSel. D. Goudsbloem4531Holland SelectLangedijker Bewaar616570BroersenSel. D. Goudsbloem4532Holland SelectRoem van Enkhuizen97471BroersenAntiplof41533Holland SelectGouden Akker/Early Bird996672BroersenBlankora522934Holland SelectGouden Akker/Early Bird698073BroersenEarstling509335Royal SluisWinningstädter1006375BroersenLangedijker Bewaar Harwin509036Royal SluisBrunswijker1006476BroersenLangedijker Kroege Witte Baldura509036Royal SluisBrunswijker1006476BroersenLangedijker Kroege Witte Baldura <td< td=""><td>24</td><td>Bejo</td><td>Vezufa</td><td>10</td><td>84</td><td>63</td><td>Sluis en Groot</td><td>Roem van Enkhuizen</td><td>100</td><td>93</td><td>10 100 T</td></td<>	24	Bejo	Vezufa	10	84	63	Sluis en Groot	Roem van Enkhuizen	100	93	10 100 T
26BejoSel, Karsten265Sluis en GrootWinningstädter1009027Holland SelectBrunswijker937266Sluis en GrootCapata1007828Holland SelectCouden Akker1017467Sluis en GrootWintergreen1008329Holland SelectJersey Wakefield1148668Sluis en GrootContinental507530Holland SelectGrey Hound1049769BroersenSel. D. Goudsbloem4531Holland SelectLangedijker Bewaar818570BroersenHerfstdeen Snitkolos4432Holland SelectWinningstädter97471BroersenAntiplof41534Holland SelectWinningstädter976572BroersenBlankora522934Holland SelectWinningstädter1009474BroersenExpress/Spiko939335Royal SluisWinningstädter1009474BroersenEarsteling409036Royal SluisBrunswijker1008375BroersenLangedijker Bewaar Harwin509336Royal SluisBrunswijker1008476BroersenLangedijker Bewaar Harwin509037Royal SluisDeense Kortpoot1008476BroersenLangedijker Vroege Witte Baldura	25	Bejo	Sel. Muis	1		64	Sluis en Groot	Kasko	100	99	1. dat . e. f.
27Holland SelectBrunswijker937266Sluis en GrootCapataCapata1007828Holland SelectCouden Akker1017467Sluis en GrootWintergreen1006329Holland SelectJersey Wakefield1148668Sluis en GrootContinental507530Holland SelectGrey Hound1049769BroersenSel. D. Goudsbloem45-31Holland SelectLangedijker Bewaar818570BroersenHerfstdeen Snitkolos44-32Holland SelectWinningstädter906572BroersenBlankora522934Holland SelectWinningstädter906573BroersenExpress/Bio509335Royal SluisWinningstädter1009474BroersenExpress/Bio509335Royal SluisBrunswijker1006375BroersenExpress/Bio509336Royal SluisBrunswijker1006375BroersenEargeting609037Royal SluisBrunswijker1006476BroersenEargeting509337Royal SluisBrunswijker1006476BroersenLangedijker Bewaar Harwin509038Royal SluisDeense Kortpoot1005476Broersen <td< td=""><td>26</td><td>Bejo</td><td>Sel. Karsten</td><td>2</td><td></td><td>65</td><td>Sluis en Groot</td><td>Winningstädter</td><td>100</td><td>90</td><td>1</td></td<>	26	Bejo	Sel. Karsten	2		65	Sluis en Groot	Winningstädter	100	90	1
28Holland SelectGouden Akker1017467Sluis en GrootWintergreen10010010029Holland SelectJersey Wakefield1148668Sluis en GrootContinental507530Holland SelectGrey Hound1049769BroersenSel. D. Goudsbloem4531Holland SelectLangedijker Bewaar818570BroersenHerfstdeen Snitkolos4432Holland SelectRoem van Enkhuizen97471BroersenAntiplof41533Holland SelectWinningstädter906572BroersenBlankora522934Holland SelectGouden Akker/Early Bird898073BroersenExpress/Spiko509335Royal SluisWinningstädter1009474BroersenLangedijker Bewaar Harwin509036Royal SluisBrunswijker1008375BroersenLangedijker Bewaar Harwin509037Royal SluisDeense Kortpoot1008476BroersenGustar509438Royal SluisDeense Kortpoot1008477BroersenLangedijker Vroege Witte Baldura507939Royal SluisCouden Akker1008477BroersenLangedijker Vroege Witte Baldura507939Royal SluisCouden Akker100<	27	Holland Select	Brunswijker	93	72	66	Sluis en Groot		100	78	the second second second
29Holland SelectJersey Wakefield1148668Sluis en GrootContinentalContinental507530Holland SelectGrey Hound1049769BroersenSel. D. Goudsbloem45507531Holland SelectLangedijker Bewaar818570BroersenSel. D. Goudsbloem454432Holland SelectRoem van Enkhuizen97471BroersenAntiplof415522933Holland SelectWinningstädter906572BroersenBlankora522934Holland SelectGouden Akker/Early Bird898073BroersenExpress/Spiko509335Royal SluisWinningstädter1009474BroersenLangedijker Bewaar Harwin509036Royal SluisBrunswijker1005476BroersenGustar509439Royal SluisDeense Kortpoot1005477BroersenLangedijker Vroege Witte Baldura507939Royal SluisGouden Akker1006978BroersenLangedijker Vroege Witte Baldura507939Royal SluisGouden Akker1006978BroersenLangedijker Vroege Witte Baldura507939Royal SluisLipraLipra1007470BroersenLangedijker Vroege Witte Baldura50 <td< td=""><td>28</td><td>Holland Select</td><td>Gouden Akker</td><td>101</td><td>74</td><td>67</td><td>Sluis en Groot</td><td>Wintergreen</td><td>100</td><td>83</td><td></td></td<>	28	Holland Select	Gouden Akker	101	74	67	Sluis en Groot	Wintergreen	100	83	
30Holland SelectCrey Hound1049769BroersenSelect angedijker507031Holland SelectLangedijker Bewaar818570BroersenHerfstdeen Snitkolos4432Holland SelectRoem van Enkhuizen97471BroersenAntiplof41533Holland SelectWinningstädter906572BroersenBlankora522934Holland SelectCouden Akker/Early Bird898073BroersenBlankora509335Royal SluisWinningstädter1009474BroersenEarsteling409036Royal SluisBrunswijker1008375BroersenLangedijker Bewaar Harwin509037Royal SluisLopense Kortpoot1005476BroersenLangedijker Vroege Witte Baldura509438Royal SluisDeense Kortpoot1005477BroersenLangedijker Vroege Witte Baldura507939Royal SluisLibra1006978BroersenLangedijker Vroege Witte Baldura507940Roval SluisLibraLibra1007470707070	29	Holland Select	Jersey Wakefield	114	86	68	Sluis en Groot	Continental	50	75	
31Holland SelectLangedijker Bewaar818570BroersenHerfstdeen Snitkolos4432Holland SelectRoem van Enkhuizen97471BroersenAntiplof41533Holland SelectWinningstädter906872BroersenBlankora522934Holland SelectCouden Akker/Early Bird898073BroersenExpress/Spiko509335Royal SluisWinningstädter1009474BroersenEersteling409036Royal SluisBrunswijker1008375BroersenLangedijker Bewaar Harwin509037Royal SluisKopenhagener Markt Coverno1008476BroersenCustar509438Royal SluisDeense Kortpoot1008477BroersenLangedijker Vroege Witte Baldura507939Royal SluisLibraLibra1008978BroersenLangedijker Vroege Witte Baldura507940Boval SluisLibraLibra1007470707070	30	Holland Select	Grey Hound	104	97	69	Broersen	Sel. D. Coudsbloem	20 45		
32Holland SelectRoem van Enkhuizen97471BroersenAntiplof41533Holland SelectWinningstädter906572BroersenBlankora522934Holland SelectGouden Akker/Early Bird898073BroersenExpress/Spiko509335Royal SluisWinningstädter1009474BroersenEersteling409036Royal SluisBrunswijker1008375BroersenLangedijker Bewaar Harwin509037Royal SluisKopenhagener Markt Coverno1008476BroersenGustar509439Royal SluisDeense Kortpoot1008477BroersenLangedijker Vroege Witte Baldura507939Royal SluisGouden Akker1008978BroersenLangedijker Vroege Witte Baldura507940Boval SluisLibra100747070707070	31	Holland Select	Langedijker Bewaar	81	85	70	Broersen	Herfstdeen Snitkolos	47 44		
33Holland SelectWinningstädter906672BroersenBlankora522934Holland SelectCouden Akker/Early Bird898073BroersenExpress/Spiko509335Royal SluisWinningstädter1009474BroersenEersteling409036Royal SluisBrunswijker1008375BroersenLangedijker Bewaar Harwin509037Royal SluisKopenhagener Markt Coverno1008476BroersenGustar509438Royal SluisDeense Kortpoot1008477BroersenLangedijker Vroege Witte Baldura507939Royal SluisCouden Akker1008978BroersenHerfstdeen Winterkolos506240Boyal SluisLibra1007470505062	32	Holland Select	Roem van Enkhuizen	97	4	71	Broersen	Antiplof	415		
34Holland SelectGouden Akker/Early Bird898073BroersenExpress/Spiko509335Royal SluisWinningstädter1009474BroersenEersteling409036Royal SluisBrunswijker1008375BroersenLangedijker Bewaar Harwin509037Royal SluisKopenhagener Markt Coverno1008476BroersenGustar509438Royal SluisDeense Kortpoot1005477BroersenLangedijker Vroege Witte Baldura507939Royal SluisCouden Akker1008978BroersenHerfstdeen Winterkolos506240Boval SluisLibra1007470505062	33	Holland Select	Winningstädter	90	65	72	Broersen	Blackora	41J 50	20	
35Royal SluisWinningstädter1009474BroersenEersteling409036Royal SluisBrunswijker1008375BroersenLangedijker Bewaar Harwin509037Royal SluisKopenhagener Markt Coverno1008476BroersenGustar509438Royal SluisDeense Kortpoot1008477BroersenLangedijker Vroege Witte Baldura507939Royal SluisGouden Akker1008978BroersenHerfstdeen Winterkolos506240Boyal SluisLibra1007470505062	34	Holland Select	Gouden Akker/Early Bird	89	80	73	Broersen	Evpress/Spiko	50	27	
36Royal SluisBrunswijker1008375BroersenLangedijker Bewaar Harwin509037Royal SluisKopenhagener Markt Coverno1008476BroersenGustar509438Royal SluisDeense Kortpoot1006477BroersenLangedijker Vroege Witte Baldura507939Royal SluisCouden Akker1008978BroersenHerfstdeen Winterkolos506240Boval SluisLibra100747070707070	35	Royal Sluis	Winningstädter	100	94	74	Broersen	Fersteling	20 40	90	
37Royal SluisKopenhagener Markt Coverno1008476BroersenGustar509438Royal SluisDeense Kortpoot1006477BroersenLangedijker Vroege Witte Baldura507939Royal SluisCouden Akker1008978BroersenHerfstdeen Winterkolos506240Royal SluisLibra1007470505062	36	Royal Sluis	Brunswijker	100	83	75	Broersen	langediiker Bewaar Harwin	50	90	
38Royal SluisDeense Kortpoot1005477BroersenLangedijker Vroege Witte Baldura509439Royal SluisGouden Akker1008978BroersenHerfstdeen Winterkolos506240Royal SluisLibra10074705062	37	Royal Sluis	Kopenhagener Markt Coverno	100	84	76	Broersen	Gustar	50	9/	
39Royal SluisCouden Akker1008978BroersenHerfstdeen Winterkolos507940Boyal SluisLibra10074705062	38	Royal Sluis	Deense Kortpoot	100	54	77	Broersen	Langeditten Vreese Witte Paldura	50	79	
40 Roval Sluis libra $100 74 70 0$	39	Royal Sluis	Gouden Akker	100	89	78	Broersen	Langeuijker vroege witte Daluura Herfstdeen Wisterkolos	50	17	
The second secon	40	Royal Sluis	Libra	100	74	79	Broonson	herrstdeen winterkoros	0	02	

1:/1	

	White cabbages							91			
Column	1		2	3	4			White cabbages			
Acc.nr.	Donor name	Cultiva	ir name	weight grams	germ %	Column	1	2	3	4	_
80	Broersen	Langeditker Bewaa	ur Stark Winter	50	96	+	Donor name	Cultivar name	weight grams	germ %	,
81	Broersen	Gustar		200		Accente					ingenerati
82	Broarsen	Bandex		50	90	119	B. van Zoest-Hoorn	Tuindersselectie - Kamper	18	81	
92 83	DACY	Tuindersselectie		5	20	120	11	" - Van Vliet	12	98	
20		Crote Herfstdeen		35		121	11	" - Uvertoom	32	85	
04		Tuindersselectie	- Pronk	15	83	122	H H	" - Schipper	19	93	
00	B. Van Zoest-Hoorn	Tuindersselectie	- Veltman	27	03	123		" – Blom	20	66	
00 .	11	"		25	05	124	11	" – Mooy	13	94	
00			- Veltman		93	125	.11	" - Hoogenboom	28	87	
00	"		- Verdhan			126	"	" – Koopman	39	87	
07	11	11	- Dekker	21	07	127	11	" – Van Hout	12	81	
90			- Derkei	15	97	128	Rijk Zwaan	Express Fijne Vroege Witte Spitse	100		
91			- Kanten	10	75		-				
92			- Westmeyer		/5	×*	<i>Q</i>				
93	11		- Hoop	3	67						
94	11		- Karsten		5/						
95			- Karsten	4	89						
96			- Entes	6	82						
97			- lesselaar	12	86						
98	11		- Berkhout	12	95						
99		IV.	- De Groot	11	83						
100		19	- Blom	21	82						
101		11	- ?	21	95						
102		11	- Groen	24	95						
103		11	- Weel	17	58						
104	De Bolster	Filderkraut		6	83		5				
105	B.van Zoest-Hoorn	Tuindersselectie	- Bleker	14	80						
106		"	- Mooy	10	95						
107		11	- Van L a ngen	15	94						
108		"	- ?	17	91						
109		1	- Hoogenboom	13	96	4	£				
110		11	- Kaan	13	92						
111		1	- De Boer	6	83						
112	11	"	- Dekker	27	95						
113	11	11	- Neefjes	17	78						
114	11	1	- Van der Vliet	43	97						
115	11	••	- Van Langen	33	70						
116	1 . H	11	- Nannes	20	92						
117	11	н	- Noordstrand	30	87						
118	1	н	- Kaan	14	93						

22				17	60				
100		11	- Blom	21	82		,		
101	11	"	- ?	21	95	•)	
102	11	"	- Groen	24	95				
103	11	11	- Weel	17	58				
104	De Bolster	Filderkraut		6	83				
105	B.van Zoest-Hoorn	Tuindersselectie	- Bleker	14	80			5	
106	11		- Mooy	10	95				
107	"	11	- Van Langen	15	94				
108	11	11	- ?	17	91				
109			- Hoogenboom	13	96		£		
110	. н		- Kaan	13	92				
111	11		- De Boer	6	83				
112	"		- Dekker	27	95				
113	11	"	- Neefjes	17	78				
114	11		- Van der Vliet	43	97				
115	H	••	- Van Langen	33	70				
116	1. н		- Nannes	20	92				
117	l II	"	- Noordstrand	30	87				
118	n		- Kaan	14	93				
	1	1		1 1					

Red cabbages

Column	1	2	3	4	1		Red_cabbages_		
•			weight		Column	1	2	3	4
Acc.nr.	Donor name	Cultivar name	grams	germ %				weight	
1	Kees Broersen	Langedijker Bewaar Superstar	5	95	Acc.nr.	Donor name	Cultivar name	grams	germ %
2	Bejo	Langedijker Allervroegste St.Pancras	100	92	40	B. van Zoest-Hoorn	Tuindersselectie - Kaan	8	86
3	Bejo	Langedijker Vroege Norma	100	95	41	11	" - Van der Vliet	24	97
4	Bejo	Langedijker Herfst Volga	100	85	12	н. н. ¹	" – Dekker	23	86
5	Bejo	Bewaar 217	100	87	42	_ 11	" - Kaan	16	00
6	Bejo	Langedijker Bewaar Kwanta	100	96	4)	"	" - Stroper	. 21	97
7	Bejo	Bewaar 218	100	92	45	Fnza	ouroper	1	07
8	Bejo	Langedijker Bewaar Extase	100	97	45	Rijk Zwaan	Langeditker Vroege	100	
9	Bejo	Negerkop	100	68		Rijk Zwaan	Langedijker Bewaar	100	
10	Bejo	Allervroegste	10	98				100	
11	Bejo	Sel. van Essen	1						
12	Holland Select	Langedijker Herfst	103	85					
13	Holland Select	Langedijker Bewaar	101	60	1	(r			<i>i</i>
14	Holland Select	Negerkop	97	71					
15	Royal Sluis	Langedijker Herfst	100	96	-				
16	Royal Sluis	Langedijker Bewaar	100	96					
17	Royal Sluis	Negerkop	100	83					
18	Sluis en Groot	Langedijker Vroege Baby	100	98					
19	Sluis en Groot	Langedijker Bewaar Baby	100	79					
20	Sluis en Groot	Langedijker Bewaar	100	79	1				
21	Sluis en Groot	Negerkop	100	77					
22	Sluis en Groot	Utrechtse	50	97					
. 23	Broersen	Langedijker Vroege Meteoor	50	92					
24	Broersen	Langedijker Allervroegste Preka	50	92					
25	Broersen	Langedijker Herfst Roodsnit	50	93					
26	Broersen	Langedijker Bewaar Dorota	50	97					
27	Broersen	Langedijker Bewaar Gouden Oogst	50	87					
28	B. van Zoest-Hoorn	Tuindersselectie – Dekker	10	95					
29	11	" - Kuileboer	14	97					
30	11	" - Smit	12	93					
31		" - De Groot	10	82					
32	1t	" - Van Vliet	14	96					
33	11	" – Kamp e n	11	89					
34	11	" - Stoop	15	98					
35		"	18	92	2				
36		" - Hosch	8	8 2			· · ·		
37		" - Kos	15	84					
38		" - Blokker	15	96					
39		" – Van Langen	6	<u>8</u> 8					
	1	· ·	!						
	·						1	1 1	

94 Savoy cabbages

رج Savoy cabb

Column	1	2	3	4	Column	1	2	3	4
Acc.nr.	Donor name	Cultivar name	weight grams	germ %	Acc.nr.	Donor name	Cultivar name	weight grams	germ %
J	los Huizer	Zwiindrechtse Puties	10	80	40	Sluis en Groot	Des Vertus	100	96
2		Bredase Puties	10	80	41	Sluis en Groot	Noorweegse	50	85
2		Langedijker Vroege Cele	100	00	42	Broersen	Groenland	50	92
, 1	Beie	Langedijker Bewaar Cele Celha	100	00	43	Broersen	Winterkoning Wigro	50	82
5	Boto	Langedijker Bewaar Cele 11	100	75	44	Broersen	Lagedijker Gele Bewaar	31	
c c	Bete	Bloemendaalse Cele	100	13	45	Broersen	Zomerparel	50	81
0	Beie		100	00	46	Broersen	Langedijker Bewaar Gele Toppy	50	65
· ·	Be to		100	74	47	Broersen	Vroege Groene Spitse	50	67
0	Bein	Algro	100	07	48	Broersen	Langedijker Bewaar Gele Prodor	50	89
7	Bete	Novum	100	07	49	Broersen	Sowa	50	80
10	Bete	Novali	100	72	50	Broersen	Groenetto	50	81
11	Bejo		100	60	51	B. van Zoest-Hoorn	Tuindersselectie	9	
12	Bejo		100	09	52	11	" Van Balder	1	
15	Вејо	Westlandse Putjes Putta	100	88	53	çe	" Glas	17	
14	Вејо	Winter Koning WKK/Harda	100	92	54	Broersen	Gele Bewaar	17	
15	Вејо	Langedijker Hertst Gele	10		55	Rijk Zwaan	Vroege Groene Spitse	100	
16	Вејо	Mei Savoye	10						
1/	Bejo	Nr.526	10						
18	Bejo	Antwerpse Putjes	10						
19	Bejo	Brusselse Lage	10						
20	Bejo	Brusselse Winter	10						
21	Bejo	Mechelse Vroege Groene	10						
22	Bejo	Sel.Jac.Glas	2						
23	Bejo	Comeet	2						
24	Bejo	Geel Groene	2						
25	Royal Sluis	Zwijndrechtse Putjes	100	80		2			
26	Royal Sluis	IJzerkop	100	90					
27	Royal Sluis	Vertus	100	94					
28	Royal Sluis	Aubervilliers	100	95					
29	Royal Sluis	Hegro	100	90					
30	Royal Sluis	Winterkoning/Wiko	100	93	-	¢.			
31	Royal Sluis	Vorbote	100	92					
32	Royal Sluis	Lagro	100	82					
33	Royal Sluis	Langedijker Vroege Gele	36		-				
34	Royal Sluis	Westlandse Putjes	100	75					
35	Sluis en Groot	Vorbote Saxa	100	84					
36	Sluis en Groot	Eisenkopf	90	35					
37	Sluis en Groot	Late Putjes	100	45					
38	Sluis en G root	Ostara	100	35					
39	Sluis en Groot	Winterkoning	100	85					
	l		l.	1		1	I state in the second se	4 (

bages

20 Curly kale

Column	1	2	3	4
Acc.nr.	Donor name	Cultivar name	weight grams	germ %
1	los Huizer	Middelboge	10	66
1	Beto	Beto 1046	100	95
3	Beio	Westlandse Herfst Westo/Toga	100	96
<u>у</u>	Beio	Tras	100	74
5	Beio	Sel.Valent Westlandse	3	81
6	Holland Select	Westlandse Herfst	85	81
7	Holland Select	Lage Krul	82	56
8	Roval Sluis	Lage Fijn Gekrulde	100	94
9	Roval Sluis	Westlandse Winter	100	95
10	Roval Sluis	Westlandse Herfst Arbo	100	82
11	Royal Sluis	Walcheren Winter Middelhoog Fijn Ge- krulde	100	83
12	Van den Berg	Westlandse Winter	100	83
13	Nunhem	Halmar	100	72
14	Nunhem	Westlandse Winter	92	
15	Sluis en Groot	Lage Moskrul Mabor	100	90
16	Sluis en Groot	Westlandse Winter Wondergroen	100	32
17	Sluis en Groot	Westlandse Winter Verdura	100	47
18	Sluis en Groot	Frosty	100	45
19	Sluis en Groot	Bleu Siberian	50	100
20	Broersen	Westlandse Winter	500	90
- 21	IVT	Tuindersselectie Dammer	40	55
22	IVT	" Smit	31	89
23	IVT	" Grozema	21	83
24	IVT	" Waalkens	10	91
25	IVT	" De Vries	6	75
26	IVT	" Popkes	27	62
27	IVT	" Delger	129	95
28	IVT	" Ebeling	10/23	60/85
29	IVT	" Ronda	3	
30	IVT	" Mars	44	33
31	Enza	Westlandse Winter	100	91
32	IVT	Tuindersselectie Koning	24	
33	IVT	" Laan	5	
34	IVT	" Olders	17	
35	IVT	" Klungel	6	
36	Rijk Zwaan	Westlandse Herfst	100	

THE COLLECTION OF SEED OF ALL CRUCIFERS EXCEPT THE HORTICULTURAL COLE CROPS IN THE NETHERLANDS - CP3

Hille Toxopeus and Henk J. Lubberts SVP, P.O.Box 117, 6700 AA Wageningen

1.1. Common and scientific names Knolrapen: turnips - B.rapa L. stoppelknollen - stubble turnips consumptieraapjes - table turnips Raapstelen, bladmoes, snijmoes: turnip greens - B.rapa L. Raapzaad: turnip rape seed - B.rapa L. boterzaad, zomerraapzaad: summer turnip rape winterraapzaad: winter turnip rape Koolraap: rutabaga or swede-turnip-B.napus L. Koolzaad: oilseed rape - B.napus L. zomerkoolzaad: summer oilseed rape winterkoolzaad: winter oilseed rape Bladkool: fodderrape - B.napus L. Voederkool, mergkool: fodderkale, marrostemkale - B.oleracea L. Radijs: radish - R.sativus L. Rammenas: giant radish - R.sativus L. Bladrammenas: oilseed radish - R.sativus L. Gele mosterd: white mustard - Sinapis allea L.

1.2. Utilization and croprotations

Dutch farmers and seedmen have grown and bred a variety of cruciferous crops since the middle ages. Most of these crops are still grown today each represented by a number of varieties highly adapted to the existing ecological niches (Table 1, map). The turnips have been specialized into three groups according to their use and niche in the cropping system. Stoppelknollen or stoppelrapen translated as "stubble turnips" refer to a group of varieties of fodder turnips that are sown in the stubble of crops like rye or summer barley around the 10th of August. The crop is ready for harvesting as from the middle of October, plants are lifted and fed directly to dairy cattle.

A good field will yield some 50 tons of roots and foliage per ha with a dry matter content of about 10%. All varieties are resistant to heavy

night frost and the modern varieties have very high levels of resistance to clubroot.

Until the late 1940's an enormous variety of land- and farmers'-races existed. The tops of the root could be white, green, purple (various shades) or bronze; the flesh of the root could be white or vellow: the form of the root would vary from flat to tall and pointed and every shape between these extremes. The leaves may be whole or cut to various degrees, the colour and curlyness is also variable. The effective introduction of plant breeders'rights and the listing evaluation of recommended varieties reduced this (often messy) variability drastically. Fortunately at the responsible institute the RIVRO, the Government Institute for Variety Testing all seed samples submitted for evaluation were kept and stored. This collection contains a great deal, if not all of the genetic variation of the past. This collection was handed over to the SVP where the seeds were tested for viability as shown in Table 1. Part of this material is also available in good condition in the SVP cruciferae working collection. This explains the large number of accessions of stoppelknollen.

<u>Consumptierapen, knolrapen</u> or table turnip is a vegetable that is not anymore popular, whereas it was one of the main staple foods until well into the 18th century until the patato. In the Netherlands only a few varieties or landraces may be found, usually very early types that produce a small flat or round bulb guickly.

Raapstelen, bladmoes, snijmoes or turnip greens are a vegetable produced on turnips that are not allowed to bulb by growing the plants in a very close spacing.

Often varieties of stubble turnips are used to produce raapstelen but some special varieties exist.

Oilseed rapes

<u>Raapzaad</u>, <u>Boterzaad</u> or summer turnips oilseedrape is an obscure crop that in the past was sometimes grown for green manure or as annual oilseed crop that could still be sown in early summer in case the winter oilseed rapa crop had failed. There is a report that the crop is used for bee production in certain periods of the year, one or a few landraces still exist.

<u>Koolzaad</u> or oilseed rape is a crop that used to be grown extensively for the production of lamp-oil in pre-electricity and pre-kerosine days. There is one landrace still in existence.

Others

<u>Bladkool</u> or rapakale is a foddercrop of limited importance mainly grown in the province of Limburg. This too is a stubble crop sown in the same niche as stubble turnips. The crop does not bulb, it produces a (vegetative) stem carrying the leaves: as from the middle of October it can be mown and is fed fresh to dairy cattle. Some varieties are resistant to heavy night frost, some are very susceptible. Only a few varieties exist and apparently one landrace. <u>Koolraap</u> or rutabaga or swede-turnip, like the turnip was an important staple foodcrop before the advent of the potato. Like the turnip it was also used as a foddercrop in the same niche but this crop had to be transplanted in the stubble because of the relatively slow seedling growth after sowing. Rutabaga seedlings were also used to gap up fodderbeetfields.

At present rutabaga is only grown for its large root which is used as a vegetable. Apparently a considerable amount of variation had developed although not nearly as much as in the turnip. <u>Voederkool</u>, <u>mergkool</u> or dodderkale, marrowstemkale was grown to a limited extend as a foddercrop in those places where stubble turnips could not be grown such as heavy soils. Some of the fodderkales have curly leaves. The marrowstemkales have a thick succulent stem. These crops require a whole growth season to produce useful plants. No varieties exist but there are quite a number of accessions in the RIVRO collection.

<u>Radijs</u>, <u>Ramenas</u>, or radish and giant radish have always been more or less popular, particularly in the past because of the supposed midicinal qualities of the roots. Most of the genetic variation probably still exists in the rather large number of varieties available. <u>Gele mosterd</u> or white mustard is grown only in home gardens for home made mustard of for greenmanure purposes; seed is available.

1.3. Main problems of cultivation

Most of the crops mentioned in this report are grown on a small scale only if indeed at all. Summer- and winterturnip rape have not been grown in the Netherlands since world war II, the same applies to fodderkale and marrowstemkale. It so happened that a few seed samples happened to be available at the RIVRO.

Horticultural crops such as the radishes, table turnips, turnip greens, rutabaga are grown on a small scale and the first three crops only for a very short period of 6-8 weeks in spring. This probably explains why there are not any particular problems of cultivation. The crops are known to be susceptible to the range of cruciferous pests and diseases. From the agricultural crops the stubble turnips, fodderrape and winteroilseedrape are grown on an area of about 10.000 ha each. The problems of the foddercrops are clubroot and damage due the night frost in the months of October and November. Varieties of both crops have very good levels of frost resistance. As to clubroot, many turnip varieties are highly resistant to clubroot, the fodderrape varieties not at all. However, because of the small area of cultivation the problem does not usually manifest itself forcefully anymore.

1.4. Localities, acreages and economic value

The stubbleturnip and fodderrape are grown on light sandy soils in the SE and East, together about on 10.000 ha. Winteroilseedrape is grown large scale on new poldergrounds: 6000 ha annually and about an equal area in the NE in the very heavy 'blue' sea clay of Groningen. The vegetables are grown on a small scale only, less than 100 ha each. The production is mainly in the Westland between the Hague and Rotterdam and in the province Noord Holland.

The economic significance of the crops is small.

2. Today all crops are represented by modern OP varieties derived from landraces not lang ago. Some of the stubbleturnip varieties are tetraploid. Many of the turnip accessions collected are landraces, this is because of the existing collections of the RIVRO and the SVP.

3. The collecting strategy was based entirely on breeding firms of cruciferous crops, a list of which is in table 2. A circular letter explaining the issue was sent round initially, this was followed by personal visits to the relevant breeder. Occasionally supported by a telephone call later on seed samples would be sent subsequently. Mostly seed samples of just the existing varieties were received and occasionally obsolete varieties or landraces. The location of the breeding firms is shown in the map.

As has been explained above, the RIVRO handed over their collection of duplicate seed samples up to 1973.

4. We believe that the genetic variation existant in the Netherlands of the crops in question has been collected. Note: A start was made with the multiplication of the oldest part of the RIVRO samples also in the context of the project.

Table 1. List of breeding firms and seedsmen to be visited in CP3

1. Barenbrug Holland B.V.

2. Bejo Zaden

3. Cebeco-Handelsraad

4. Van Engelen Zaden B.V.

5. Enza Zaden

6. Geertsema Groningen B.V.

7. Selectiebedrijf J. Groenbroek

8. Kweekbedrijf D.J. van der Have B.V.

9. J. Joordens Zaadhandel B.V.

10. Fa. Luidenburg B.V.

11. Dr. R.J. Mansholt's Veredelingsbedrijf B.V.

12. Mommersteeg Int. B.V.

13. Nunhem's Zaden

- 14. Royal Sluis
- 15. Sluis en Groot
- 16. Landbouwbureau Wiersum
- 17. B.V. Kweekbedrijf Zelder

18. Zwaan en de Wiljes B.V.

Noord-Scharwoude Lelystad Vlijmen Enkhuizen Groningen Scheemda Rilland-Bath Kessel (LB) Warfhuizen (Gr.) Ulrum Vlijmen Haelen Enkhuizen Enkhuizen Dronten **Ottersum** Scheemda

Wolfheze





Samples from seed companies

Crop	Cultivar name	Seed company	Amount	Germination	Year of harvest
(oilseed radish)	Siletina	Van der Have	500 gr		
n n	Levana	Van der Have	500 gr		
Radish	Scarlatino	Holland-Select	100 gr	<u>+</u> 60%	1975
11	French Breakfast	Holland-Select	100 gr	<u>+</u> 80%	1975
	Klein witpunt broei	Holland-Select	100 gr	<u>+</u> 40%	1975
"	Minitas	Nunhems Zaden	100 gr	97/99	1979
ni ni	Novitas	Nunhems Zaden	100 gr	86/91	1975
	Robijn	Nunhems Zaden	100 gr	50/73	1976
"	Scharo, ronde rode	Enza Zaden	<u>+</u> 100 gr		
11	Klein witpunt broei	Van den Berg	100 gr	83%	1977
11	Piggelmee	Van den Berg	100 gr	66%	1977
н	Halfl.witpunt broei	Van den Berg	100 gr	97%	1974
"	Halfl.witpunt broei	Van den Berg	100 gr	64%	1969
"	Americano	Van den Berg	100 gr	87%	1980
"	Pastel herfstteelt	Van den Berg	100 gr	98%	1976
11	Pois d'Horloge	Van den Berg	100 gr	78%	1977
11	Roodkapje	Van den Berg	100 gr	77%	1966
11	Violette de Gournay	Royal Sluis	100 gr	90%	1977
н	Lange zwarte winter	Royal Sluis	100 gr	98%	1979
11	Halflange witter zomer	Royal Sluis	100 gr	98%	1978
11	Ronde zwarte winter	Royal Sluis	100 gr	93%	1977
11	Ronde witte	Royal Sluis	100 gr	99%	1978
	Halflange rode klein witpunt	Royal Sluis	100 gr	89%	1981
"	IJskegel	Royal Sluis	100 gr	99%	1979
н	Ronde rode broei en vollegronds, novired	Royal Sluis	100 gr	90%	1981

Samples from seed companies

Crop	Cultivar name	Seed company	Amount	Germination	Year of harvest
Radish	18 Daagse	Royal Sluis	100 gr	98%	1978
"	Riesen von Aspern	Royal Sluis	100 gr	91%	1981
11	Ronde rode vollegrond Flevo	Royal Sluis	100 gr	90%	1981
"	French Breakfast	Royal Sluis	100 gr	97%	1978
11	Gaudry	Royal Sluis	100 gr	98%	1978
11	Halfrood halfwit	Royal Sluis	100 gr	99%	1978
Fodderrape	Akela	Joordens	500 gr		
tt	Blako	Joordens	500 gr		
	O.W.	Joordens	86 gr		
	0.0.	Joordens	100 gr		
**	H.S.	Joordens	96 gr		
11 Alexandre	Zls	Joordens	80 gr		
**	Vrl	Joordens	82 gr		
11	SjG	Joordens	88 gr		
**	ВРТ	Joordens	75 gr		
	ZS	Joordens	53 gr		
**	Viva	Zwaan en de Wiljes	1000 gr		
- 11	Velox	Zelder	100 gr		a
**	Lonto	Zelder	100 gr		1978
11	Mara	Zelder	100 gr		1980
**	Windal	Zelder	100 gr		
11	Rampal	Zelder	100 gr		1980
11	Ramon	Zelder	100 gr		1978
11	Emerald	Van der Have	500 gr		
11	Lair basisz.	Van der Have	500 gr		

Samples from seed companies

Crop	Cultivar name	Seed company	Amount	Germination	Year of harvest
Winterrape	Yet Neuf	Wiersum	500 gr		1981
11	Orma	Wiersum	500 gr		1977
	Rafal	Wiersum	500 gr		1981
"	Marcus	Wiersum	500 gr		1979
Fodderturnip	Jobandi	Joordens	425 gr		
"	Jobe	Joordens	476 gr		
"	Samson	Joordens	377 gr		
"	Stramproy	Joordens	029 gr		1965
	Oliekammetjes	Joordens	130 gr		1965
"	Novitas	Cebeco	113 gr		1962
"	Andijvieblad	Cebeco	115 gr		1973
"	Deelblad	Cebeco	121 gr		1973
	Andijvieblad	Cebeco	113 gr		1973
"	Andijvieblad	Cebeco	137 gr		1973
"	Andijvieblad	Cebeco	118 gr		1973
"	Deelblad	Cebeco	134 gr		1973
"	Vabra	Mommersteeg	100 gr	98%	1978
"	Debra	Mommersteeg	100 gr	94%	1978
1 - II	Polybra	Mommersteeg	100 gr	98%	1978
"	Gelria R	Sluis & Groot	100 gr	' 80=94%	1979
"	Cyclon	Sluis & Groot	100 gr	90%	1978
11 .	Tigra	Sluis & Groot	100 gr	95%	1978
11	Tyfon	Sluis & Groot	100 gr	91%	1980

Samples from seed companies

Crop	Cultivar name	Seed company	Amount	Germination	Year of harvest
Fodderturnip	Frisia	Sluis & Groot	100 gr	90%	1980
II.	Ronde witte herfst roodkop	Royal Sluis	100 gr	99%	1978
"	Ronde witte roodkop	Royal Sluis	100 gr	95%	1980
	Platte witte mei	Royal Sluis	100 gr	99%	1980
"	Brasto	Cebeca	1430 gr		1968
	Vesto	Cebeco	775 gr		1968
"	Nobitter R	Van der Have	500 gr		1968
	Milaanse	Van den Berg	100 gr	98%	
	Platte witte groenkop	Van den Berg	100 gr	98%	
	Siloga	Zelder	100 gr		1977
	Marco	Zelder	ll6 gr		1981
п	Civasto	Zelder	lll gr		1977
"	Goldvital	Zelder	102 gr	96%	1980
n	Vollenda	Zelder	100 gr	92%	1980
	Goldrubin 2x	Zelder	100 gr		1980
	Grandessa	Zelder	100 gr		1979
TI	Goldrubin 4x	Zelder	100 gr		1980
H .	Siloganova	Zelder	109 gr		1979
11	Ponda	Zelder	105 gr		1980
11	Cultura	Zelder	102 gr		1981
"	Mosa	Zelder	100 gr		1980
**	Salusia 4x	Zelder	100 gr		1979
11	Taronda	Zelder	105 gr		1980

Crop	Cultivar name	Seed company	Amount	Germination	Year of harvest
Fodderturnip	Vedette	Zwaan en de Wiljes	1000 gr		1982
Ξ	Novax	Zwaan en de Wiljes	1000 gr		1982
=	Trofee	Zwaan en de Wiljes	1000 gr		1982
E	Promota	Zwaan en de Wiljes	200 gr		1982
E	Primax	Zwaan en de Wiljes	1000 gr		
Ξ	Sinax	Zwaan en de Wiljes	500 gr		
Vegetableturnip	Goudbal	Royal Sluis	100 gr	97%	1980
=	Vertus Marteau	Royal Sluis	100 gr	98%	1978
Turnipgreen	Geslu.(Namenia,nipposinica)	Royal Sluis	100 gr	96%	1980
=	Blauwe Groninger	Royal Sluis	100 gr	97%	1960
-	Groene Groninger	Royal Sluis	100 gr	806	1979
Rutabage	Hollandse Gele Roodkop	Royal Sluis	100 gr	98%	1980
Samples from the	è RIVRO	£			

1 Ś Т

Samples from seed companies

108

1			109
	Samples * fro	om the RIV	/R0 **
			and the second
	* since mos	t of the	samples are very old,
	to be ver	y poor.	
	** the Gover	nmernt In	stitute for Research
	Stoppelknolle	n 26	
	0700		Cultivar name
	erop	code	Cultivar name
		series	1954 (samples received
	fodderturnip	003	Hollandia halflange
	11	005	Halflange blauwkop
1	11	012	Halflange blauwkop
	ų.	014	Halflange ronde blau
	"	018	Wago
	11	030	Halflange stompe wit
	11	024(804) Lucratief
	11	034	Halflange stompe wit
		045	Baltico
		050	Halflange roodkop "M
,		051	Sceempter halflange
		053	Red Top Tankard (Ost
		111	Niimeegse lange witt
		112	Voorrangsstoppelknol
		113	Halflange witte blau
		114	Wiko
		207	Ronde witte roodkon
	· • • • • • • • • • • • • • • • • • • •	230	Ronde witte roodkop
	11	257	Ronde witte groonken
	11	240	Conte mande witte
	11	260	Grote ronde witte gr
	"	201	
	"	400	Ronde witte groenkop
	11	409	Ronde gele herfst
		414	Ronde gele herfst
	11	415	Goudbal
	11	511	Platte gele herfst
	"	661	Lange witte groenkop
	"	706	Bortfelder sel. Z.Z.

819

...

Soester knol

80T

100

d, the germinative power is expected

on Varieties of Cultivated Plants.

ved by RIVRO, from breeders, in 1954) ge blauwkop stomppuntige "Bonga"

lauwkop

witte roodkop

witte blauwkop Perozo "Standaard" ø

"Maes"

```
ge stompe blauwkop heelblad
)stersundom)
tte
ol
auwkop
```

p "Bonga"

ор

groenkop Geslu sel.

р

110

Stoppelknoppen 26

Stoppelknoppe	<u>n 26</u>		Stoppelknolle	en 26	
crop	RIVR0 code	Cultivar name	crop	RIVR0 code	Cultivar name
	series	1958		series	1960
fodderturnip	002	Halflange witte roodkop	fodderturnip	859	Hardy Green Top
11	009	Jumbo		860	Disease Resisti
11	026	Gelderse halflange witte roodkop		861	Disease Resistin
11	031	Gebo halflange witte roodkop		series	1961
	039	Halflange witte roodkop	fodderturnin	054	Civasto
	641	Avis (halflange witte blauwkop stompp.)		070	Halflange Celd
	044	Halwi (halflange witte paarskop)	"	252	Bonde witte groe
	076	Halflange witte blauwkop	"	407	Ronde goudgele k
	224	Globe ronde witte roodkop	α Π	412	Crema
	253	Ronde witte herfst	"	501	Goldi
			"	612	Lnage witte rood
	series	1959	T	659	Verdal
fodderturnip	077	L.M. 48	n	660	Corna
	216	Ronde witte roodkop	"		002,10
	234	Ronde witte roodkop		series	1962
11	265	Grote ronde witte	fodderturnip	037	Herfstkoning
	816	BB Gedeeldbladige 464		055	Nobitter
	849	Stoppelknol VI		115	Saskia
	856	Saelhuysener		121	Maschinella
				222	Grote ronde witt
	series	1960		259	Grote ronde witt
fodderturnip	063	Tetraploide halflange blauwkop CB		267	Voska
	064	Tetraploïde halflange breedblad CB		508	Ronde gele groen
	068	Halflange stompe Perozo Robur		613	Lange witte rood
11	215	Mommersteegs ronde witte roodkop	11	614	Waaslander
11	216	Ronde witte roodkop	TT -	704	Bortfelder lange
ħ	510	Vispla verbeterde platte gele	The second se	864	No. 29-48 (knolv.
"	604	Lange witte roodkop			
n	610	Lange witte roodkop		series 1	1963
11	611	Lankro	fodderturnip	083	Gebr. Sluis no. 1
	653	Lange witte groepkop		155	Orion anditviebla
11	706	Bortfelder sel. Z.Z.	"	225	ronde witte rood
11	858	ronde witte roodkop Smith's Strain	"	262	Ronde witte herfs

Yellow ng Green Top Yellow ng Pur<u>p</u>le Top

blauwkop gedeeldbl. Dépé enkop herfst

dkop

te roodkop e groepkop

kop Geslu sel. kop Dépé

gele resist. halfl. witte groenk.)

1206 ad kop herfst st

Stoppelknollen 26

Stoppeiknoiler			Stoppelknolle	n 26	
crop	RIVRO code	Cultivar name	crop	RIVR0 code	Cultivar name
	series	1963		series	1967
fodderturnip	266	Meetjeslander	fodderturnin	261	Ronde grote witte g
11	067	Halflange gele groenkop	· · · · · · · · · · · · · · · · · · ·	609	Lange witte roodkop
			1	870	No. 29-65
	series	1964	1		
fodderturnip	008	Halflange blauwkop C.B.		series	1968
	232	Vega ronde witte roodkop	fodderturnip	013	Vesto
	413	Wilhelmsburger sel. Z.Z.		019	Halflange roodkop K
	702	Bortfelder lange gele Geslu sel.		056	Gelria A
	864	No. 29-48		075	Slusia halflange bl
11	868	Cebeco GB 1		082	No. 464
11	869	Cebeco HB 2	"	088	Hobe knolvoetresist
				091	S.V.P. II
	series	1965		151	Orion halflange gel
fodderturnip	007	Siloroem		152	Massala
	038	Veko gedeeldblad		154	Pendant
	085	Veko andijvieblad knolvoetresistent	" · · ·	156	Orion andijvieblad
	119	Wegro andijvieblad		226	Ronde grote witte r
	607	Lange witte roodkop		263	C.I.V. R.L.
	701	Bortfelder lange gele	· · · · · · · · · · · · · · · · · · ·	608	Lange witte roodkop
11	870	No. 29-65	"	615	0chsenhörner
	871	NLV		655	Lange witte groenko
•••••••••••••••••••••••••••••••••••••••				656	Lange witte groenko
	series	3 1966			
fodderturnip	223	Grote ronde witte roodkop Geslu sel.		series	1969
	231	Bicolor	fodderturnip	046	Favoriet
	235	Globemaster heelbladig		086	Bodo
II.	657	Lange witte groenkop		087	Senator
	series	s 1967		series	1970
fodderturnip	049	Anco	fodderturnip	047	Zwawi
11	080	No. 1105		060	Barcoupé
	116	Nijmeegse	п	081	Brasto
"	203	Ronde witte roodkop	IJ	094	HS 1
tr	213	Ronde witte roodkop K.V.			

roenkop

.ν.

auwkop heelbladig

ent

Le groenkop Geslu sel.

ş'

oodkop

pp

op Geslu sel.

Stoppelknollen 26

11

Stoppelknolle	n 26		Koolraap 24		
crop	RIVR0 code	Cultivar name	crop	RIVR0 code	Cultivar name
	series	1970		series	1954
fodderturnip	096	ZW 29-67	rutabaga	026	Grote Gele Engels
	117	Wegro		027	Grote Gele Engels
	118	Armada		028	Oud Goud
"	123	Rekord		166	Bangholm
	876	Goudbal		232	Superlative
"				315	Grote Gele Friese
	series	1971		318	Friko
fodderturnip	029	Siloga		319	Friese Gele paars
	052	Brabo		320	Friese paarskop g
11	069	Gelbla		463	Wilhelmsburger ge
. 11	877	Ronde witte roodkop herfst		464	Wilhelmsburger ge
"				465	Grote gele groenk
	series	1972	"	466	Wilhelmsburger
fodderturnin	072	Veko andijvieblad	"	467	Gewone gele
	122	Leielander	"	469	Wilmo
11	881	Weseler		470	Wilhelmsburger
17			· · · · · · · · · · · · · · · · · · ·	472	Wilhelmsburger
2 .	series	1974	" 	473	Gruno
fodderturnin	074	Novitas		514	Grote Witte roodk
rouder carnip	098	Toria	"	516	Westerwälder (gro
"	099	Laubo	"	517	Gewone witte aroe
II	077		"	518	Gewone witte groe
	corioc	1975	11	519	Ronde witte roodk
foddontunnin	000	Lahra		520	Witte Hoffmann's
rouder curnip	103	Cabaco St 4	TT	610	Aubiany witte roo
N. 11 - 1	100		"	660	Aubiany witte aro
Koolman 24			. "	661	Aubigny halfl wi
Koolraap 24			na da anti-	662	Aubigny witte aro
	series	1954	The second se	711	Pommerse Kannen
rutabaga	010	Engelse blauwkop	11 11	714	Ostmärkische sel
n	013	Batavo	п	1	SCOULDENT DOUG SCI.
"	016	Roodkop			
11	020	Gele Engelse roodkop			
	024	Gele Engelse roodkop Geslu sel.			

se roodkop A.V.

se roodkop

paarskop

skop grote gele Geslu sel. ele groenkop ele groenkop kop Geslu sel.

kop Geslu sel. ote witte roodkop) enkop enkop kop reuzen sel. Z.Z. odkop benkop itte groene Geslu sel. enkop

Ζ.Ζ.

Koolraap 24

Koollddp 24			Raapzaad 27		
crop	RIVRO code	Cultivar name	crop	RIVR0 code	Cultivar name
	series	1955		serie	1956
rutabaga	801	Koolrapen C.I.V.	springturnin	501103	
11	802	Borns Friese koolraap	rape	801	Boterzaad landras
11	511	Grote witte groenkop		ceries	1959
11	018	Grote gele Engelse roodkop	white mustard	001	Mansholtsgele
"	- 029	Z & d W's Elite Engelse roodkop	initio indoudru	802	Hollands gele moste
"	227	Best of All	11 11	803	Montaner orientaler
"	302	Wassenaar's Friese	11 11	804	Deensgele mostand
11	401	Gele reuzen Z.W.	17 11	004	beensgere mosteru
15	411	Hoffmann's bronskop Geslu sel.		series	1962
	412	Hoffmann's gele reuzen bronskop	white mustard	801	Candeesgele mosterd
11	414	Hoffmann's gele reuzen sel. Z.Z.	black mustard	805	Brassica nigra 231/
11	415	Gele Hoffmann's reuzen	white mustand	907	Cicilha
"	416	Hoffmann's gele bronskop	while mustaru	806	GISIIDA
15	451	Wilhelmsburger Otofte X en E	indian mustard	807	Primus (Brassica ju
11	460	Wilhelmsburger Otofte X en E	Ramenas 30		
**	462	Grote gele groenkop	· · · · · · · · · · · · · · · · · · ·	•	1040
11	510	Grote witte roodk. Westerwälder	nadiah	series	1960
	612	Limbra	rautsn	201	Halflange chinese ro
				series	1974
	series	1964	oilseed radish	206	Virgina (tetrapl.)
rutabaga	301	Born's Friese gele	11 11	207	Palet (tetrapl.)
				series	1977
Koolzaad 25			fodderradish	209	Neris (met knol)
	series	1955	Mergkool 28		
rape	802	Koolzaad CB		corios	105/
	series	1956	marrow stemkal		Hollandia groopo
н .	801	Koolzaad CB	indrion Stollingi	015	
	series	1964		026	Merckool groene
	502	Komet	11 H	020	Witto groathladigo
	series	1965	11 H	025	
11	501	Liho	. " "	037	Blauwo
			11 11	040	Menakool modo Cool.
			11 H	042	Mongkool NEW
			11 11	U=12	METYKOOT NEM

117

lands gele mosterd

taner orientaler mosterdzaad

ssica nigra 231/55

nus (Brassica juncea)

flange chinese rode ramenas

ngelen groene mergstamkool

cool rode Geslu sel.

Mergkool 28

crop	RIVR0 code	Cultivar name
	series	1955
marrow stemkal	e 212	Grove Boerekool
11 11	213	Westerwoldse grove
11 11	113	Duizendkoppige kool
	series	1956
marrow stemkal	e 805	Duizendkoppige kool
fodderrape ?	807	Mosa voederkool
	series	1962
marrow stemkal	e 003	Witte mergkool ZW
11 11	012	Hoge groene
fodderrape	809	Giant Rape seed (Bladkool?)
	series	1963
marrow stemkal	e 011	Groene witte
	series	1964
fodderrape ?	805	Voederkoolzaad 56-609 (Bladkool?)
	series	1966
marrow stemkal	e 022	Groene witte
fodderrape	803	Bladkool landras (Bladkool!)
	series	1968
fodderrape	806	Bladkool Limburgs landras (Bladkool!)
	series	1970
marrow stemkal	e 043	Littmann's Grüner Markstammkohl
11 11	044	Littmann's Blattstammkohl
	series	1972
marrow stemkal	e 001	Goliath
	002	Markanta groene
11 11	031	Giant Marrow Geslu sel.
0 0	033	Witte
11 11	045	Grüner Angeliter

E.C. COLLECTION PROGRAMME 6 - IRELAND - CP 6

FINAL REPORT

Collection of land races of all crucifers in the Republic of Ireland

R.F. Murphy Kinsealy Research Centre, Dublin 5

INTRODUCTION

Ireland situated on the Atlantic coast with its relatively mild winters and long cool growing season has an excellent climate for growing all brassica crops. Growth continues well into the winter months and in many cases brassicas are put in as a second crop late in the year for additional winter forage. Although some breeding has taken place in Ireland most brassica cultivars are imported. Some growers have found it indeed advantageous to select their own land races and have been doing this for some years now. Many wild brassica relatives cross freely and these populations are to be found abundantly in many areas particularly near the coast line.

The country is small, approximately 600 km long x 300 km wide and has significant climatic variations with the southern part having 2-3 weeks advantage in growth compared with the midlands. Similarly, large differences in rainfall occur with areas in the West having over twice that of the east (62 cm). Overall, however, the Gulf Stream's influence keeps the island relatively cool in the summer and mild in the winter.

Ireland has a very strong agricultural base with over 20% people still involved in agriculture. The main industry revolves around cattle and sheep. Brassicas, particularly swedes, turnip and kale grown for forage. It is within these crops that most of the landraces exist. In addition, important areages of horticultural crops for human use including cabbages, cauliflowers and Brussel sprouts are also grown and some local land races of these are also available. Genetic erosion has recently and is continuing

April 1984

with many of the local land races. The reasons are mainly due to commercial introduction of hybrids and the fact that when cultivars were withdrawn from commercial practice growers discarded their own selections of these as well. This has happened with swedes, cabbage and Brussel sprouts in particular.

1. CRUCIFEROUS CROPS IN IRELAND

1.1. Common and scientific pseudonyms

Oilseed rape	Brassica napus var oleifera
Turnip	Brassica rapa
Swede	Brassica napus var napobrassica
Kale	Brassica oleracea
Fodder rape	Brassica napus
Cabbage	Brassica oleracea var capitata
Cauliflower	Brassica oleracea var botrytis
Green broccoli	Brassica oleracea var Italica
Brussels sprouts	Brassica oleracea var gemmifera
Purple headed broccoli	Brassica oleracea var Italica

1.2. Utilisation

Agricultural crops

All the stubble turnip are grown for forage, while swedes are grown both for forage and human consumptions as well. They are harvested from August to April. Roots and leaves are used for forage while only the roots are used in human consumption. With fodder, rape kale both stems and leaves are consumed for autumn and early winter harvesting. More recently oilseed rape has become very important and is grown entirely for processing for its oil content.

Horticultural crops

A much smaller acreage of these brassicas is grown. Cabbage is the ost important and is grown mainly for human consumption all the year round.

In the west of Ireland cabbage is also grown for cattle feed and many land races are grown specifically for this purpose, where the whole head is consumed. In contrast certain other land races of cabbage are specifically grown for human consumption for summer to autumn period in the South of the country and are harvested as for spring greens taking the lower leaves when large enough and are cropped over many months. Cauliflower is produced all the year round mainly for the fresh market but some also for freezing. Green broccoli is produced from June to November and both centre heads and side shoots are utilised. Brussels sprouts are harvested from August to March and are grown mainly for the fresh market but also frozen for the processing trade.

1.3. Cultural practices and crop rotation

Agricultural crops

Produced over the entire country mainly in mixed tillage/livestock enterprise systems. Oilseed rape usually sown after a cereal crop, overwintered and harvested during the following late summer or early autumn. Swedes and turnips are sown during April to June period and kale and rape are often drilled in after an early crop of potatoes or peas in July/August period. The main rotations used are grass/cereals/ cereals/root crops/cereals. Borated compounds are normally used for swedes and turnip as boron deficiency is common.

Horticultural crops

Produced mainly by specialised growers in relatively small holdings of about 20-100 ha. Rotation is similar to that of the agricultural crops. Both direct seeding and transplanting is carried out. Without exception the larger growers go for direct seeding and these are nearly all precision sown. Hybrids are grown whereever possible especially in the case of Brussels sprouts and cabbages and green broccoli. Boron is recommend and often incorporated with the fertilizer at sowing time.

1.4. Main problems of cultivation

For both agricultural and horticultural crops the main disease problems are clubroot (<u>Plasmodiophora brassicae</u>)- especially in areas low in calcium; ringspot (<u>Mycosphaerella brassicicola</u>) which is very prevalent in overwintered crops of cabbage, Brussels sprouts and cauliflower; downy mildew (<u>Peronospera parasitica</u>) which attacks many crops both in the seedbed and also later cropping stages; Powdery mildew (<u>Erysiphe</u> <u>cruciferarum</u>) mainly attacks swedes and turnip in dry seasons; light leaf spot (<u>Pyrenopeziza brassicae</u>) which invariably attacks some brassicas like sprouts and finally dark leaf spot (<u>Alternaria spp</u>.) which is on the increase because of the expanding acreage of oil seed rape being grown. The main pest is cabbage root fly followed by aphids, flea beetles and caterpillar.

1.5. Localities and acreage

An estimate of acreages and localities together with the value of these crops are shown in Tabel 1 below.

Table 1: Acreage and value of crucifer crops grown in Ireland 1982.

Crop		Acreage (ha)	Value IR £	Location
Agricultural	crops			
Oilseed rape		5,000	3,000	Cultivation widespread
Swedes and st	tubble turnips	14,000	7,000	Cultivation widespread
Kales and fie	eld cabbage	4,000	2,000	Cultivation widespread
Horticultura	crops			
Swede		800	2,335	Cultivation widespread
Cabbage		1,700	4,597	Cultivation widespread near areas of towns and cities
Cauliflower	Summer/autump	600		Southern and sea-side
cuultitower	Winter	330	852	areas
Brussels Spro	outs	400	1,080	Near areas of towns and cities
Green Broccol	li	30	140	Near areas of towns and cities
Total		26,860	21,005	

Agricultural crucifers

Oilseed rape has only recently (in the last 10 years) been cultivated in Ireland and is grown exclusively for the oil content of its seeds. Turnips have a long tradition of growing and are cultivated all over the country as are the kales. It is common to sow the forage kales as late as July or August for green manure or winter cropping, particularly in the southern areas of the country which have higher growing winter temperatures.

Horticultural crucifers

In general the largest acreages are located not far from the larger cities and areas of population. For cabbages and Brussels sprouts heavier soil types are used as these are more moisture retentive. Medium heavy soils are used for autumn production of cailiflower also, but for winter production lighter and particularly free draining soils are used which are located in frost free sheltered areas near to coasts and in the milder southern parts of the country. Drills are always used for winter production to aid drainage in the rooting zone.

2. VARIETAL SITUATION OF CRUCIFEROUS CROPS IN IRELAND

The varietal situation has undergone great changes within the last decade. The introduction of hybrids, plant breeders rights and national seed lists have all been responsible for genetic erosion and many land races have now disappeared. This is particularly so with the horticultural crops where very few land races exist. In fact, since the author started collecting these in 1982 approximately 40% of the growers have now discontinued the practice of saving and selecting their own seed. Indeed collection was already too late for many crops, particularly, Brussels sprouts in the Rush area - an important traditional growing area near Dublin.

In the west of Ireland there was still an old tradition of saving and collecting cabbage seed. These were mainly used for cattle forage and commonly known as 'flat Dutch'. Some of these selections go back at least 100 years or more. Unfortunately genetic erosion is also threatening these land races but many accessions were collected. In contrast to other similar Dutch cabbage these particular land races could be sown in late summer, overwintered and planted the following April without any risk of bolting. Grown in or near the western coast-

- 124 -

line with high rainfall the growers had an ideal opportunity to select for resistance to ringspot as no chemical control measures were ever used for controlling this disease. This also applies to cabbage root fly as well.

In the southern areas, land races of cabbage for human consumption were found - known locally as 'Cut and Come'. In this case the plants were multistemmed and could be harvested over a long period - as for spring greens. These genotypes resembled 'wallflowers rather than cabbages' at first glance. These land races have been successfully collected. Table 2 gives an appraisal of the present situations on a percent basis for brassicas grown for horticultural purposes and in Table 3 those grown for agricultural uses.

Table 2: Percentage appraisal of horticultural and agricultural crops in Ireland

Crop	Land races	Commercial 0.P. varieties	F hybrids
Cauliflower			
Winter	1.5	95.5	3
Summer	0	100	0
Autumn	0	99	1
Cabbage			
Summer	0	40	60
Autumn	2	18	80
Winter	3	0	97
Spring	3	97	0
Brussels sprou	its 0	4	96
Green broccoli	0	0	100
Swedes	0	100	0

Table 3: Percentage appraisal of agricultural crops in Ireland

	Land races	Commercial 0.P. varieties	F _l hybrids
Swedes and stubble turnip	0	100	0
Kales	0	40	60
Oilseed rape	0	100	0

3. REGIONAL WORKING AND/OR GENE BANK COLLECTIONS

This has been the first major collection carried out in Ireland for all cultivated brassica crops, except for swedes of which the Dept. of Agriculture made some collections for breeding purposes. These lines have been collected and are now in the gene bank.

No-one in Ireland is presently doing any regional selection or breeding work on any brassica crop.

4. COLLECTING STRATEGY

The main collecting strategy has been to seek the help of the advisory service (ACOT) to check out and get lists of growers still producing their own seed. This was followed up by visits to these growers by the author. Growers were persuaded to donate some of their seed to the gene bank. Most of these growers agreed to do so and seed of alternative brassicas such as Brussels sprouts cauliflower or other was given in lieu. When visiting the growers information regarding cultural practice, method of selection and seed production was gathered and recorded. The major pest and diseases affecting the crops in the localities were also noted.

Growers were asked for 100 gm of fresh seed but samples varied from a few grams to over 600 gms. These were brought back to the Kinsealy Research Centre, cleaned and tested for germination before despatching to the genebank at the National Vegetable Research Station, Wellesbourne, England. In some cases actual plant cuttings were taken and these were

- 125 -

subsequently rooted at Kinsealy and sent to Wellesbourne after packing in peat.

The commercial seed merchants had no commercial varieties or pure lines, as Ireland imports all its crucifer seed requirements.

5. COLLECTING LOCALITIES

After initial investigation it became clear that some land races existed in selected areas throughout the country. However, it was only when these growers were visited that they told us of other growers who were likewise saving their own seed and so the number of contacts increased. In this way a number of important regions were located. The main regions were in the West of Ireland (Counties Clare, Roscommon and Galway) and North West (Donegal and Sligo) where many local land races of 'flat Dutch' or 'Cow Cabbage' existed. In the South a particular region (Glen of Aherlow) in County Tipperary had a unique land race of cabbage known locally as 'Cut and Come' while in the south of the country there was a tradition of saving spring cabbage seed. In contrast on the east coast there were traditions of growing and saving winter cauliflower and Brussels sprout seed, particularly in counties Dublin and Waterford. Many of the areas were geographically different and generally suited to the requirements of the crops needs. Land races of each of these occurred sporadically elsewhere throughout the country as well.

6. COLLECTION RESULTS

The collection is comprised almost entirely of land races mostly cabbages with smaller amounts of cauliflower, swedes, Brussels sprouts and sprouting broccoli. These are listed together with the names of growers in Appendix I.

7. DEGREE TO WHICH THE GENETIC VARIATION HAS BEEN COLLECTED (PER CROP)

The degree to which the genetic variation has been collected in this project varied very much with each crop. With cabbage about 90% of land races have been collected in the present collection but it was reckoned that at least the same number or even more were lost due to growers having discontinued the practice over the last 20 years of so. All the available land races of Brussels sprouts, cauliflower, swedes and kales existant have been collected but unfortunately much genetic erosion has occurred with these crops and the numbers collected are but a small fraction of those that existed in the past.

SUMMARY OF COLLECTION - A summary of the collection is given in Tabel 4.

Table 4: Summary of number of accessions collected in Ireland

Crop	N	ο.	acces
Cabbages			
Flat Dutch			26
Spring			9
Savoy			3
'Cut and Come'			6
Swedes			5
Rape			2
Cauliflower			4
Sprouting broccoli			2
1000 headed kale			1
Brussels sprouts			3
Marrow stem kale			1
	Total		62

sions

APPENDIX I

Identification no.	Crop	Туре	Germination %	Quantity (gms)
1	Brussels sprouts	L	1	190
2	Brussels sprouts	L	1	300
3	Brussels sprouts	L	70	280
4	Winter cauliflower	L	98	115
5	Savoy cabbage	L	1	270
6	Savoy cabbage	L	1	310
7	Winter cauliflower	L	86	80
8	Winter cabbage	L	8	20
9	Flat Dutch cabbage	L	82	80
10	Flat Dutch cabbage	L	68	35
11	Swede	L	2	200
12	Swede	L	26	200
13	Swede	L	1	210
14	Marrow stem kale	Ľ	2	190
15	1000 headed kale	L	28	215
16	Rape	V	1	270
17	Flat Dutch cabbage	L	28	95
18	Flat Dutch cabbage	L	90	160
19	Flat Dutch cabbage	L	86	90
20	Flat Dutch cabbage	L	62	90
21	Cabbage(flat Dutch)	L	71	250
22	Cabbage(flat Dutch)	L ·	90	57
23	Cabbage(flat Dutch)	L	97	112
24	Cabbage (spring)	L	94	28
25	Cabbage (spring)	L	99	28
26	Winter cauliflower	L	97	10
27	Cabbage (spring)	L	93	50
28	Cabbage (spring)	L	93	11
29	Cabbage (spring)	L	99	40
30	Swede	L	9	600

31RapeV32Cabbage (spring)L33Broccoli (Purple sprouting)L34Cabbage (Raggedy Jack)L35Cabbage (flat Dutch)L36Cabbage (savoy)L37Cabbage (flat Dutch)L38Cabbage (flat Dutch)L39Cabbage (flat Dutch)L40Cabbage (flat Dutch)L41Cabbage (flat Dutch)L42Cabbage (flat Dutch)L43Cabbage (flat Dutch)L44Cabbage (flat Dutch)L45Cabbage (flat Dutch)L46Cabbage (flat Dutch)L47Cabbage (flat Dutch)L48Cabbage (flat Dutch)L49Cabbage (flat Dutch)L	99 95 98 Plants 99	420 40 16
32Cabbage (spring)L33Broccoli (Purple sprouting)L34Cabbage (Raggedy Jack)L35Cabbage (flat Dutch)L36Cabbage (flat Dutch)L37Cabbage (flat Dutch)L38Cabbage (flat Dutch)L39Cabbage (flat Dutch)L40Cabbage (flat Dutch)L41Cabbage (flat Dutch)L42Cabbage (flat Dutch)L43Cabbage (flat Dutch)L44Cabbage (flat Dutch)L45Cabbage (flat Dutch)L46Cabbage (flat Dutch)L47Cabbage (flat Dutch)L48Cabbage (flat Dutch)L49Cabbage (spring)L	95 98 Plants 99	40 16
33Broccoli (Purple sprouting)L34Cabbage (Raggedy Jack)L35Cabbage (flat Dutch)L36Cabbage (flat Dutch)L37Cabbage (flat Dutch)L38Cabbage (flat Dutch)L39Cabbage (flat Dutch)L40Cabbage (flat Dutch)L41Cabbage (flat Dutch)L42Cabbage (flat Dutch)L43Cabbage (flat Dutch)L44Cabbage (flat Dutch)L45Cabbage (flat Dutch)L46Cabbage (flat Dutch)L47Cabbage (flat Dutch)L48Cabbage (flat Dutch)L	98 Plants 99	16
34Cabbage (Raggedy Jack)L35Cabbage (flat Dutch)L36Cabbage (savoy)L37Cabbage (flat Dutch)L38Cabbage (flat Dutch)L39Cabbage (flat Dutch)L40Cabbage (flat Dutch)L41Cabbage (flat Dutch)L42Cabbage (flat Dutch)L43Cabbage (flat Dutch)L44Cabbage (flat Dutch)L45Cabbage (flat Dutch)L46Cabbage (flat Dutch)L47Cabbage (flat Dutch)L48Cabbage (flat Dutch)L	Plants 99	-
35Cabbage (flat Dutch)L36Cabbage (savoy)L37Cabbage (flat Dutch)L38Cabbage (flat Dutch)L39Cabbage (flat Dutch)L40Cabbage (flat Dutch)L41Cabbage (flat Dutch)L42Cabbage (flat Dutch)L43Cabbage (flat Dutch)L44Cabbage (flat Dutch)L45Cabbage (flat Dutch)L46Cabbage (flat Dutch)L47Cabbage (flat Dutch)L48Cabbage (flat Dutch)L49Cabbage (spring)L	99	310
36Cabbage (savoy)L37Cabbage (flat Dutch)L38Cabbage (flat Dutch)L39Cabbage (flat Dutch)L40Cabbage (flat Dutch)L41Cabbage (flat Dutch)L42Cabbage (flat Dutch)L43Cabbage (flat Dutch)L44Cabbage (flat Dutch)L45Cabbage (flat Dutch)L46Cabbage (flat Dutch)L47Cabbage (flat Dutch)L48Cabbage (flat Dutch)L	1	210
37Cabbage (flat Dutch)L38Cabbage (flat Dutch)L39Cabbage (flat Dutch)L40Cabbage (flat Dutch)L41Cabbage (flat Dutch)L42Cabbage (flat Dutch)L43Cabbage (flat Dutch)L44Cabbage (flat Dutch)L45Cabbage (flat Dutch)L46Cabbage (flat Dutch)L47Cabbage (flat Dutch)L48Cabbage (flat Dutch)L	1	600
38Cabbage (flat Dutch)L39Cabbage (flat Dutch)L40Cabbage (flat Dutch)L41Cabbage (flat Dutch)L42Cabbage (flat Dutch)L43Cabbage (flat Dutch)L44Cabbage (flat Dutch)L45Cabbage (flat Dutch)L46Cabbage (flat Dutch)L47Cabbage (flat Dutch)L48Cabbage (flat Dutch)L	-	125
39Cabbage (flat Dutch)L40Cabbage (flat Dutch)L41Cabbage (flat Dutch)L42Cabbage (flat Dutch)L43Cabbage (flat Dutch)L44Cabbage (flat Dutch)L45Cabbage (flat Dutch)L46Cabbage (flat Dutch)L47Cabbage (flat Dutch)L48Cabbage (flat Dutch)L	97	320
40Cabbage (flat Dutch)L41Cabbage (flat Dutch)L42Cabbage (flat Dutch)L43Cabbage (flat Dutch)L44Cabbage (flat Dutch)L45Cabbage (flat Dutch)L46Cabbage (flat Dutch)L47Cabbage (flat Dutch)L48Cabbage (flat Dutch)L49Cabbage (spring)L	99	360
41Cabbage (flat Dutch)L42Cabbage (flat Dutch)L43Cabbage (flat Dutch)L44Cabbage (flat Dutch)L45Cabbage (flat Dutch)L46Cabbage (flat Dutch)L47Cabbage (flat Dutch)L48Cabbage (flat Dutch)L49Cabbage (spring)L	99	165
42Cabbage (flat Dutch)L43Cabbage (flat Dutch)L44Cabbage (flat Dutch)L45Cabbage (flat Dutch)L46Cabbage (flat Dutch)L47Cabbage (flat Dutch)L48Cabbage (flat Dutch)L49Cabbage (spring)L	94	90
43Cabbage (flat Dutch)L44Cabbage (flat Dutch)L45Cabbage (flat Dutch)L46Cabbage (flat Dutch)L47Cabbage (flat Dutch)L48Cabbage (flat Dutch)L49Cabbage (spring)L	97	50
44Cabbage (flat Dutch)L45Cabbage (flat Dutch)L46Cabbage (flat Dutch)L47Cabbage (flat Dutch)L48Cabbage (flat Dutch)L49Cabbage (spring)L	93	85
 45 Cabbage (flat Dutch) L 46 Cabbage (flat Dutch) L 47 Cabbage (flat Dutch) L 48 Cabbage (flat Dutch) L 49 Cabbage (spring) L 	5	126
46Cabbage (flat Dutch)L47Cabbage (flat Dutch)L48Cabbage (flat Dutch)L49Cabbage (spring)L	96	150
47Cabbage (flat Dutch)L48Cabbage (flat Dutch)L49Cabbage (spring)L	93	135
48 Cabbage (flat Dutch) L	100	80
49 Cabhage (spring)	10	6
Caprade (abrand) E	99	25
50 Cabbage (flat Dutch) L	94	39
51 Cabbage (cut and come) L	Plants	
52 Cabbage (spring) L	80	100
53 Broccoli (sprouting) L	Plants	-
54 Cabbage ('cut and come') L	Plants	-
55 Cabbage ('cut and come') L	Plants	
56 Cabbage ('cut and come') L	Plants	-
57 Cabbage (spring) L	28	130
58 Cabbage (flat Dutch) L	96	125
59 Cabbage (flat Dutch) L	76	250
60 Cabbage ('cut and come') L	-	10
61 Cauliflower (winter) L	96	700
62 Swede V		0 E

- 130 -

COLLECTING CRUCIFEROUS CROPS IN DENMARK - CP7

E. V. Schelbeck, Hvenebo, Hvenekildevej 18, DK - 5240 Odense NØ

CAULIFLOWER 'DANOVA' LD

A very uniform and vigorous cauliflower, with very firm and ample curds well protected by foliage. Very late development. Very heavy cropper.

CAULIFLOWER 'DOMINANT' LD

A very uniform, extremely vigorous cauliflower. Very big, extremely firm and ample curds. Curd protection medium. Development very late. Very high yield of excellent quality.

CAULIFLOWER ERFURTER 'ERFU' LD

A uniform, medium-vigorous to rather vigorous cauliflower. Good protection of curd. Fast development, harvest starting after 52-66 days. Harvesting period short to rather short, relatively concentrated. Fairly high yield of good quality.

CAULIFLOWER 'GRANDESSA' LD

Extremely uniform and very vigorous cauliflower. Very big, extremely firm and ample curds. Very well protected by foliage. Development medium-early to rather late. Very high yield of very fine quality.

CAULIFLOWER 'KING' LD

A very uniform, medium-vigorous cauliflower with good curd protection. Very fast development, harvest beginning after 49-63 days. Harvesting period short and rather concentrated. Very high yield of good guality.

CAULIFLOWER 'PERFECTION' LD

A uniform, medium-vigorous cauliflower, with very firm and very ample curds of medium size. Leaves with strongly marked keel; protection of the curd rather poor. Very early cauliflower giving fairly high yield of fine quality.

I	den	tif	ica	tion	no.

Grower/address

35	Paddy Flaherty, Oughtmama, Bellharbour, Co. Clare
36	Hugh McGuire, Balbriggan, Co. Dublin
37	John McMahon, Ballyburna, Tubber, Curry, Boston,
	Co. Clare
38	Owen Sweeney, Gortahork, Co. Donegal
39	Manus Ferry, Keeldrum, Gortahork, Co. Donegal
40	Joe Coyle, Ardsbeg, Gortahork, Co. Donegal
41	John Coyle, Ardsbeg, Gortahork, Co. Donegal
42	Frank Coyle, Ardsbeg, Gortahork, Co. Donegal
43	Barry McNulty, Ardsmore, Gortahork, Co. Donegal
44	Paddy McNulty, Ardsbeg, Co. Donegal
45	Pat Mulhern, Baltony, Gortahork, Co. Donegal
46	Edward McCarrons, Doughcribbin, Portsalon,
	Co. Donegal
47	Dan Callaghan, Drumnacraig, Ballylar, Co. Donegal
48	Martin Reape, Turim Corroy Ballina, Co. Mayo
49	Jack Desmond, 77 Nuns Walk, Paulodoff Rd., Cork
50	John Gallagher, Strassalagh, Glenties, Co. Wicklow

CAULIFLOWER 'STARLA' LD

Very uniform cauliflower of medium-vigorous to rather weak growth. Extremely firm and ample, medium-sized curds. The leaves have a marked keel. and the protection of the curd is not very good. Extremely early, with a heavy yield of good quality.

CAULIFLOWER 986 'VALI' AH

Very uniform, medium-vigorous to rather vigorous cauliflower, with extremely firm and ample medium-sized curds. The leaves have strongly marked keel, and the curd protection is not very good. Curds sitting low in the foliage. Very early, with a heavy yield of fine quality.

CAULIFLOWER 'GARANT' AH

Very uniform, rather vigorous cauliflower with big, very firm and ample curds, well protected by leaves. Medium-early. Very heavy crop of nice quality.

CAULIFLOWER 'BRAVO' AH

A very uniform, medium-vigorous cauliflower with good curd protection. Very fast development. Harvest starting after 49-63 days. Harvesting period short and rather concentrated. Heavy yield of good quality.

CAULIFLOWER 'SAFIR' FDB

Very uniform, rather vigorous cauliflower, with big, extremely firm and ample curds, very well protected by foliage. Development mediumearly. Heavy yield of fine quality.

BORECOLE 'HALVHØJ KRUSET', 'KONSERVA' LD

Very homogeneous borecole with medium-tall stem, and nicely curled. dark green leaves. Uniform as to height of stems, and healthy when harvested in due time. Medium to high yield at early and medium-early harvests.

BORECOLE 'LÆ RKETUNGE' LD

Recognized for spring and short culture. Leaves long and narrow, strongly curled, and glaucous. Low yield, but good quality. Fairly good for wintering. Tendency to early renewal of growth rather pronounced.

BORECOLE 'HØJ KRUSET' LD

A tall, very hardy borecole giving a high yield of healthy leaves of agreeable taste.

BORECOLE 'LAVO' LD

A dwarf borecole with upright leaves and therefore especially suited for mechanical harvest. When the leaves are cut above the growingpoint, harvest can take place three times in a season.

BORECOLE 'HØJ AMAGER SUNDBY TORVE' AH

A fairly homogeneous, rather tall-stemmed, coarsely curled borecole. Fresh green leaf colour. Uniform height of stems. Healthy, very durable. Heavy yield.

BORECOLE 'HALVHØJ KRUSET' 'BONA' FDB

Very homogeneous borecole, with medium to tall stem and nicely curled leaves. Leaf colour rather light green. Very high yield at early and particularly at medium-early harvests. Even in case of late harvest, the yield has been above average. Suited for fresh use and industry, because of the somewhat light colour perhaps especially for the former purpose.

WHITE CABBAGE AMAGER 'HØJ GRØN' 'GRAMI' LD

A fairly homogeneous, medium-vigorous to vigorous cabbage, rather late developed, with relatively dark green leaf colour and rather light head colour. Outer stem about 20 cm (half-tall), tap medium. Heads deep flattish round, most with balloon-shaped base. Interior quality medium. In Danish trials some tendency to interior tipburn. Autumn yield very high. Keeping qualities good in January-February, dropping a little in March-April but the yield is still acceptable after storage.

WHITE CABBAGE AMAGER LAV 'AMLARO' LD

A short-stemmed, early winter cabbage. Heads are medium-sized, round to flattened round. High yield.

- 134 -

WHITE CABBAGE 'BEWAMA'

A very uniform cabbage, not very vigorous, comparatively early developed. Leaf and head of a dull-green colour. Outer stem about 17 cm (short), tap medium. The heads are round, most of them without balloonshaped base. Interior quality very fine. Showed in the Canish trials very little tendency to interior tipburn. Autumn yield rather high keeping qualities medium good for January/February, only moderate for March/April.

WHITE CABBAGE DITMARSKER 'PRIMAX' LD

A very uniform, rather vigorous cabbage with fresh-green leaf and head colour. Heads very big, ball-shaped to flattened round with rather good closing. The interior quality is fairly good. High yield. Average head weight about 1500 g. Rather early to medium early.

WHITE CABBAGE DITMARSKER 'SPECIAL' LD

A very uniform cabbage of very early development, with medium to weak leaf growth. Heads round to flattenend round, light green, with medium good closing and medium to fairly good inner quality. Time of development short, 45-55 days form transplanting. Harvesting period short. Heads will soon burst if not cut in due time. Yield in tons rather low. Weight per head about 900 g. Very high percentage of first quality.

WHITE CABBAGE KØBENHAVNS TORVE 'KOTO' LD

A very uniform, comparatively vigorous cabbage. Leaf and head colour a fresh green. Good closing. The heads are bit, spherical to flattened round. Average weight 2.4 kg. Inner quality fairly good. Medium-early to rather early.

WHITE CABBAGE 'VIVALDI' LD

A fairly uniform, medium-vigorous to vigorous cabbage of late development. Leaf and head of a fresh green colour. Outer stem about 25 cm (tall), tap medium. Deep globe to globe shape with balloon-shaped base. Interior quality good, in trials no interior tipburn found. Autumn yield high, keeping qualities good.

WHITE CABBAGE 'WIDI' LD

A very uniform cabbage of medium early to rather late development. Very weak leaf growth. Heads round to flattened round, medium green, with good closing, very fine interior quality. Time of development rather long, 63-80 days from transplanting. Harvesting period fairly long. The heads will stand comparatively long without bursting. Yield high percentage of first quality.

WHITE CABBAGE 'DIMA' AH

A very uniform cabbage of very early development, with medium to weak leaf growth. The heads are flattened round to round, comparatively light green. Medium to good closing, interior quality medium. Time of development short, 47-60 days from transplanting. Harvesting period rather short. If not cut in due time, the heads will rapidly burst. Yield in tons rather low. Weight about 1000 g per head. Percentage of first quality very high.

WHITE CABBAGE LANGENDIJKER VINTER 'VERNIDO' AH

Fairly uniform, medium vigorous to vigorous cabbage of medium early to rather early development. Leaf colour rather dark green, head colour rather light. Outer stem about 20 cm (half-tall), tap medium. The heads are between flattened round and slightly deep globe-shaped, i.e. roundish. About half of the heads with balloon-shaped base. The interior quality medium to good, and in Danish trials no interior tipburn was gound. High autumn yield. Keeping qualities were medium for January/February less good for March/April.

WHITE CABBAGE AMAGER HØJ GRØN 'KALIDA' AH

A uniform, vigorous cabbage, rather late developed, with light leaf colour and rather light head colour. Outer stem about 25 cm (tall). Tap medium-sized. Heads flattened round with balloon-shaped base. Inner quality medium. Trials showed rather little tendency to interior tipburn. Autumn yield very high. Keeping qualities good.

WHITE CABBAGE AMAGER GRØN VINTER 206 OE

The heads are fairly uniform, very firm, smooth, of good colour, round, most of them with balloon-shaped base. Little tendency to tattering or sliming when standing. Late development. At short term storage very low waste percentage. Heavy yield - percentage of first quality very high.

WHITE CABBAGE 'DURAL' OE

Fairly uniform, medium vigorous cabbage, rather late of development. Leaf and head of a fresh green colour. Outer stem about 20 cm tall, tap medium. Heads round, most with balloon-shaped base. Interior quality medium to good, no interior tipburn found in the Danish trials. Autumn yield was high. Keeping qualities, especially for January/ February and March, were good.

WHITE CABBAGE KØBENHAVNS TORVE 'BIRO' OE

A uniform cabbage of medium-early to rather late development with comparatively vigorous leaf growth. The heads are round to flattened round, medium green, with medium to good closing, and medium to fairly good interior quality. Time of development rather long to long, 76-108 days from transplanting. Harvesting period rather short, but the heads will stand comparatively long without bursting. Yield in tons very high. Head weight about 2300 g apiece. Percentage of first quality very high.

WHITE CABBAGE TIDLIG DITMARSKER 'EGA' OE

A very uniform cabbage of very early development, with weak leaf growth. Heads rather deep globe-shaped, light green, with medium to good closing, and medium to good interior quality. Time of development short, 45-55 days from transplanting. Harvesting period short. If they are not cut in due time, the heads will rapidly burst. Yield in tons rather low. Head weight about 900 g apiece. Percentage of first quality is very high.

WHITE CABBAGE DITMARSKER 'MIDI' OE

A uniform, vigorous Ditmarsker type with ample foliage and big, flattened round to round heads. Leaf colour rather dark green, head colour fresh green. Closing and interior quality fairly good. Smoothness after trimming less good. Relatively early to medium early, can follow the early Ditmarsker types. High yield, with an average head weight of 1500 g.

WHITE CABBAGE BRUNSVIGER 'LADU' OE

Large-sized, vigorous cabbage with rather large, slightly wavy leaves. The heads are large and oblate (flat round) in shape. Colour a fresh green. Approx. 95 days from transplanting to maturity.

WHITE CABBAGE 'DARKRI' OE

A very uniform cabbage of medium-early development with medium-ample foliage. Heads round to flattened round, medium-green, with good closing and good interior quality. Time of development rather long, 75-87 days from transplanting. Harvesting period long. The heads will stand comparatively long before bursting. Yield in tons is high. Head weight about 2000 g. Percentage of first quality very high.

WHITE CABBAGE 'DELIKATESSE' OE

Belongs to the same series as Cabbage 'Noblesse', which it resembles in many ways. However, it is slightly smaller and earlier. Days to maturity: about 62-65.

WHITE CABBAGE 'GODIN' (TIDLIG DITMARSKER) OE

A very uniform cabbage of very early development, with medium to little foliage mass. Heads round, rather light green, with good closing and medium to good interior quality. Time of development comparatively short, 51-60 days from transplanting. Harvesting period fairly long, but the heads will rapidly burst if not cut in due time. Yield in tons rather small. Head weight about 1000 g apiece. Percentage of first quality very high.
- 138 -

WHITE CABBAGE 'NOBLESSE' OE

A rather small, early to medium-early cabbage, round in shape with very fine closing of the heads. The interior quality is excellent, very firm. The tap (core) is about 20%. Interior leaves thin, delicate, and sweet. Outer leaves few in number, quite small and round. Days to maturity: about 70.

WHITE CABBAGE RUHM VON ENKHUIZEN '386' OE

A little varying in type, vigorous, with medium-sized, flat rounded heads with fairly good closing. Head colour rather dark green. Development medium-early - keeping long without bursting or tattering. Showed but little interior tipburn in the trials and yielded 80 t/ha. High growing value, good quality.

WHITE CABBAGE LANGENDIJKER VINTER 'HEKLA' FDB

Fairly uniform, medium-vigorous cabbage of rather late development. Leaf colour medium - head colour rather light. Outer stem about 20 cm (half-tall), tap medium. Heads spherical to slightly flattened round, most with slightly balloon-shaped base. Interior quality medium to good. No interior tipburn found in the trials. Yield in autumn was very high. Keeping qualities good in January/February - decreasing somewhat in March/ April, but the yield is still acceptable after storage.

WHITE CABBAGE DITMARSKER 'FRIGGA' FDB

A uniform, vigorous Ditmarsker type, with ample foliage, and big, round to flattened round heads. Leaf and head colour fresh green. Closing and interior quality rather good. Smoothness after trimming is good. Early to medium-early, 'FRIGGA' can follow the early Ditmarsker types. The yield has been high with an average head weight of more than 1500 g.

BRUSSELS SPROUTS ODENSE TORVE 'OTO' LD

Very uniform, short-stemmed, with big, dark green to bluish green leaves. Sprouts very well covered. Oval, often compressed, very firm and very smooth sprouts with excellent closing. Those at the bottom are biggest. Sprouts sitting quite closely. A very hardy strain. Yield very high of fine quality.

BRUSSELS SPROUTS'POLARSTJERNEN' LD

Uniform, half-tall plant with big, broad leaves giving good protection to the sprouts. Nicely coloured, deep globe shaped to oval, smooth, very firm sprouts, with fine closing. Density on the stem is medium. The sprouts may be rather big, but most of them are of a suitable size. Very heavy yield. Sprout quality fine.

BRUSSELS SPROUTS 'HUGIN' FDB

Uniform type, relatively tall stem. Vigorous growth. Big leaves with comparatively long petioles, medium-green colour. The closing of the sprouts is rather good. Early of development - the leaves are shed rather early. Heavy yield in good quality, most sprouts are medium-sized. Below 0.3 per cent with interior tipburn at the latest harvest.

RED CABBAGE 'HOLDBAR AMAGER' LD

A uniform, relatively vigorous red cabbage; shape deep globe to round. Fairly good inner and outer colour. Colour after cleaning good. Closing medium. Tap small. Very high yield in fine quality. Good keeping qualities.

RED CABBAGE AMAGER 'CARO' (180) OE

Fairly uniform, rather vigorous red cabbage, with a very nice outer colour also after trimming. The heads are large, deep globe shaped, some spherical or oval. Very few balloon-shaped. The closing is very fine, and so are the interior colour and quality. Outer stem about 18.5 cm tall. Tap very small. Very little waste at short storage. High yield, high growing value, and very high quality.

RED CABBAGE 'HOLDBAR VINTER', 'ROKA' OE

Vigorous, round to oval, petioled leaves with slightly undulated edges. Heads medium-sized, deep globe to balloon-shaped. Relatively high autumn yield, good keeping qualities, and good inner and outer quality also after storage.

- 140 -

RED CABBAGE KISSENDRUP 'PIRU' OE

A medium-early red cabbage, spherical in shape. The head is smooth with a thin to medium thick waxy layer. The outer leaves are medium long, petioled and slightly wavy with a medium thick waxy layer.

RED CABBAGE 'HOLDBAR AMAGER' FDB

Very productive strain with average keeping percentage. Harvested in autumn and stored until February 1st, it gave the highest yield of useable heads in trials. Uniform, very vigorous, stem 18 cm tall. Leaves with short petioled, strongly glaucous, almost round, somewhat patulous, with slightly undulated edges. Heads big, almost round with very fine closing. The inner quality is good, and so is the appearance after cleaning.

RED CABBAGE AMAGER '304' AH

A uniform, vigorous red cabbage of deep globe shape. Very nice inner and outer colour. Closing fine, and density good. The heads are somewhat uneven after trimming. Tap very small. High yield of very fine guality. Good keeping qualities.

RED CABBAGE 'HOLDBAR VINTER', 'ROVI' AH

Vigorous, round to oval, petioled, strongly undulated leaves. Heads medium-sized, round to deep globe shaped. Relatively high autumn yield. good keeping qualities, good inner and outer quality.

SAVOY CABBAGE VERIUS 'VERIUS' LD

A medium-sized savoy cabbage suited for autumn use. Heads round to flattened round.

SAVOY CABBAGE AUBERVILLIERS 'PLADANO' OE

A typical Aubervilliers type, abt. 10 days earlier than 'Vertus'. Medium-early, oblate in shape (flat round) with large, well-curled heads. Colour green with a slight yellowish tinge when the heads are fully ripe. Outer leaves quite large, blue-green with a waxy layer. Almost blistered in texture with a cloqué effect.

POINTED CABBAGE ERSTLING 'LINGA' LD

Uniform; medium-vigorous growth. Big heads of comparatively good colour. Tap very short. Development medium- early to rather late. Very high yield in fine quality.

POINTED CABBAGE 'BIGAL' OE

An early to medium-early cabbage. The heads are green to dark green with a waxy layer, and deeper than usual for a pointed cabbage. The shape is deep oval, nearly cylindrical, attaining 50% of the head height before the point is formed. /Days to maturity: 75.

POINTED CABBAGE ERSTLING 'TRETA' OE

Uniform, medium-vigorous to vigorous with medium-green head colour. Heads big, rather short, broad, comparatively smooth, fairly well closed. Tap short. Development medium-early. Very high yield fo fine quality.

POINTED CABBAGE JERSEY WAKEFIELD 'PEWA' OE

A uniform, medium-vigorous cabbage, Head colour a comparatively intense green. Big heads, very smooth, rather long, and broad at the base. Well closed. Tap rather long. Development medium-early to rather late. High yield in very fine quality.

POINTED CABBAGE CHARLESTON WAKEFIELD 'MITOL' OE

Relatively uniform wiht very vigorous growth, head colour a rather light green, Heads medium-sized, relatively long, rather broad at the base, and very smooth. Very fine closing. Tap rather long. Development very late. Very high yield of fine quality.

POINTED CABBAGE 'WAKKER' OE

A uniform, medium-vigorous cabbage. Head colour rather dark to dark green. Heads relatively high, wide at the vase, smooth, and with fairly good closing. Tap rather small. Medium-early to rather late in development.

POINTED CABBAGE ERSTLING 'ERNOVA' FDB

Uniform, medium to rather vigorous. Head colour medium to dark green. Heads big, rather short, broad, fairly smooth, and with fine closing. Tap rather long. Of medium-early development. Very high yield of fine quality.

POINTED CABBAGE ERSTLING 'PIKOLA' AH

Very uniform. Growth rather weak. Heads big, fairly smooth, mediumgreen with fine closing. Very short tap. Development early. Acceptable yield of very fine quality.

KOHLRABI DELIKATESSE BLAA LD

Medium-sized, round to flattened round, purple. Foliage with torsion.

KOHLRABI DELIKATESSE HVID 'DELIWI' LD

Medium-sized, round to flattened round, white. Foliage with torsion.

RADISH GAUDRY LD

A fairly uniform radish, somewhat deep ball-shape. Dark rose with approx 1/3 white tip. Has to be harvested in due time, otherwise it may tend to become pithy. Very early, yielding a high percentage of first quality.

RADISH 'HALVLANG ROSENRØD HVIDSPIDSET', 'VIDAN' LD

A very uniform radish with vigorous foliage, relatively early developed. Half-long to long, red with about 1/5 white tip. Yield high, quality and durability on root good.

RADISH 'HALVLANG SKARLAGENRØD HVIDSPIDSET No. 25' LD (French Breakfast)

A uniform, short/half.long to long/oval radish. Scarlet with 1/5 white tip. Foliage fairly vigorous. Early, with a very high percentage of first quality.

RADISH 'HALVLANG SKARLAGENRØD HVIDSPIDSET No. 35' LD

A uniform, short/half-long, dark scarlet radish with very small white tip (1.3 tenths). Foliage medium-vigorous. Early with a very high percentage of first quality.

RADISH 'HALVLANG SKARLAGEN HVIDSPIDSET No. 875' LD

A very uniform, relatively early radish with short top. Half-long, dark red with approx. 1/5 white tip. Fine quality.

RADISH ISTAP 'ISMO' LD

A very uniform, very long, conical radish, snow-white, with very vigorous foliage. In a fairly good stand, 'Istap' gave a high percentage of first quality, and it did not show any tendency to pith in the trials.

RADISH KØBENHAVNS TORVE 'KOTOMA' LD

Outdoor radish with rather vigorous foliage. Red with 3/8 white tip.

RADISH 'METEOR' LD

A uniform, oval, all bright red radish, rather well shaped at bottom. Foliage medium to small. Development early to very early. Very high percentage of first quality.

RADISH NON PLUS ULTRA 'NONDAN' LD

A uniform, round to flattened round, all bright red radish, nicely shaped at bottom. Foliage rather small to medium. Development mediumearly. Relatively high percentage of first quality.

RADISH RUBIN 'RUNO' LD

A round, red radish. Suited for summer crop.

RADISH 'RUND ROSENRØD HVIDSPIDSET' LD

Round, rose-red, with white tip.

RADISH SAXA 'SARA' LD

Round, red forcing radish. Short top.

RADISH 'MINARET' AH

High-summer radish, of a bright scarlet, with 1/3 to 1/2 white tip. Foliage medium-long.

RADISH 'CLARO' OE

A very uniform radish. Development medium-early. Rather small foliage. Round, dark red, without white tip. Fine quality.

RADISH KØBENHAVNS TORVE 'DEMA' OE

An outdoor radish, round in shape with a tendency to be oblate (flat round). The colour is scarlet with a tinge of rose-pink. 30-40% white tip.

RADISH SAXA 'KORTO' OE

A relatively uniform radish, with a short top, rather late developed. Round, bright red without white tip. Yield high, guality fine, durability good on root.

RADISH 'HALVLANG HVIDSPIDSET', 'FOTA' OE

A uniform radish of very early development. Foliage vigorous to rather vigorous. Short to half_long, rose_red, with a little more than 1/3 white tip. Good guality.

RADISH 'HALVLANG ROSENRØD HVIDSPIDSET' 205 OE

A uniform, half.long, rose-red radish with approx. 1/3 white tip. Foliage rather vigorous. Very early. Very high percentage of first quality.

RADISH 'HALVLANG SKARLAGEN HVIDSPIDSET' 393 OF

A very uniform, short/half-long to oval, scarlet radish with a small white tip. Rather early of development. Small foliage.

RADISH NON PLUS ULTRA 357 'FALKAN' OE

A very uniform radish with small foliage. Development rather early. Round, dark red, without white tip. Fine quality.

RADISH NON PLUS ULTRA 406 OE

A very uniform, almost round, all bright red radish with rather small foliage. Very high percentage of first quality.

RADISH ISTAP 'SYLA' OE

Istap (Icicle) 'SYLA' is a long, pointed radish, very white and delicate.

RADISH 'ROVI' OE

A uniform, round to round-oval, bright signal-red radish, with approx. 1/5 white tip. Foliage relatively vigorous. Very high percentage of first quality.

RADISH WURZBURGER 'GIGA' OE

A large outdoor radish with good resistance to bolting. It is scarlet in colour, round with a slight tendency to be oblate (flat round). A characteristic trait is the interior colour, white with spots of red here and there.

RADISH 'HALVLANG HVIDSPIDSET', 'RAPID' FDB

A very uniform radish, development very early, foliage vigorous. Halflong, rose red with approx. 1/3 white tip. When harvested in due time, it is of good quality, but pith appears rather soon after maturity.

RADISH 'HALVLANG SKARLAGEN HVIDSPIDSET' FDB

A very uniform, half, long to short/half-long, scarlet radish with a little more than 1/5 white tip. Foliage vigorous. A very high percentage of first quality.

RADISH KØBENHAVNS TORVE 'HAFNIA' FDB

A very uniform, spherical radish of a dark rose red colour, with approx. 1/3 white tip. Relatively vigorous foliage. A very high percentage of first quality.

- 146 -

CAULIFLOWER 'CODANIA' AH

A very uniform, medium-vigorous cauliflower with very big, firm, ample curds of good colour. Very little tendency to riceyness. Development early, harvesting period short. Very heavy yield of fine quality.

CAULIFLOWER 'AKRON' OE

(Description covering plants grown in house only)

Very uniform in type and time of development. Growth more than mediumvigorous. Tall-stemmed, with comparatively long, smooth leaves. Leaf colour a rather light, fresh green. Early development. Having no keel, the leaves give good protection to the curds, which are medium-sized, of fine quality. Very high percentage of first quality, most curds being medium-sized.

CAULIFLOWER 'BOSS' OE

A relatively uniform, very vigorous cauliflower, with very big, very firm and rather ample curds. Foliage giving fairly good protection to the curds. Rather medium-early of development. Very high yield of good quality.

CAULIFLOWER 'EKO' OE

A uniform, very vigorous cauliflower with extremely big, very firm and very ample curds. Protection of curds rather good to good. Mediumearly to rather early of development. Producing a very high yield of good quality.

WHITE CABBAGE AMAGER 'HØJ GRØN' No. 5 AH

Medium-vigorous with medium-sized, roundish leaves, standing somewhat out, with rather short petioles. Glaucous, very waxy. Keeping very well. Interior quality fairly good. Remaining rather green after storage.

WHITE CABBAGE AMAGER 'HØJ GRØN' No. 13 AH

Medium-vigorous cabbage. Leaves medium-sized, roundish, with rather short petioles. Glaucous, very waxy. Keeping very well. Interior quality fairly good. Remaining green after storage.

WHITE CABBAGE LANGENDIJKER VINTER 007 AH

Weak-growing cabbage, with rather small, petioled, oval leaves with undulating edge. Green with light-coloured leaf veins. Keeping very well. Interior quality very fine. Small tap. very green after storage.

WHITE CABBAGE LANGENDIJKER VINTER No. 453 OE

Rather weak-growing cabbage with rather small, petioled, oval, somewhat bowl-shaped leaves. Green with light coloured veins. Keeping very well. Very fine interior quality, small tap. Strongly green after storage.

RADISH 'FORINA' OE

A very uniform, short - half-long, rose-red radish with almost 1/3 white tip. Rather well-shaped at bottom. Foliage medium to rather small. Development early to very early. Very high percentage of first quality.

RADISH 'TRIRO' OE

Very ujiform in shape and colour. Bright scarlet, round radish with medium to small foliage. Nicely shaped at bottom, fine tap root. Development medium early to late. Little tendency to pith and neck.

CP 8. CP 11: COLLECTING LANDRACES AND CULTIVARS OF CRUCIFEROUS CROPS IN THE FEDERAL REPUBLIC OF GERMANY

Peter Mattusch and Hille Toxopeus

1. COMMON AND SCIENTIFIC NAMES

Kohlarten: cole crops - B. oleracea L. Weisskohl, Rotkohl, Wirsing: white, red, savoy cabbage Grünkohl ? Blumenkohl: cauliflower Kohlrabi: kohlrabi Kuhkohl-Geisskael: no english name (cowkale, goatkale) Herbstrueben: stubble turnips, bulbing B.rapa L. Ruebsen: turnip rape, B. rapa L. winter- und sommer ruebsen Kohlruebe: rutabaga, swede-turnip B. napus L. Sarepta senf: indian mustard B. juncea ? Weisser senf (Gelb senf): white mustard Sinapis albe L. Rettich: Radish-Raphanus sativus Radischen-table radish Rettich-giant radish

Oelrettich-no english name (oilseed radish, non bulbing).

2. STUTTGART - 'FILDERKRAUT' Pflanzenschutz berater: Mr. Bühl. The name Fildern indicates horticultural area bordering on the south of Stuttgart. Here, crop production is dominated by white cabbage production for Sauerkraut. The traditional cabbage type is known as 'Filderkraut', which plants grow into ver large, pointed, cabbages. We visited farmers in the field and in the farmhouse and a small processing factory specialized in making Sauerkraut from Filderkraut. Every one agreed (including a customer) that this Sauerkraut has a superior quality.

The main problem of this Filderkraut is its large pointed head so that each head has to be bored (to get rid of the tough innerstem) seperately by hand. Ordinary Sauerkraut cabbages have a flat head, which can be rolled onto pins that carry them to the boring machine. In other words Filderkraut is less easily mechanized and is on its way out because of it.

Only some of the elderly farmers still grow their own seed. They were interested in our request for samples but could not give us any yet because the seed plants were still hanging in the attics to dry. In any case, our project had not been given much publicity yet and it was suggested that dr. Mattusch would return to Stuttgart in February in the time that farmers submit their seed for a warm water treatment against Phoma lingam. We expect to collect between 10 and 20 seed samples of Filderkraut.

The soils are clayey and the main diseases are Alternaria and Clubroot. 2.1. Augsburg - Merchingerkraut - Pflanzenschutz berater: Mr. Heiss. Although much smaller than Stuttgart of München, Augsburg too used to have its traditional Sauerkraut variety named after the production area Merching. Sauerkraut is still being produced here but only one farmer still raises his own seed of this Merchinger kraut. This seed sample had already been sent to Dr. Mattusch.

2.2. München

2.2.1. Münchener Radi - Pflanzenschutz berater: Mr. Krauss The Münchener Radi is a very special type of giant radish which is eaten as a snack when drinking beer. The Radi is sliced length-wise, the slices are salted, put together and squeezed gently to get rid of some of the juice. One radi is eaten to one litre of beer. There used to be 15 types of Radi in the past but now only three forms remain, 2 are glasshouse types and one is a field type. The glasshouse types have fewer leaves and a longer (cylindrical) root than the field type. The Radi has white flesh, a white top, is cylindrical and half long, its taste is mild. The breeding firm of the name Karl Hild (near Stuttgart) markets seed of a variety called 'Münchener Bier' but according to the growers its taste is really inferior to the true Radi. The growers are suffering from competition of the Japanese radish which produces an exceedingly long root, and of which good hybrid seed is available. The point is that out of 1 well developed Japanese radish about 3 pieces of the size of a Münchener Radi can be cut. Only true Münchener can really appreciate Radi and distinguish it from the inferior Japanese. Since the beer gardens are populated mainly with innocant youngsters and tourists these are provided with chunks of the cheaper Japanese radish. Another competitor are Italian radish growers in the middle of Italy. These radishes are ready for marketing earlier than the Radi.

2.2.2. Ismaninger Kraut - Pflanzenschutzberater: Mr. Krauss.

The Ismaninger cabbage production area is located to the north east of München. Soil conditions in most of the area are very special in that ground water with a high Ca content and a hig PH (7.2 and up), from the Alps, comes near the surface. The topsoil is only 30-50 cms deep overlying gravel. At times Ca is deposited on top of the soil. The most common croprotation is potatoes - summerbarley - cabbage silage maize.

Clubroot is not a problem and it is thought to be because of the special soil conditions.

The Ismaninger Kraut has a rounded head and a soft sweet heart. We met with the chairmen of both the Radi growers- en the Krautgrowers associations. They promised to encourage growers to give seed samples. Mr. Krauss would act as an intermediary to Dr. Mattusch.

2.3. Bayerische Wald - Pflanzenschützberater Mr. Peschl.

Mr. Peschl had not been able to locate any farmers who grow own seed anymore in this area. In the past these existed and were grown only for home consumption in the mountinous area unlike the above cases. He had been able to get 2 samples of farmers' own seed of a Radi from farmers in the vicinity of Landshut who produce the crop for the Munich market. The origin of this seed is from München. We begged Mr. Peschl to be alert on cabbage landraces and sure enough he got hold of two samples about a month later which he sent to Dr. Mattusch.

2.4. Würzberg - Unterpleichfelder Herbstkraut - Pflanzenschutzberater:

Mr. Kempf.

We were most pleasantly surprised to come acrose farmers' own seed in the farming community of Unterpleichfeld. Like in Munchen and Stuttgart white cabbage is grown here for Sauerkraut. We visited the factory first and were informed of the fact that guite a few farmers still grow their own seed of the Unterpleicfelder Herbstkraut. Mr. Kempf had recently taken up the post of Pflanzenschützberater and promised to go into the problem of getting seed samples. On his request the Mayor's office was visited, where a local newspaper is made and a request to farmers' to come forward with their seed was put into the next issue. Dr. Mattusch returned on 23 and 24 November to attend to a meeting of the farmers' association. On this occasion he was given a total of 12 samples of farmers' own seed.

Mr. Niedermayer the local Horticultural Advisor mentioned the existence of a landrace of a giant radish in the town of Kitzingen. He promised to look into this matter and try to get seed. This Kitzinger Rettich could conceivably be collected in 1983. As has been reported earlier, Collection Programme nr. 11 had the objective to collect landraces of 'Stoppelrüben' or 'Herbstrüben' * and any other crucifer fodder crop that might exist in the Black Forest area in the Land (state) Baden-Württenberg.

Apart from the usual desk work in planning the CP we made a trip to the area to meet fieldworkers concerned and see for ourselves. We managed to pick up some samples of farmer's own seed as is reported in the following.

Contacts with farmers or farming communities were made through the Landwirtschaftsamt of the state and several Landwirtschaft-berater (agricultural advisors).

In Bühl we met with Dr. Hasel, director, and messrs Fliegl and Reuther, and explained the collection programme and its objective. The last two gentlemen were prepared to attempt to collect seed samples from farmer's own seed. There was agreement about the likelyhood that the crop concerned would be fodder turnips.

In Offenburg we met with Dr. Gruber, agricultural advisor, with whom we made a brief trip into the fringes of the black forest. In the village of Durbach we stopped at a hillside farm where we had spotted a plot with a couple of hundred kale plants, on the hillside just behind the farmhouse. The farmers' wife, who managed this crop, explained that the leaves were used for fresh fodder (during winter) for pigs: 'Suukael' (pig-kale). In the past the name was 'geiss-kale' (goat kale) at a time that a farm would keep goats. She mentioned that the crop could also be referred to with the name Kuh-kohl (cow kale) since other farmers would feed the leaves to their cows.

For seed production she would keep abou 7 plants apart, planted elsewhere, to go to seed after the winter. Unfortunately there was no seed to spare. Sometime during the month of July a small nursery would be sown. Six to eight weeks after sowing, seedlings would be transplanted in the plot in rows about 70 cms apart and plants in the row at 30 cm. At the same time the plants for seed production would be set apart. We were told that fodder turnips could not be grown on the steep hill (40%).

produce a very palatable fresh fodder as from the late autumn well into the winter.

* Fodder turnips, sown in the barley stubble in late July or early August,

Subsequently we drove to Eckartsweil a hamlet on the flat grounds near the river Rhine. On a farm in the village we met a farmer's wife who kept her own seed of fodder turnips. She had inherited this type from the previous owner on the farm some 30 years ago. The type was described as 'Stoppelrube, halblang, rotköppig, weiss fleissig'.

There was not an opportunity to visit the farm land. We were given about 100 gr of last year's seed. In this area there was no sign of the 'Geisskael' the farmer's wife did not know the crop !

In Hasslach we met Mr. Walter of the Landwirtschaftschule and we made a swing through the fringes of the Schwarzwalz here.

Quite a few plantings of 'Geisskael' were observed but invariably planted inside the vegetable garden. The 'kael' was taller here, the leaves larger and the green colour was rather lighter than the former we had seen. It appeared that a particularly active farmer's wife (whom we met) produced (seed and) seedlings fir sale. The plots we had seen had all been planted with such seedlings.

In Oberharmersbach we spent the night in a Gasthof (inn) where we had been on other occasions and knew the owner, Mr. Schäck himself a farmer He confirmed the story of the 'Geisskael' and added that the upper leaves are cooked and eaten as a delicacy after the first night frosts have occurred. He also told us about a crop of the name 'Kreuselkael' (curly kale) which is sown in autumn so the plants are rather small during winter (consequently they do not flower in the following year). When in spring the plants grow out, the lowest leaves are cooked into a delicacy. The leaves are sliced lengthwise into thin strips, briefly cooked, some salt and pepper added, and eaten with bacon and potatoes with horse radish sauce.

As the plants grow out the leaves are fed to pigs, rabbits, chickens. A few plants are allowed to go through the second winter and will flower the following year to produce seeds.

In the Landwirtschaftskammer in Lahr we met Mr. Wachter who took us to farmland near the Rhine. Here we met a farmer who grew his own fodderturnip seed and we saw his turnip field. There were many different kinds of turnip plants in the field; all combinations of white flesh or yellow flesh and white, green red and bronze tops. It transpired that the farmer did this deliberately, i.e. he would plant representatives of the different types in the seed production plot. His belief was that in this way, no matter the vagaries of the climate, he would have a crop.

Note on soils and clubroot in this area (information from Dr. Gruber). Black forest soils tend to be acid as against Alp derived soils deposited by the Rhine, which have a high PH. Rivers from the Black forest (draining in the Rhine) deposit material with a low PH and it is on such soils that clubroot disease occurs. Clubroot disease is well known to people but it is rare. Gruber mentioned a very serious case of clubroot in a field of a farmer who had grown oilseed rape, fodder turnips, white mustard and fodder rape within a couple of years time.

3. The identification of areas where farmers, still grow their own seed was done by contacting so called 'Pflanzenschütz berater' (Plant Protection officers), a network of whom exists throughout the Bundes Republick. Most of these officers live in the areas for many years, are highly regarded by know the farmers well. In his capacity of Plant Pathology and Plant Protection specialist the senior author functions in this network . At the same time, the breeding firms registered at the Bundessortenamt were approaches with a request for samples of seed of their varieties. Both approaches were entirely successful as will be clear from the summary of accessions as in Table 1. and the full list of accessions collected.

We believe that the genetic variation of the crops in guestion has been collected. It has all been sent to the German gene bank in Braunschweig.

- 155 -

Material collected in CP's 8 and 11 by P. Mattusch and H. Toxopeus.

T	ab	le	1	

		Number of accessions					
Weisskohl (white cabbage)	Landraces	52		Braun-	Collec	-	Sortnr
Experimental materials		12		schweig-	tors')	(name variet
	OP varieties	20		code	couc		VIIICO
Rothkohl u Wirsing (red cabbage and savoy cabbage)	r	20					
Kohlrabi		25		WEISS KOHL	WHITE	CABBAGE	B. ole
Blumenkohl (cauliflower)		6		landraces			
Herbstrueben bulbing (stubble turnips)		13		34720	PMHT	1	Bayerr
Winterruebsen non bulbing		4		34721	PMHT	2	Bayerr
Sommerruebsen (summer turnip rape)		4	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	34722	PMHT	3	Merchi
Kohlruebe (rutabaga) Sarepta senf (indian mustard)		9		34723	PMHT	4	Unterp Herbst
Weisser senf (white mustard)	4	7		34724	PMHT	5	Unterp
Oelrettich (oilseed radish)		6		24725	DMUT		Herbst
Rettich (giant radish)	Landraces	19		34723	PMAI	6	Herbst
Radies (radish)	OP varieties Landrace	18		34726	PMHT	7	Unterp Herbst
	OP varieties	24		34727	PMHT	8	Unterp Herbst
	Total	243 accessions		34728	PMHT	9	Unterp Herbst
231 (Landraces OP varieties	72/231 x 100 159/231 x 100		34729	PMHT	10	Unterp Herbst
	Exp.materials	12		34730	PMHT	11	Unterp Herbst
				34731	PMHT	12	Unterp Herbst
				34732	PMHT	13	Unterp

*) PM = Peter Mattusch HT = Hille Toxopeus name of ty) Ursprung (Origin)

eracea L.

Baar, Paul nwaldkraut nwaldkraut Petzi, Anton Lefin, Josef, Merching inger Kraut pleichfelder Wild, Ottmar, Unterpleichfeld tkraut pleichfelder Büttner, Hubert tkraut pleichfelder Schneider, Willy tkraut pleichfelder Bauer, Erwin tkraut pleichfelder Wild, Ewald tkraut pleichfelder Schneider, Kurt tkraut pleichfelder Strauss, Hermann tkraut pleichfelder Bauer, Ewald tkraut pleichfelder Kamm, Richard tkraut Unterpleichfelder Fischer, Paul Herbstkraut

34733	PMHT 14	Unterpleichfelder Herbstkraut	Schmitt, Hermann		35918	РМНТ 239	Ismaninger Kraut
34734	PMHT 15	Unterpleichfelder Herbstkraut	Schmitt, Alfons		35919 35920	РМНТ 240 РМНТ 241	Ismaninger Kraut Ismaninger Kraut
35064	РМНТ 104	Filderkraut	Schumacher, G., Bernhausen		35921	PMHT 242	Ismaninger Kraut
35065	РМНТ 105	Filderkraut	Wölfle, Echterdingen				
35066	PMHT 106	Filderkraut	Wölfle, Echterdingen	•			
35067	PMHT 107	Filderkraut	Schumacher, H., Bernhausen		experim	ental materia	al
35068	PMHT 108	Filderkraut	Beck, Ernst, Echterdingen		35886	РМНТ 207	Türkis
35069	PMHT 109	Filderkraut	Stäbler, L., Echterdingen	-	35887	РМНТ 208	Zimmiaja gribovskaja
35070	PMHT 110	Filderkraut	Weinmann, Bernhausen		35888	РМНТ 209	Ladozskaja 22
35071	PMHT 111	Filderkraut	Kitzele, Echterdingen		35889	РМНТ 210	Losinoovstrovskaja 8
35072	PMHT 112	Filderkraut	Schäfer, M., Echterdingen		35890 。	PMHT 211	(F ₅ (24-127x8-41)
35073	РМНТ 113	Filderkraut	Bayha, A., Sielmingen		35891	РМНТ 212	Châteauguay
35074	PMHT 114	Filderkraut	Schüle, H., Perouse		35892	РМНТ 213	Friedberg
35075	РМНТ 115	Filderkraut	Auch-Schwarz, Echterdingen		35893	РМНТ 214	Bindsachsener
35076	РМНТ 116	Filderkraut	Stollsteimer, H., Echterdingen				(1VT /2/54)
35077	PMHT 117	Filderkraut	Steckroth, Echterdingen		35894	PMHT 215	(IVT 72755)
35078	PMHT 118	Filderkraut	Schollmanz, Echterdingen		35895	РМНТ 216	Böhmerwaldkohl A
35079	РМНТ 119	Filderkraut	Limbächer, K., Echterdingen				(IVT 72756)
35080	РМНТ 120	Filderkraut	Gross, M., Leinfelden		35896	РМНТ 217	Böhmerwaldkohl A
35081	PMHT 121	Filderkraut	Stäbler, F., Echterdingen		25.007		(P1/USA 215514)
35082	PMHT 122	Filderkraut	Vohl, Unteraichen		32897	PMHT 218	(PI/USA 215515)
35083	PMHT 123	Linie M 21 Filderkraut	Landessaatzuchtanstalt Stuttgart				
35084	РМНТ 124	Linie M 23 Filderkraut	Landessaatzuchtanstalt Stuttgart		varieti	es	
35085	PMHT 125	Linie M 24	Landessaatzuchtanstalt Stuttgart		34839	PMHT 80	Dithmarscher Früher
		Filderkraut			34840	PMHT 81	Dithmarscher Früh-
35086	PMHT 126	Filderkraut	Gross, Echterdingen Ernte 73		24041	DMUM 92	Amagor - hochstrun-
35087	PMHT 127	Filderkraut	Krämer, Plieningen Ernte 71		34841	PMHI 02	kig
35088	PMHT 128	Filderkraut	Schäfer, Echterdingen Ernte 71		34842	PMHT 83	Dauerweiss
35899	РМНТ 220	Filderkraut	Priem, Bernhausen		34843	PMHT 84	Holsteiner platter
35900	PMHT 221	Filderkraut	Lutz, Bernhausen		34844	PMHT 85	Ledtjes Herbst weiss
35901	PMHT 222	Ismaninger Kraut	Reisinger, K., Ismaning		34845	PMHT 86	Ledtjes Winter weiss
35902	РМНТ 223	Ismaninger Kraut	Reisinger, Ch., Ismaning		34846	PMHT 87	Marner Allfrüh
35914	PMHT 235	Ismaninger Kraut	Kienast, Ismaning		34847	PMHT 88	Marner Augustkohl
35915	РМНТ 236	Ismaninger Kraut	Deimel, Ismaning		34848	PMHT 89	Marner Frühseptem-
35916	РМНТ 237	Ismaninger Kraut	Deimel, Ismaning				ber
35917	PMHT 238	Ismaninger Kraut	Kraus, Ismaning		34849	PMHT 90	Marner Julico

- 157 -

Kraus, Ismaning Wanzinger, Ismaning Soller, Ismaning Bauer, Ismaning

Vavilov, Institut Vavilov, Institut Vavilov, Institut Vavilov, Institut Kanada Kanada USA IVT, Wageningen, NL IVT, Wageningen, NL IVT, Wageningen, NL PI- Institut, Pullman PI-Institut, Pullman

Diener, Schülp Diener, Schülp GZG Marne GZG Marne GZG Marne

GZG Marne

GZG Marne

GZG Marne

GZG Marne GZG Marne

GZG Marne

- 158 -

- 159 -

34850	РМНТ 91	Marner Frico	GZG Marne		35152	РМНТ 199	Vertus
34851	РМНТ 92	Marner Industraweiss	GZG Marne		35153	РМНТ 200	Gonsenheimer
34852	рмнт 93	Marner Lagerweiss	GZG Marne		35154	PMHT 201	Ferrus HKZ
34853	рмнт 94	September	GZG Marne		35155	PMHT 202	Praeco HKZ
34854	PMHT 95	Ballony	Rohde, Guxhagen				
35150	РМНТ 197	Nagels Frühweiss	Nagel, Glückstadt				
3515 1	РМНТ 198	Nostra HKZ	Sperling, Lüneburg		•		
35935	РМНТ 256	Wiam	Hild, Marbach		KOHLRABI	KOHLRAB	B. oleracea L.
35940	РМНТ 261	Agat	Kruse, Bielefeld				
		5			Varietie	es	
					34829	PMHT 70	Noriko
				5 T	34830	PMHT 71	Blauer Delly
ROTKOHL	RED CABB	AGE B. oleracea L.			34831	PMHT 72	Prager blauer Markt
					35127	РМНТ 174	Wiesmoor Weisser Treib
Varietie	25				35128	PMHT 175	Corvus
34832	РМНТТ 73	Dieners Frührotkohl	Diener, Schülp		35129	PMHT 176	Blaro
34833	PMHT 74	Dauerrot	GZG Marne		35130	PMHT 177	Lanro
34834	РМНТ 75	Marner Frührotkohl	GZG Marne		35131	PMHT 178	Rowel weiss
34835	РМНТ 76	Marner Lagerrot	GZG Marne		35132	PMHT 179	Trero
34836	РМНТ 77	Marner Rocco	GZG Marne		35133	PMHT 180	Castor
34837	РМНТ 78	Marner Septemberrot	GZG Marne		35134	PMHT 181	Delikatess blau
34838	РМНТ 79	Nigay	Rohde, Guxhagen		35135	PMHT 182	Ozean
35148	рмнт 195	Allrot	Wagner, Heidelberg		35136	PMHT 183	Galant
35149	РМНТ 196	Mohrenkopf	Stahn + Finke, Osnabrück		35137	PMHT 184	Capri
	100				35138	PMHT 185	Primavera weiss
					35139	PMHT 186	Primavera blau
					35140	PMHT 187	Optimus
WIRSING	SAVOY CAB	BAGE B. oleracea L.			35141	PMHT 188	Prila
					35142	PMHT 189	Primafix
Varietie	25				35143	PMHT 190	Primalux
34855	РМНТ 96	Hammer	Aders, Düsseldorf		35144	PMHT 191	Prinovit
34856	РМНТ 97	Juliwirsing	Diener, Schülp		35145	РМНТ 192	Knaufs Frühweiss
34857	PMHT 98	Vorbote	Erfurter Samenzucht, Walluf	*	35146	PMHT 193	Knaufs Ideal
34858	РМНТ 99	Dauerwirsing	GZG Marne		35158	PMHT 205	Blusta
34859	РМНТ 100	Marner Frühkopfwirsing	GZG Marne		35938	РМНТ 259	Azur Star
34860	PMHT 101	Marner Grüfewi	GZG Marne				
34861	PMHT 102	Marner Grünkopf	GZG Marne				
34862	РМНТ 103	Marner Septemberwir-	GZG Marne				
		÷					

sing

.

Stahn + Finke, Osnabrück Wagner, Heidelberg van Waveren, Göttingen van Waveren, Göttingen

Pfann, Nürnberg				
Rohde, Guxhagen				
Schmitz, Bonn				
Benary, HannMünden				
Fetzer, Kitzingen				
Roggli, Hilterfingen				
Royal Sluis, Enkhuizen				
Sperling, Lüneburg				
Stahn + Finke, Osnabrück				
Wagner, Heidelberg				
van Waveren, Göttingen				
van Waveren, Göttingen				
van Waveren, Göttingen				
van Waveren, Göttingen				
van Waveren, Göttingen				
van Waveren, Göttingen				
van Waveren, Göttingen				
van Waveren, Göttingen				
Zwaan, Kleve				
Zwaan, Kleve				
RIJK Zwaan, Welver				
Hild, Marbach				

BLUME	NKOHL CAU	LIFLOWER B. oleraced	۶L.	18101	PMHT	138	Dr. v. Schmieder's Steinacher Früher Winterrübsen	Saatzucht Steinach
Variet	cies							
35125	PMHT 171	Alpha	Stahn + Finke, Osnabrück					
35125	PMHT 172	Alpha	van Waveren, Göttingen					
35 126	PMHT 173	Danova	Garvens	COMMEDD		CLIM		
35156	PMHT 203	Flora-Blanca RZ	RIJK Zwaan, Welver	JUMMERK	JEBSEN	50M	IMER TURNIP RAPE D. ra	lpa L.
35157	PMHT 204	Malinus RZ	RIJK Zwaan, Welver	Varieti	es			
35939	PMHT 260	Neckarperle	Hild, Marbach	2/101/1	DMUT	1.6	Fala	1/WS Finhack
	•			24014		46	Falo	KWS, EINDECK
				29619		4/	NOKO	KWS, Einbeck
				3/1815	ГРИПТ ОМЦТ	40 /19	Saturn	Freudenherger Krefeld
HERBST	RUEBEN SI	UBBLETURNIPS B. (car	mpestris) rapa L.	240Ţ2	PMAI	49	Saturn	Freudenberger, kreieru
Variet	ies							
34820	PMHT 57	Goldrubin	Nebelung, Münster	KOHLRUEI	BE	RUT	TABAGA B. napus L.	
28613	PMHT 58	Goldvital	Nebelung, Münster					
34821	PMHT 59	Grandessa	Nebelung, Münster	Varieti	es and e	experim	mental material	/
34822	PMHT 60	Maschinella	Nebelung, Münster	34816	PMHT	53	Heinkenborsteler	Petersen, Lundsgaard
28611	PMHT 61	Salusia	Nebelung, Münster	34817	PMHT	54	Seefelder	Petersen, Lundsgaard
34823	PMHT 62	Siloganova	Nebelung, Münster	34818	PMHT	55	Seegold	Petersen, Lundsgaard
34824	PMHT 63	Teutonengold	Nebelung, Münster	34819	PMHT	56	Wilhelmsburger	Petersen, Lunsgaard
28607	PMHT 64	Vollenda	Nebelung, Münster	35094	PMHT	134	Grunkopfige gelbe	Sperling, Lüneburg
34825	PMHT 65	Weseler	Nebelung, Münster				Wilhelmsburger	
34826	PMHT 66	Aarselia	Stroetmann, Münster	35095	PMHT	135	Mella	Stahn + Finke, Osnabrück
34863	PMHT 67	Weseler	Stroetmann, Münster	35904	PMHT	225	York x Wilhelmsburger	Kanada
35096	PMHT 136	Goldwalze	Stahn + Finke, Osnabrück	35905	PMHT	226	York	Kanada
35097	PMHT 137	Teutoburger	Stahn + Finke, Osnabrück	35906	PMHT	227	Turnip-rutabaga Hybride	Kanada
	•				P			
WINTERF	RUEBSEN FO	DDERTURNIPRAPE B. (compestris) rapa L.	SAREPTA	SENF	IND	DIAN MUSTARD B. juncea	
				28602	Рмнт	42	Aurea	Uni v Giessen
Varieti	es			28601	рмнт	76]/13	Secus	Honne, Sittensen
34335	PMHT 50	Heges Winterrübsen	Hege, Hohebuch	20001		177	00000	hoppo, or consen
7313	PMHT 51	Perko PVH	KWS, Einbeck					
34351	PMHT 52	Buko	KWS, Einbeck					

WEISE	R SENF	WHITE MUSTARD Sinapis a	lba L.	34801	PMHT 28	
Varie	ies			34802	РМНТ 29	Münchener weisser Treib u. Setz
34503	די ב אורי ב	13 Cisilba	Dohm Hardware	35907	РМНТ 228	Riedel x Sterr
34812	РМНТ 4	4 Siko	Bohm Harburg	35908	РМНТ 229	Original Münchner Tre
34813	ר ב אמריד 1	15 Albetros	Betargen Lunda -			brettich Typ Kuchler
34538	PMHT 13	a Simal	Sectorselt, Lundsgaard	35909	PMHT 230	Pauli - Rettich
34536			Saatzucht Steinach	35910	PMHT 231	Münchner Treib und
51550	1 1411 14	Steinacher Weisser	Saatzucht Steinach	25044		Freiland
		Senf		32911	PMHT 232	Munchner Treib und Freiland, Selektion
18339	PMHT 14	1 Arda	Pflanzenzucht Oberlimpurg			Schamberger-Ettner
18338	РМНТ 14	2 Dr.Franck's Hohenhei- mer Gelb	Pflanzenzucht Oberlimpurg	35912	РМНТ 233	Münchner Treib und Freiland, Selektion
						Ettner-Kattner
				35913	PMHT 234	Münchner Treib und Freiland, Selektion Eggenweber
OE LRET	TICH 0:	ILSEEDRADISH Raphanus sa	tivus L.			Eggenweber
Variet	ies			Varieti	es	
34325	PMHT 31	1 Pegletta	Petersen, Lundsgaard	35098	PMHT 144	Schifferstädter Mai
34804	PMHT 32	2 Siletta Nova	Petersen, Lundsgaard	35099	PMHT 145	Schifferstädter Mai
34805	PMHT 33	3 Toro	Freudenberger, Krefeld	25 400		Frunstamm
34806	PMHT 34	4 Apoll	Semundo, Hamburg	35100	PMHT 146	Regina
26657	PMHT 35	5 Rauola	Böhm, Lüneburg	35101	PMHT 147	Benarys Reform
34807	РМНТ 36	5 Mira	Böhm, Lüneburg	35102	PMHT 148	Halblanger Weisser Sommer, Type Kitzinge
				25 10 2		III. 8
				25104	DMIT 149	Maindreieck
				25104	PMHI 150	Mainkrone
RETTIC	I GIANT	RADISH Raphanus sativus	s L.	35105	PWHI 121	und Setz, Typ Nockher berg
Landrad	ces			35106	PMHT 152	Quick
34791	PMHT 18	}	Seidel, Segnitz	35107	РМНТ 153	Rex
34792	РМНТ 19		Seidel, Segnitz	35108	РМНТ 154	Unus Treib
34794	PMHT 21		Töpfer, Albertshofen	35929	PMHT 250	Pax
34795	PMHT 22		Busigel, Albertshofen	35930	PMHT 251	Roter Neckarruhm
34796	PMHT 23		Wenkheimer, Albertshofen	35931	РМНТ 252	Hilds blauer
34797	PMHT 24		Gernert, Albertshofen			Herbst und Winter
34798	РМНТ 25		Gernert, Albertshofen	35932	РМНТ 253	Osterfruss rosa
34799	РМНТ 26		Gernert, Albertshofen	35933	PMHT 254	Hilds weisser Neckar-
34800	РМН Т 27					runm

Höhn, Albertshofen

PMHT 27

```
Röder, Kitzingen-Etwashausen
   Fischer, Pfaffenhofen
   Zotz, München
ei- Öllbrunner, München
   Öllbrunner, München
   Ollbrunner, München
   Öllbrunner, München
   Kiening, München
   Evers, München
   Wagner, Heidelberg
   Wagner, Heidelberg
   van Waveren, Göttingen
  Benary, Hann.-Münden
   Fetzer, Kitzingen
≥r
   Fetzer, Kitzingen
  Fetzer, Kitzingen
ib Fetzer, Kitzingen
  Fetzer, Kitzingen
  Fetzer, Kitzingen
  Fetzer, Kitzingen
  Hild, Marbach
  Hild, Marbach
  Hild, Marbach
  Hild, Marbach
  Hild, Marbach
```

1.	CRUCIFEROUS CROPS IN BELGIUM - CP9
	L. van Hee, Rijksstation voor Plantenver
1.1.	Common names and their scientific synon
	<u>Brussels sprouts</u> - Brassica oleracea L

redeling, Merelbeke. yms. var. gemmifera D.C. Cabbage - Red - Brassica oleracea L var. capitata D.C.f. rubra "F. alba - White -.. Sabauda - Savoy -88 12 91 ... Cauliflower - Brassica oleracea L var. botrytis D.C. Kale - Brassica oleracea L var. acephala D.C. Radish and fodder radish - Raphanus sativus L.

Rape and fodder rape - Brassica napus var. oleifera Turnip - Brassica rapa var. rapa

- Utilization 1.2.
- in the winterfeeding of cattle.
- 1.2.3. Oleiferous crops:

1.2.1. Crucifers used as forage crops and green manure: Kale and fodder rape are mostly used for cattle grazing in winter. Turnips are harvested from late autumn on and used as a supplement Fodderrape and fodder radish are sometimes used as green manure. They are sown in August and ploughed in autumn. 1.2.2. Crucifers cultivated for human consumption: Red cabbage, white cabbage, savoy cabbage, cauliflower, radish and Brussels sprouts (Stems and upper leaves of Brussels sprouts are used also for animal feeding). Rape is the only oleiferous crop cultivated in Belgium. It is cultivated only on a small scale, mainly in the southern part of Belgium. However in the last two years the cultivated area is expanding.

1.3. Cultural practices and crop rotations

> Kale, fodder rape and turnips usually are sown as a catch crop after winter barley or potatoes.

Kale is sown in rows of 40 cm apart at the end of July. Fodder rape is sown in rows of 20 cm apart in the first week of August.

35934	PMHT 255	Münchner Bier	Hild, Marbach
RADIES	RADISH	Raphanus sativus L.	
Landrace	2		
34713	PMHT 20		Seidel, Segnitz
			
Varietie	ès		
34803	PMHT 30	Roky	Rohde, Guxhagen
35 109	PMHT 155	Stoplite	Fetzer, Kitzingen
35110	PMHT 156	NZ 1618/77	Rohde, Guxhagen
35111	PMHT 157	Knacker	Sperling, Lüneburg
35112	PMHT 158	Parat	Sperling, Lüneburg
35113	РМНТ 159	Carnita	Sperling, Lüneburg
35114	PMHT 160	Prinz Rotin	Sperling, Lüneburg
35115	PMHT 161	Kutara	Sperling, Lüneburg
35116	PMHT 162	Delikat	Stahn + Finke, Osnabrück
35117	PMHT 163	Non plus ultra	Stahn + Fin ke, Osnabrück
35118	РМНТ 164	Certina	Wagner, Heidelberg
35 119	PMHT 165	Eterna	Wagner, Heidelberg
35120	PMHT 166	Fix	Wagner, Heidelberg
35121	PMHT 167	Korund	Wagner, Heidelberg
35122	PMHT 168	Frühwunder	van Waveren, Göttingen
35123	PMHT 169	Hawo Alpha	van Waveren, Göttingen
35124	PMHT 170	Signal	van Waveren, Göttingen
35159	PMHT 206	Rota	RIJK Zwaan, Welver
35722	PMHT 243	Riesenbutter	Hild, Marbach
35723	PMHT 244	Hilds Boy	Hild, Marbach
35924	PMHT 245	Hilds Neckarperle	Hild, Marbach
35925	PMHT 246	Raxe	Hild, Marbach

35926

35927

35928

PMHT 247

PMHT 248

PMHT 249

Hilmar

Hilds Sora

Hilds Karissima

Hild, Marbach

Hild, Marbach

Hild, Marbach

- 166 -

Turnips are sown in rows of 40 cm apart at the end of July or in the first week of August after barley.

After emergence turnips are thinned out by hand to a plant-distance of 30 cm in the rows.

Horticultural crucifers are mostly sown in seedbeds and transplanted to the field. Cauliflowers and radish have a short growing period and can be cultivated in rotation with other crops in the same year.

1.4. Main problems of cultivation

1.4.1. Diseases

Clubroot (Plasmodiophora brassicae) is a main problem in the cultivation of turnips. Some land races of turnips are more resistant to it than others.

In rape and fodder rape phoma, alternaria sclerotinia and ring-spot occur rarely. Aphids and different sorts of caterpillars cause often much damage on young plants of crucifers.

1.4.2. Other problems

Bird damage to the ripening rape crop is causing considerable seed losses. In horticultural crops the use of the more uniform F_1 hybrids will contribute to the solving of mechanization problems.

Turnips are mostly still harvested by hand. There also mechanization could promote the culture of turnips.

1.5. Localities, acreage and economic value

1.5.1. Crucifers for fodder and green manure purposes. Stubble turnips are grown as a catch crop, mainly in Flanders. In the autumn they cover an area of + 35.000 ha. The second important catch crop is fodder rape with an areage of + 20.000 ha.

The area of fodder kale and marrow-stem kale is estimated at + 5.000 ha. New varieties of Sinapis alba and Raphanus, resistant to beetcysteelworms are now tried as a green manure crop.

1.5.2. Horticultural crucifers

In Belgium the province of West-Flanders is the main cultivation center of vegetable crucifers, while the region of Mechelen is the second important center.

Official figures for 1982 in the following table give an idea of their economic value

Vegetable crucifers in Belgium - 1982 - cultivated area in ha.

$(C_{i}) = (c_{i}) + (c_{$	Belgium
Brussels sprouts	1.260
Cauliflowers	991
Red cabbage	219
White cabbage	105
Savoy cabbage	119
Radish	18

2.712 ha

More than half the cultivated area is situated in the province West-Flanders.

Deep-freeze conservation methods of Brussels sprouts contributed to the rapid spreading of this culture.

1.5.3. Rape

Total

Only a few ha were cultivated in Belgium till 1981. In the last two years the cultivation of rape is spreading rapidly in the region of Namur. In 1982 - 1983 + 5.000 ha of winter-rape were cultivated.

2. VARIETAL SITUATION

Turnips

Many land races of turnips are cultivated in the province of East-Flanders. However the cultivars Leielander, Meetjeslander and Record - are more club-root resistant and are estimated to cover 70% of the cultivated area.

Fodderrape and Kale

The cultivated area of fodder rape consists mainly of cultivars such as Emerald and Gruner Angeliter. The only existing land race Bladkool van Lo is not so productive as the new cultivars. No land-races of kale are grown. The Belgian kale cultivar Cauletta is still cultivated.

Prov. W. Flanders

1.004	
442	
139	
42	
45	
2	

1.674 ha

Rape

Only the french cultivars Jet Neuf and Bienvenue are cultivated at this moment.

Horticultural crucifers

The cultivars of Brussels sprouts that are cultivated are mostly F_1 hybrids. Some land races still exist.

Of cabbage the percentage of ${\rm F}^{}_{1}$ hybrids is growing steadily because they are more uniform and facilitate mechanisation of harvest. Some land races of cabbage still exist. Of cauliflower some land races exist also.

3. REGIONAL WORKING-GENE BANK COLLECTIONS

In Belgium no systematic collecting of land races and cultivars of crucifers was done before. At the State Plant Breeding Institute (R.V.P.) at Merelbeke a collection of cultivars of rape (46 cultivars) and fodder rape (15 cultivars) is conserved at -20° C.

4. COLLECTING STRATEGY

Seed firms were contacted and farmers were visited. Usefull information was obtained from merchants who are in contact with farmers, and also from extension services of the Ministry of Agriculture. The amount of seed of each land race we received was 100 g.

The collected seeds had to be cleaned and germination tests were performed. The seed samples were stored in a refrigerator at -20° C.

5. COLLECTING REGIONS

The project CP9 embraced the collection of seed of land races and cultivars of crucifers in the Belgian provinces East and West-Flanders.

6. COLLECTION RESULTS

Collecting work was concentrated on turnips, fodder rape, fodder Kale and marrow-stem kale.

Turnips

In the 16th. century this crop was already intensively cultivated in Waasland, a region situated in the Northern part of East-Flanders. At this time. Waasland was the first region where thinning out of turnips after emergence was practiced.

At wider plant-distance turnips form bigger tubers. This method spreaded later to other regions. On the townshields of several towns in Waasland a turnip is pictured. Nowadays the culture of turnip remains important in this region. However the typical old land races of Waasland, characterised by a long blue-red or white root with a pointed toottip and a blue-red top, and that served as basic material for the breeding of the clubroot-resistant cultivar "Waaslander R.V.P.", have nearly disappeared. The land races of this region remain however an important gene source for

clubroot resistance.

The collecting of land races of turnips came in fact some years too late for Belgium. The cultivated area of turnips has diminished considerably due to the extension of the culture of fodder maize. At some farms, the farmer had ceased to produce seeds from his own variety since two or more years, so he could only deliver old seed if any. Several collected seed samples had no germination capacity.

In many cases also land races are superseded by clubroot resistant cultivars.

In West-Flanders land races have almost completely disappeared. The sum of two years collecting amounts to 33 land races and 8 Belgian

cultivars of turnips (see map).

I received also a collection of seeds of 22 land races of stubble turnips collected by Dr. Toxopeus in 1971 in East-Flanders (Waasland). This makes a total of 55 land races and 8 cultivars.

Fodder rape and kale

We collected only one land race and one cultivar of fodder-rape. The search for land races of marrow stem kale and fodder kale has been unsuccessful. However we obtained one Belgian cultivar of marrow-stem kale and one Belgian cultivar of fodder kale.



- 171 -

LIST OF MAINTAINERS OF THE COLLECTED RACES AND CULTIVARS

Brassica rapa L Var. rapa

<u>Coll</u>	.nr.		Weight	Germ. %
В	1	- Land race - maintained for more than 40 years Long cylindrical shape, green-white colour Marcel Martens, Magretstraat 30-32 9131 BEERVELDE	100 g	96
В	2	- Land race - maintained for more than 20 years Globular shape, white colour Armand de Pourcq, Diepestraat 7 9790 WORTEGEM	100 g	88
В	3	- Land race - maintained for many years Long cylindrical shape, green-white colour, clubroot resistant Paul de Keukeleire, Broekstraat 69 9280 OVERMERE	100 g	96
В	4	- Land race - maintained for more than 40 years Long cylindrical shape, green-white colour, André Roobroeck, Steenweg Deinze 107 9770 KRUISHOUTEM	100 g	98
В	5	- Land race - maintained for more than 40 years Globular shape, green-white André Roobroeck, Steenweg Deinze 107 9770 KRUISHOUTEM	100 g	95
В	6	- Land race - maintained for more than 50 years Globular shape, green-white colour Cyriel Wittoeck, Butswerve 23 9990 MALDEGEM	100 g	35
В	7	- Land race - maintained for more than 50 years Long cylindrical shape, green-white colour Cyriel Wittoeck, Butswerve 23 9990 MALDEGEM	100 g	70
В	8	- Land race - maintained for more than 20 years Shape mixed long or globular, green-red-white colour De Preester-Bracke, Spoorwegstraat 1 9731 EKE	100 g	95
В	9	- Land race - maintained for more than 20 years Long cylindrical shape, green-white colour not very clubroot resistant Valère Schelstraete, Mosgaverstraat 21 9810 DRONGEN	100 g	100
В	10	- Land race - maintained for more than 50 years	100 g	84

Half long shape, green-white colour Germain Bert, Rijborgstraat 13 9790 WORTEGEM

.

- 172 -

Coll.nr.		Weight	Germ. %	Coll.nr.	
B 11	- Land race - maintained for 40 years Long cylindrical shape, blue-red-white colour Robert Thienpont, Burg. Maenhoutstraat 5 9220 MERELBEKE	100 g	85	Б 23	 Land race - maintained for + 4 years Globular shape, green-white colour Roodts, Stekelhoek 1 9890 KNESSELARE
B 12	- Land race - maintained for more than 20 years Long cylindrical shape, green-white colour Willy Verniers, Eikelstraat 2 9101 DAKNAM	100 g	97	B 24	- Land race - maintained for more than Long cylindrical shape, green-white Kinderen Colpaert, Waregemse straat 9790 WORTEGEM
B 13	- Land race - maintained for more than 20 years Long cylindrical green-white colour Gebr. Zaman, Hazestraat 11 9101 DAKNAM	100 g	100	B 25	- Land race - maintained for more than Globular shape, green-white colour Kinderen Colpaert, Waregemse straat 9790 WORTEGEM
B 14	- Land race - maintained for more than 10 years Globular shape, green-white colour Cyriel Verschelde, Pontweg 9101 DAKNAM	100 g	71	B 26	- Land race - maintained for more than Globular shape, green-white colour Leon de Lombaerde, Anzegemweg 2 9790 WORTEGEM
B 15	- Land race - maintained for more than 20 years Globular shape, green-white colour Gebr. Vermeulen, Geirlandstraat 9101 DAKNAM	100 g	95	В 27	- Land race - own land race for more t Long green roots G. Buffel, Hollevoordestraat 2 8210 ZEDELGEM
B 16	- Land race - maintained for more than 20 years Long cylindrical, green-white colour Gebr. Vermeulen, Geirlandstraat 9101 DAKNAM	100 g	91	B 28	- Land race - maintained for more than Mixture of globular shape and long c shape André Santens, Gaverstraat 10
B 17	- Land race - maintained for more than 10 years Long cylindrical shape, green-white colour Bultinck-Oudenaert, Moerstraat 75 9970 KAPRIJKE	100 g	87	B 29	9790 WORTEGEM - Land race - maintained for more than White coloured, globular shape, full Cyriel Roels, Schorreweg 19
B 18	- Land race - maintained for more than 40 years Long cylindrical shape, red & green-white colour Jo de Roo, Warandestraat 35 9842 HANSBEKE	100 g	83	В 30	9992 MIDDELBURG - Land race - maintained for more than own seed production Green-white, gl obu lar shape
B 19	- Land race - maintained for more than 10 years Globular shape, red & green-white colour Jo de Roo, Warandestraat 35	100 g	62	B 31	Marcel Kerkaert, Veldhoekstraat 30 9990 MALDEGEM - Land race - Long cylindrical shape,
B 20	9842 HANSBEKE - Land race - maintained for more than 15 years Long cylindrical shape, green-white colour	100 g	89		race for more than 50 years J. Kerschaever, Biezeveldstraat 1 9990 MALDEGEM
	clubroot resistant Herteleer, Haagstraat 26 9930 ZOMERGEM			В 32	- Land race - Long shape, green-white more than 20 years own variety Edward Verhulst, Luiseekstraat 11
B 21	- Land race - maintained for more than 10 years Half long cylindrical shape, green-white colour Camiel van Poucke, Ameldonkdreef 2 9890 KNESSELARE	100 g	97	B 33	 2690 TEMSE Land race - Own variety for more tha white coloured globular shape clubro
B 22	- Land race - maintained for more than 50 years Globular shape, white colour Gebr. Moerman, Oudenaardse weg 88 9790 WORTEGEM-PETEGEM	100 g	3	B 34	 R. Houtekeete, Noordhoutstraat 111 9810 BAARLE-DRONGEN Cultivar "HOUTLANDER" LABOR S.V., Kleine Dokkaai 1-5 9000 GENT

- 173 -

.

	Weight	Germ. %
5	100 g	93
n 50 years colour 95	100 g	70
n 50 years 95	100 g	86
n 10 years	100 g	100
than 100 years	100 g	100
n 10 years cylindrical	100 g	85
n 8 years 1 leaves	100 g	94
n 6 years	100 g	100
his own land	100 g	98
coloured,	100 g	99
an 40 years, oot resistant	100 g	91
	100 g	87

<u>Coll.nr</u> .		Weight	Germ. %	
B 35	- Cultivar "ALANDER" J. Geeroms, Driesstraat 74 8880 TIELT	100 g	90	
B 36	- Cultivar "MEETJESLANDER" R.V.P. Van Gansberghelaan 109	100 g	92	<u>Coll.nr</u> . BC 13- 1
B 37	9220 MERELBEKE - Cultivar "WAASLANDER" R.V.P. Van Gansberghelaan 109	100 g	86	BC 13- 2 BC 13- 3
B 38	9220 MERELBERE - Cultivar "LEIELANDER" R.V.P. Van Gansberghelaan 109 9220 MERELBERE	100 g	98	BC 13- 4
B 39	- Cultivar "CRUZEL" DUMON-AGRO, Pathoekeweg 32 8000 BRUGGE	100 g	88	BC 13- 5
B 40	- Cultivar "RECORD" LABOR S.V., Kleine Dokkaai 1-5 9000 GENT	100 g	96	BC 13- 7
B 41	- Cultivar "ARCA" J. Geeroms, Driesstraat 74 8880 TIELT	100 g	93	BC 13- 8
	Brassica napus var. oleifera			
Coll.nr.		Weight	Germ. %	BC 13- 9
Bn 1	 Land race: Bladkool van Lo maintainded by R.V.P., Van Gansberghelaan 109 9220 MERELBEKE 	100 g	86	BC 13-10
Bn 2	- Cultivar : Annick LABOR S.V., Industrieweg 98-100 9030 WONDELGEM-GENT	100 g	91	BC 13-11
	Brassica oleracea L. var. acephala D.C.			BC 13-12
<u>Coll.nr</u> .		Weight	Germ. %	BC 13-13
Bo 1	- Cultivar : Angero J. Geeroms, Driesstraat 74 8880 TIELT	100 g	92	
Bo 2	- Cultivar : Cauletta LABOR S.V., Industrieweg 98-100 9030 WONDELGEM-GENT	100 g	88	BC 13-14

	COLLECTION OF LAND RACES WAASLAND-BELGIUM- DR.	OXOPEUS 1970	- 1971
	Brassica rapa L Var. rapa	t. De	
.nr.		Weight	Gern
3-1	- Kemzeke Oud	<u>+</u> 8 g	44
3- 2	- Eigen ras Krimineelstraat 4, KALKEN EESVELDE	<u>+</u> 8 g	2
3- 3	- Leielander X Rekord Krimineelstraat 4, KALKEN EESVELDE	<u>+</u> 8 g	97
3- 4	- Daknam Juul Timmerman, Kerkstraat 5	<u>+</u> 8 g	96
3- 5	- Zaffelare DAENINCK, Bij Vierweegse	<u>+</u> 8 g	90
3- 6	- Ronde St. Pauwels Zaadhandel, STEKENE	<u>+</u> 8 g	99
3- 7	- Felix over den Burger, Langewitte Barrevoetse Hoek 123, LEDE bij Kasteel Ronkenburg	<u>+</u> 8 g	81
3-8	- Felix over den Burger, platte witte ronde Barrevoetse hoek 123, LEDE bij Kasteel Ronkenburg	<u>+</u> 8 g	97
3-9	- Gyzichem ronde witte blauwkop Steenweg 86 AALST	<u>+</u> 8 g	62
3-10	 Platte ronde witte blauwkop uit Bruss. raap res. tegen knolv. Lebbeke, Korte Breestraat 23 KLEIN GENT 	<u>+</u> 8 g	98
3-11	- Lebbeke, Schuurkenstraat 2 KLEIN GENT	<u>+</u> 8 g	97
3-12	- Denderbelle, Dries 3 Ronde witte DENDERBELLE	<u>+</u> 8 g	92
3-13	- Ronde Rapen (witte) Conseriere Maurice, Dieterheidense veer 2A ZWAANAARDE	<u>+</u> 8 g	90

- Lange rapen (witte) Conseriere Maurice, Dieterheidense vee ZWAANAARDE BC 13-15 - KEIRSMAKER, ronde witte rapen Dam 41, DOORSELAARE, EKSAARDE

	Weight	<u>Germ. %</u>
	<u>+</u> 8 g	44,5
	<u>+</u> 8 g	2
	<u>+</u> 8 g	97
	<u>+</u> 8 g	96
	<u>+</u> 8 g	90
	<u>+</u> 8 g	99
	<u>+</u> 8 g	81
onde	<u>+</u> 8 g	97
	<u>+</u> 8 g	62,0
•	<u>+</u> 8 g	98
	+ 8 g	97
	<u>+</u> 8 g	92
er 2A	<u>+</u> 8 g	90
er 2A	<u>+</u> 8 g	81
	<u>+</u> 8 g	96

Coll.nr.		Weight	Germ. %
BC 13-16	- Zaffelare 2, ronde grote heelbl. SPEURDONK, Merenhoek 55	<u>+</u> 8 g	95
BC 13-17	- Land race	<u>+</u> 8 g	94
BC 13-18	- Land race	<u>+</u> 8 g	96
BC 13-19	- Nieuwkerken Waas konijnenvoer	<u>+</u> 8 g	1
BC 13-20	- Leielander Waasmunster aan grote Weg St. Niklaas GENT	<u>+</u> 8 g	96
BC 13-21	- HOUTLANDER	<u>+</u> 8 g	98
BC 13-23	- Kemzeke 1 of 2	<u>+</u> 8 g	98

E.C. RESEARCH PROGRAMME 0890 THE COLLECTION OF LAND RACES OF CRUCIFEROUS CROPS IN E.C. COUNTRIES

C.P. 10. FRANCE FINAL COUNTRY REPORT

Y. Hervé

Rennes Plant Breeding Station INRA Domaine de la Motte - 35650 - Le Rheu

I. CRUCIFEROUS CROPS IN FRANCE

- 1.1. Common names and their scientific synonyms

 - b. Cauliflower (Brassica oleracea L. var. botrytis D.C.): choufleur
 - c. Brussels sprouts (Brassica oleracea L. var. gemmifera D.C.): chou de Bruxelles
 - d. Kale (Brassica oleracea L. var. acephala D.C.): chou fourrager
 - e. Rape and fodder rape (Brassica napus var. oleifera): colza oléagineux et colza fourrager
 - f. Swede (Brassica napus var. napobrassica): rutabaga.
- 1.2. Utilization
 - a. Horticultural crops

Cabbage, cauliflower and Brussels sprouts are of course cultivated for human consumption, mainly during autumn and winter, except cauliflower which is the only vegetable which can be produced all year long in France, owing to varietal diversity; however leaves and stems are also often used for animal feeding.

b. Forage crops

Kale, forage rape, rapekale and swedes are now only used in dairy farming and, scarcely, for sheep grazing. Those forages are declining and, in most regions, have been superseded by fodder maize and grass.

a. - Cabbage (Brassica oleracea L. var capitata D.C.): chou pommé

c. Oleiferous crops

Rape is, along with sunflower, the most important oleiferous crop in France and its importance is still growing up, due to progress in oil and oil-cake guality.

1.3. Cultural practices and crop rotations

Horticultural crucifers

Cabbage is mainly grown for autumn and winter harvesting. Some winter hardy types can be harvested till late april but they have to undergo winter frost and are generally cultivated in coastal areas.

Cauliflower is grown in special horticultural regions in rotation with non cruciferous crops. For instance, in Brittany, winter cauliflower is used in alternance with globe artichokes and autumn cauliflower with early potatoes.

A part of the Brussels sprouts are now harvested for deep freezing by growers under contracts with factories.

Nearly all cruciferous vegetables are sown in seed-beds and transplanted by machines at various densities from 1 to 3 plants by squaremeter, and in rows suitable for mechanical cleaning (70 to 100 cm apart).

Forage crucifers

Kale is grown in two different ways:

The old practice of transplanting (30 to 40.000 plants by hectare) is still used by farmers harvesting the crop for feeding cattle in stable.

A growing part is directly drilled and grazed in-situ during autumn and early winter. This system is often damaging for the soil. A rather recent method uses kales for summer grazing when sown in spring (April).

Oleiferous crucifers

One of the reasons for the development of rape, in addition to fixed prices, is that it is a good first crop in triennal (cereal) rotation. followed by winter wheat and barley.

1.4. Main problems of cultivation

1.4.1. All crucifers face a lot of common diseases Stems and roots damages due to clubroot (Plasmodiophora brassicae), black-leg, black-rot, Foliage diseases like downy mildew (Peronospora parasitica), white

rust (Albugo candida), Alternaria, ring-spot (Mycosphaerella brassicicola)

Other problems come from insects like flea-beetle, root-fly and many sorts of caterpillars, but, for the most, they can be controlled by insecticides.

Some of crucifers diseases and mainly clubroot are now increasing owing to:

- overspecialization of some regions like in Brittany for cabbage and cauliflower:
- leaving the affected roots in the fields;
- using heavy machines damaging the soil sometimes bad-drained and acid.
- 1.4.2. The second problem of crucifer production is the harvesting cost. Indeed most crops are still harvested by hand, except forage grazed or some kale and fodder rape picked by silage harvesters.

For cabbage, Brussels sprouts and cauliflower an improvement is coming from varieties more and more uniform (Fl hybrid) but entirely mechanical cropping cannot be assumed until now. Urgent need for more uniform varieties is however a source of genetic erosion.

1.5. Localities, acreage and economic value.

- 1.5.1. Vegetable crucifers
 - a. Cauliflower is one of the most important vegetable crops in France, nearing 40.000 hectares. Exportation reaches 50% of the total production. Three types have to be distinguished:
 - one region is very important with 1500 hectares, near Belgium border (Saint Omer-Dunkergue-Aubers).
 - the south of the Rhone-valley (Avignon-Chateaurenard) under irrigation.

- Summer cauliflower is grown in all green belts around cities but - Autumn cauliflower is grown in two quite distinct climatic areas: 4.500 hectares in Brittany (Saint Malo), and 2.000 hectares in

FRANCE-GEOGRAPHICAL DISTRIBUTION OF HORTICULTURAL CRUCIFERS

.....

• Choux à choucroute

Cabbage . (Choux-pommés)





(chou de Bruxelles) Brussels sprouts

- Winter and winter-hardy (or spring) cauliflowers are cultivated and northern coast of this region.
- b. Cabbage is grown everywhere, but three regions are more or less specialized:
 - Brittany, in two small areas: one near the Channel (500 hectares varieties (December to May) for fresh market.
 - Paris area growing cabbage in autumn for fresh market
 - 1300 hectares).
- c. Radish is grown everywhere and is an important crop now often cultivated under plastic tunnels and greenhouses for harvesting all year round.
 - For all vegetable crops, gardening is also very important for cabbage, turnips, radish, but less for cauliflower.

1.5.2. Oleiferous crucifers

- a. Rape, the most important cruciferous crops in France is expanding is cultivated with winter types which are more productive. Economic value of the crop, with an average yield of 2400 kg/ha is about 3 billions francs/1,1 billion DFL).
- b. Rape (Brassica campestris) has been largely cultivated in the past (50.000 hectares in 1850, 4000 hectares ten years ago), but has now disapeared.
- (Dijon area).

1.5.3. Forage crucifers

a. Kale is the most important, about 200.000 hectares mainly used in

in Brittany for 80% and reach now 30.000 hectares on the western

around Saint Malo), the other in the south on the atlantic coast (150 hectares near Lorient). These two regions are growing late

- Eastern part of France, mostly Alsace, well known for production and processing of heavy types of cabbage for sauerkraut (about

in the center and northern parts of the country (while sunflower the other competitive oil crop is very important in southwestern regions, and soybean is limited to the south). 90% of the acreage

c. Mustard (Brassica juncea) is grown for condimentary purpose on a few hunderd hectares (1600 ha) in the central east of the country

the western part of France. The acreage is decreasing slowly with the reduction of number of the smallest farms. However the amount



OILD-SEED-RAPE



BRASSICA NAPUS Oil-seed rape (colza oléagineux)







of seed used by farmers is increasing due to development of direct drilled crops (2 to 3 kg by hectare instead of 200 to 300 g for transplanted crops).

b. Forage rape (brassica napus) is also an important crop. About 200.000 hectares are sown but nearly an half is for green manure. Forage rape had in the last years more or less supplanted fodder turnip (navette) which can be harvested earlier in spring but was less productive. With the development of grass or maize silage, very early forage became less necessary.

ECONOMIC SITUATION OF CRUCIFEROUS CROPS IN FRANCE (1980)

	CRUCIFERS	ACREAGE (hectares)	YIELD (t/ha)	PRODUCTION (tonnes)
1.	Vegetable crops:			
	- Cauliflower	40.000	12	470.000
	- (fresh) Cabbage	7.000	23	160.000
	- (sauerkraut) Cabbage	1.300	68	90.000
	- Brussels sprouts	3.000	10	30.000
	- Radish	2.300	17	40.000
	- Turnip	3.000	21	64.000
	TOTAL VEGETABLE:	56.600		
2.	Forage crops:			
	- Kale	160.000	45	7.160.000
	- Fodder rape	110.000	28	3.100.000
	- Turnip rape	11.000	37	410.000
	- Fodder turnip	8.800	24	205.000
	- Swede	9.000	33	300.000
	TOTAL FORAGE:	300.000	2,8	1.090.000
3.	Oleiferous crops = Rape	390.000		
5	(winter rape)	(375.000)		
	TOTAL CRUCIFERS:	750.000 Hecta	res	

II. VARIETAL SITUATION OF CRUCIFEROUS CROPS IN FRANCE

Varietal situation is of course very different from crop to crop but for all to them genetic erosion is threatening and beginning land races collection was already too late for some species - at least in some types.

Horticultural crops

The importance of land races with regard to commercial varieties is uneasy to estimate because private gardeners or small growers selling to local markets sometimes use their own populations or old commercial open-pollinated varieties. A probably imperfect appraisal of present situation can be tried, in a very evolutive context:

20 %	80 %	_
30 %	60 %	10 %
80 %	20 %	-
5 %	25 %	70 %
_	10 %	90 %
	30 % 80 % 5 % -	30 % 60 % 80 % 20 % 5 % 25 % - 10 %

Oleiferous crops

For rape all varieties in use are pure lines of French origin. Ten years ago (1973), the first variety without eruciq acid was introduced and since 1974 only these varieties are allowed for French oil production. In 1983-84 only four varieties are in use (Jet neuf -Lingot - Bienvenue - Tandem). Tandem is the first 0.0. cultivar (without eruciq acid and with low glucosinolate content). The importance of these varieties will probably be increasing in the next years.

Forage crucifers

	Land races	Commercial 0.P. varieties	Hybrids
Kale	15 %	85 %	_
Turnip-rape	5 %	95 %	-
Fodder rape	5 %	95 %	-

III. REGIONAL WORKING AND GENE-BANK COLLECTIONS

This collection is the first operation fully engaged for all crucifers crops. However several initiatives had taken place in the past, most of them organized by plant breeders:

3.1. L'Institute National de la Recherche Agronomique (INRA) through Plant Breeding Stations of Rennes and Versailles manage collections and breeding work on some species:

Rape (M.J. MORICE Rennes) (started 25 years ago). Current cultivars of seed and forage rape are born of these collections but original land varieties are not yet available.

Kale (M.G. du CREHU Rennes). Two collections campaign in the past: one 25 years ago (60 land varieties) another 5 years ago (20 varieties, some still available).

Cabbage (M. BOULIDARD Versailles). A work on sauerkraut cabbage breeding in progress, started with French Alsacian land populations coming from a grower cooperative organization.

Cauliflower (Y. HERVE Rennes). A intensive collection work has been carried out in 1980 and 1981 for breeding purposes. 120 land races was gathered in the winter cauliflower growing areas of Brittany and Normandy.

3.2. Private breeding firms made their own collection works and hold a lot of land varieties, old commercial varieties and breeding material. The main firms are:

Horticultural crucifers: CLAUSE, CAILLARD, VILMORIN, TEZIER and a lot of smaller firms producing, selling and sometimes maintaining old commercial 0.P. varieties.

Forage crucifers: DESPREZ, CLAUSE, FABRE, LEDUC et LUBOT, RINGOT. Oleiferous cruciferous: RINGOT is the main firm, cooperating with INRA.

3.3. Due to growing interest on the general problem of genetic resources, some local or regional organizations are taking place, but they are not always fully equipped for long term conservation of seed for genetic material collected.

IV. COLLECTING STRATEGY

in different regions.

Growers was asked for 100 g of fresh seeds but samples collected by populations varies from 20 g to 300 g. Some lot of seeds had to be cleaned and germination tests was necessary before storing in cold chambers.

4.2. All commercial open-pollinated was asked from seed-merchants and some of them was got from several firms and will be separately preserved.

۷. COLLECTING REGIONS

Major work was done on crops where true land varieties are still in use in some regions. Western parts of France has been the most intensively investigated and this part of the country is for climatic. social and agronomic reasons appropriate for horticultural and forage crucifers growing (see maps).

VI. COLLECTION RESULTS

The most intensive collecting work was done on kale where genetic diversity in land-races is still important but is vanishing quickly. The types are not distinguished here but all sorts of kale was collected, belonging to 4 main groups with all intermediaries: - marrow-stem kale: oceanic areas (frost sensitive); - medium-stem kale: all regions; - thin-stemmed kale: northern and inland regions; - thousand-headed kale: mostly southern regions.

- 186 -

4.1. Owing to emphasis put on collection of true land races the main strategy has been to recruit collectors, generally Agronomy Students working during their summer holidays. Those collectors had to visit local agricultural advisers to get lists of farmers still producing their own seeds and then to visit growers and collect the seeds and informations regarding cultural practices, selection rate, method of seed production (directly in the field, after transplantation) In addition, the program co-ordinator and his assistants did some collecting trips and investigations about collecting opportuneness

breeding firms. On account of possible genetic drift in old varieties

A lot of work was devoted to horticultural crucifers emphasizing on cabbage where genetic erosion is important and several old varieties are now extinct. For cauliflower there is also a considerable threat, but less than for cabbage. Land-races have now almost disappeared for oleiferous crucifers and genetic diversity have to be found through international cooperation.



each dot = 2 land-races

- 191 -

COLLECTION OF LAND-RACES OF CRUCIFERS IN FRANCE

50

М

53

MeleL

49

D..S.

79

V.

86

H. . V 81

> С 19

VIJ

L.A.

կկ

N.

85

. RENNES

C.ON 22

M 56

DEPARTMENTS VISITED



Number of samples

- Kale (Brassica oleracea var acephala or fruticasa) = Chou fourrager
- + Fodder turnip (Brassica campestris var. rapa) = navet 4
- Swedes (Brassica napus var rapifera) = rutabaga 15

each dot = one land-race



2. COMMERCIAL POPULATIONS

Cabbage :	59
Cauliflower :	80
Brussels sprouts :	7
Kale :	18
Fodder Rape :	9
Turnip Rape :	4
Radish :	56
Swede :	15
Turnip (vegetable):	36
Rape (oilseed) :	9
-	
Total	293

3. RECAPITULATION

.

	NU	MBER OF VARIETIES COLLECTE	D
	Land races	Commercial Populations (excluding hybrids)	Total
1. VEGATEBLE CRUCIFERS			99999999999999999999999999999999999999
Cabbage	40	59	99
Cauliflower	62	80	142
Brussels sprouts	5	7	12
Radish	-	56	56
Turnip		36	36
Total Vegetable:	107	238	345
2. FORAGE CRUCIFERS			
Kale	263	18	218
Fodder Rape	23	9	32
Swede	15	15	30
Turnip Rape	· _	4	4
Fodder Turnip	4	-	4
Total Vegetable	305	46	351
3. OLEIFEROUS CRICIFERS			
Oilseed Rape	- -	9	9
Total Crucifers	412	293	705

- 192 -

1. LAND-RACES

ORIGINS	V	EGETABLE			FOR	AGE	
French Departments	Cabbage	Cauli- flower	Brussels sprouts	Kale	Fodder rape	Swede	Fodder turnip
Finistere 29		12		24			
Morbihan 56	25			59	9		
Cotes-du-Nord 22	10070	5		16			
Ille-et-Vilaine 35				61	10		
Loire-Atlantique 44				28			
Maine-et-Loire 49				35		3	
Deux-Sevres 79				7			
Vendee 85				24	2	12	
Vienne 86				7	2		
Haute Vienne 87							1
Correze 19							3
Nord 62		40	5	2			
Manche 50		5					
Bas-Rhin 67	12						
Region Parisienne	3						
	40	62	5	263	23	15	4
	Total	Land-Rac	es collect	l ed: 412			

1. CRUCIFEROUS CROPS IN ITALY

Subcontracts CP13 - Dr. D. Astley, NVRS, Wellesbourne, Warwick, UK Dr. P. Crisp, NVRS, Wellesbourne, Warwick, UK and CP15 - Dr. P. Perrino, BARI, Italy

1.1. The types of Italian horticultural crucifers collected are given in Table 1.

1.2. Utilization

There is a great consumption of corymbs and leaves in Italy. Several kind of dishes are prepared especially with corymbs. Today in Italy 20.000 cauliflowers are frozen and used for human consumption. 500 q/ha of leaves provide good fodder for cows.

1.3. <u>Cultural practices and crop rotations</u>

Cauliflower and the majority of other <u>Brassica</u> species are considered intercrops; often they follow wheat, but also other vegetable crops like bean, pea, carrot, lettuce, potato. Although direct seeding yields well, the technique of transplanting is the rule. Seedlings with 5-6 leaves are normally transplanted from July to September. Seedlings may be vernalized at 2° C for 15-20 days for increasing uniformity at harvesting. For the production of small cauliflowers 100.000 plants/ha are used. Harvesting starts in October and ends in May.

1.4. Main problems of cultivation (diseases, etc)

A fungus <u>Xanthomonas campestris</u> is the most dangerous pathogen. Insects like cavolaia, mamestra and aphids are a serious problem and they may completely destroy the crops.

Table 1 Types of I	talian horticul	tural crucifers		
Species	Ssp/var.	Italian name		English name
Brassica oleracea	botrytis	Cavolofiore	Toscano napoli Jes Neve Fanese	White curded cauliflowers
e		Cavolofiore, Cime,	Romanesco	Romanesco green cauliflower
	5	or Cavolo broccolo	Molfettesi Barese Macerata	Smooth green curded cauliflowers
	italica		Albenga Sicilia	Purple cauliflowers, or purple headed broccoli
		Cavolo broccolo	Calabrese Sarno Neri	Calabrese - Black broccoli
	gongylodes	Cavolo rapa		Kohl rabi
	-	, r		

- 195 -

	асериата	LAVOIO NELO		black kale or cabbage
· · · · · · · · · · · · · · · · · · ·	capitata	Cavolo verza	Asti Napoli Piacenza Castenuovo Ferro	Savoy cabbages
		Cavolo cappuccio		Smooth (summer) cabbages
	gemmifera	Cavolo di Bruxelles		Brussels sprout
B. campestris	rapa?	Cima di rapa, broccolo rapa, or broccoletti di rapa		Turnip tops; turnip broccoli
	rapa	Rapa		Turnip
Raphanus sativus		Ramolaccio Ravanello		Winter radish (large) Radish (small)
Eruca sativa		Rucola		Rocket

- 197 -

1.5. Localities and acreages

The Italian area cultivated with cauliflowers is 28,000 ga, the yield is 204 g/ha and the total production is 577,000 tons.

The area cultivated with <u>Brassica</u> crops in the most important regions together with yield economic value are given in the following table (ISTAT data):

... . .

	Area	Yield	Value (1)
Regions	(ha)	(p)	(Lit. x 1,000,000)
Campania	12.336	2.446.500	250.000
Puglia	8.300	1.595.000	160.000
Lazio	7.722	1.609.800	160.000
Abruzzi	4.768	722.600	70.000
Sicilia	4.237	748.400	70.000
Marche	3.425	601.100	60.000
Calabria	2.874	410.300	40.000
Veneto	2.721	819.900	80.000
Basilicata	2.158	309.400	30.000
Toscana	1.861	312.100	30.000
Piemonte	1.514	506.900	30.000
Liguria	879	282.700	20.800
Molise	385	59.700	5.600

(1) These figures are overestimated by at least 20-30%.

1.6. Economic value

The results are given in point 1.5.

2. Varietal situation

Many of the crucifer crop types collected (see 1.1.) are not included in the National List regulations and therefore are not under threat from legislative changes at present. Additionally, it may be that EEC regulations concerning the sale of listed crops are widely unknown and ignored. However, the traditional varieties maintained by the peasants and local growers are under threat from the introduction of modern commercial varieties. The extent and rate of this genetic erosion varies between regions.

The changes which are taking place in the commercial infrastructure of vegetable production are reflected at all stages from seed production to marketing the produce. The extremes of this change are the traditional horticulture where

growers using their own seed provide produce for the local market selling any seed produced excess to their own requirement, contrasted to large seed companies packeting local seed and imported commercial varieties for redistribution to large scale growers. Many farmers are being encouraged to form cooperatives and increase productivity by modernisation. The regions of Basilicata, Calabria and Marche show a preponderance of commercial varieties while in Sicily and Puglia land race selections are still maintained by local growers. The greater the organisation of the horticultural community in an area the higher the probability of losing traditional material. In Sicily social changes are accelerating the rate of erosion of the traditional varieties. Market garden production of fresh vegetables is always clustered as near to the consumer market as possible ie. around or even within towns. However, increasing urbanisation with the related rise in the value of urban land has seen the loss of traditional growing areas. Of the remainder many farmers are replacing their ancient land races with imported seed stock. There are changes in market preferences and policy, eq. the output of white cauliflowers has increased in Italy because of its value as a national and international cash crop. The increase in white cauliflower production has been at the expense of the traditional variable forms of Italian cauliflowers and other cruciferous crops.

3. Regional collections

The Istituto del Germoplasma, Bari, holds a collection of crucifer land races which will be duplicated in the NVRS Gene Bank. The National Vegetable Research Station, UK, maintains a collection of commercial Italian crucifer varieties in long term storage. This collection will be duplicated at the Institute del Germoplasme, Bari and the Netherlands Gene Bank, Wageningen, The Netherlands.

4. Collection strategy

The strategies applied to the collection of land races and commercially available seed were different.

To collect samples of local land races teams from the Istituto del Germoplasma, Bari concentrated on specific areas visiting farmers and sampling field crops or stored seed. Certain areas were visited twice to ensure the collection at the different harvest times of the various cruciferous crops. The collection of commercial material was based on the method of Crisp and Ford-Lloyd (1981) using the telephone 'yellow pages' to locate seed merchants. The method varied in its value depending on the collection area. In the cities of Rome and Naples and the Marche area a majority of seed merchants could be located in the Yellow Pages but this was not true in Puglia and Sicily. More reliable sources of information were the local Chamber of Commerce, local botanical experts and the seed merchants themselves. Local markets were a good source of growers seed stocks where seed excess to their own requirements was sold. Local knowledge of the timing and sites of these markets was essential to ensure the efficient use of time. The tendency for growers and seed merchants to package local seed in standard illustrated packets caused some confusion. Therefore seed samples were obtained from as many localities as possible irrespective of packaging. In all cases efforts were made to collect large quantities (100 g) of high quality seed for long term storage.

- 198 -

5. Collection localities

A number of different collecting trips were made by various teams:

Date		Regions visited	Team	Subcontract
1982		Lazio, Marche and Campania	NVRS	CP13
July	1983	Basilicata and Calabria	BARI	CP15
Sept	1983	Puglia, Basilicata, Calabria		
		and Campania	BARI	CP15
0ct	1983	Puglia	BARI	CP15
0ct	1983	Sicily, Puglia and March	NVRS	CP13

6. Collection results (list of collected accessions)

The results are reported in Appendix 1.

7. Degree to which genetic variation has been collected

A proportion of the genetic variability has been collected but more remains to be collected in the regions visited and in other regions were no collecting activities have taken place.

Collections made in Italy

	CP 13 1982	CP 13 1983	CP 15
Cauliflower	56	32	13
Broccoli	34	29	43
Cabbage	30	27	12
Kale	2		5
Cima di rapa, broccoletti di rapa	30	31	125
Rapa	5	9	13
Brussels sprout	7	5	
Kohl rabi	5	11	
Radish	20	25	
Rucola	11	_	
Mustard		2	
5	200	171	211
	1 4		1

	- 200 -				- 201 -		
Acc No.	CROP and CULTIVAR	Seed Wt	Germ %	Acc No.	CROP and CULTIVAR	Seed Wt	Germ %
		7 5. 80	96.0	4005415	Cavolo broccolo - broccolo di minestra spicata	50,00	99.0
4005282	Broccolo grande precoce	71.50	81.0	4005419	- broccolo di moio	[~] 82.50	97.0
3005418	Cavolfiore -	74.50	87.0	4005406	- broccolo di siracusa	13.10	98.0
3005327	- di lesi a parla risciu	36.50	88.0	4007400	- a foglie liscie	36.00	96.0
3005363	- di jesi	28,90	67.0	4001455		23 10	47 0
3005458	- di jesi	72.50	93.0	4005581	- agostina	1/19 50	73 0
4005313	- di sicilia precoce	86.00	100.0	4001426	- aprilocu	27 50	91.0
3005293	- fanese precoce	80.50	93.0	4005386	- Trevarola	27.50	21.0
3005294	- fanese tardivo	38.00	91.0	4005385	- Innorota	28.50	64.0
3005414	- frivarolo	157 50	98.0	400r402	- invernale 'Type A'	278.24	42.0
3005423	- frivarolo	52 13	66.0	4005403	- invernale 'Type B'	57.50	31.0
3005254	- genarese	124.00	94 0	4005387	- marzullo	26.10	81.0
3005422	_ gennarino	134.00	97.0	4005384	- natalina	28.80	69.0
3005424	- marzolo	165.00	100.0	4005425	- natalino	146.50	85.0
3005421	- natalino	146.50	100.0	4005281	- ramoso calabrese precoce	32.90	87.0
3005255	– palla di neve	43.34	96.0	4005365	- ramoso calabrese	24.10	84.0
4005256	- precoce di sicilia violetto	45.70	92.0	4005396	- ramoso calabrese	27.00	91.0
3005347	– precocissimo di jesi	60.80	/9.0	400r429	- ramoso di calabria mezzo precoce	46.70	95.0
3005413	- san martinisi	117.20	72.0	8005474	- rapa	19.20	100.0
3005257	Cavolfiore verde – di macerata	64.23	99.0	4005383	- sammartinara	20.50	44.0
3005364	- di macerata	71.50	92.0	4005382	- settembrina	22.50	52.0
3005328	- tardivo big. flover	69.50	71.0	4005457	- tardivo di verona	12.60	0.0
3005///4	Cavolo fiore -	12.10	70.0	4005297	- verde calabrese	30.50	85.0
2005391	- sammartinaro bianco	20.50	87.0	4005404	- verde calabrese	75.80	52.0
2005202	- verde di palermo sammartinaro	21.70	85.0	5005377	Cavolo cappuccio - 51	53.50	62.0
2005272	Cavelo e cima - verde barese	77.60	100.0	5005456	- bianco gloria di enkhuizen	21.00	0.0
2005272	- violetta natalino	78.60	98.0	5005432	- cuor di bue	33.00	97.0
3005276	- violetta precoce	75.70	89.0	5005451	- cuor di bue grosso	21.00	94.0
5005277	Cauala fiore - di sicilia violetto	26.20	96.0	5005452	- cuore di bue	8.50	0.0
4005431	gigante di napoli natalino	21.30	73.0	5005454	- di copenhagen precoce	25.50	0.0
3005430	- gigance al mapping	76.50	0.0	5005370	- di brunswich	5.50	42.0
3005330	Cima di rapa - macciacese	29.01	90.0	5005455	- di brunswik tardivo	15.10	0.0
3005258	Cima tardiva	35.50	55.0	5005394	- grosso	25.50	91.0
3005312	Cima verde barese settembrind di dicimara	69.50	98.0	5005260	- mercato di copenhagen	34,50	92.0
3005259	Cime moltettes1	5.00	76.0	5005279	mercato di copenhagen	73.50	99.0
4005405	Cavolfiore violetto -	33.00	31.0	5005280	- mercato di copenhagen	73.50	91 0
4005295		51,50	69.0	5005220	- mercato di copenhagen	49.00	45.0
4005314	- pugliese precoce	190-88	96.0	5005324	- mercalo ul copennagen	22 /0	76 0
4005389	Cavolo	8 90	36.0	5005450	- testa di pietra	23.6U	70.0
4005388	Cavolo broccolo -		44.0	5005453	- tondo precocissimo	24.50	0.0
4005463	Cavolo broccolo -	42.70					

Acc No.	CROP and CULTIVAR	Seed Wt	Germ %	Acc No.	CROP and CULTIVAR	Seed Wt	Germ %
4005416	Cavolo cavolina rizza	39.20	100.0	8005251	Broccoletto o cima di rapa - novantina	66.01	100.0
6005395	Cavolo Bruxelles	22.87	23.0	8005252	- novantina a cima grande	32.65	97.0
6005278	Cavolo di Bruxelles	102.70	85.0	8005269	- sessantina a cima grande	69.70	69.0
6005326	Cavolo di Bruxelles	85.50	6.0	8005270	- guarantina a cima grande	12.50	99.0
6005348	Cavolo di Bruxelles	78.60	4.0	8005271	- tardiva di marzo a cima gra	ande 38.30	98.0
6005371	Cavolo di Bruxelles mezzo nano	5.00	88.0	8005272	- tardiva di marzo a cima gra	ande 74.10	89.0
5005393	Cavolo di palermo	26.33	37.0	8005274	- guarantina a cima grande	76.50	97.0
5005443	Cavolo forte	17.42	99.0	8005350	- guarantina	83.50	92.0
5005410	Cavolo linguaglossa	5.60	13.0	8005253	- 120	63.07	95.0
5005442	Cavolo sparacello	6.50	90.0	8005311	Cima di brocoletti precoce	122.00	93.0
5005344	Cavolo verza – delle virtu	74.50	60.0	8005411	Cima di rapa -	7.90	73.0
5005346	- di piacenza	76.00	49.0	8005298	- centoventina a testa grossa	74.50	98.0
5005261	- grosso delle virtu	119.00	98.0	8005372	- guarantina	16.20	98.0
5005284	- invernale di piacenza	17.50	99.0	8005435	- guarantino	94.50	93.0
5005345	- precocissimo di s. giovanni	71.74	44.0	8005351	- sessantina	76.00	98.0
5005325	- riccio di piacenza	74.50	71.0	8005299	- sessantina a testa grossa	74.50	100.0
5005362	Cavolo zolfino	105.50	21.0	8005436	- sessantino	95.50	97.0
7005315	Cavolo rapa -	20.50	96.0	8005296	Cima o broccoletto di rapa novantina	72.50	99.0
7005264	- bianco	87.50	90.0	8005378	Cima di rapa - quarantina a cima grossa	210.50	98.0
7005283	- bianco	106.50	97.0	8005306	Rapa - 60 giorni	60.50	97.0
7005428	- cavulu (September)	163.00	98.0	8005309	- aprile	40.20	85.0
7005427	- cavulu augusto	139.50	97.0	8005352	- bianco piatta guarantina	88.80	19.0
7005420	- di acireale	22.10	65.0	8005366	Rapa da cima broccoletto - mezzo tardivo 60	69.30	98.0
7005434	- di praga bianco	18.80	98.0	8005367	- tardivo 90	78.50	93.0
7005316	- marzotico tardivo	6.10	0.0	8005397	- precoce 40	37.80	72.0
7005265	- rosso	25.50	92.0	8005329	Rapa da mensa o navona	70.50	100.0
7005409	– trunzo majolino	20.10	45.0	8005353	Rapa di milano a colletto viola	61.00	0.0
7005300	- violetto	66.80	26.0	8005308	Rapa febbrario	53,50	98.0
8005273	Broccoletto a cima grande natalina o cima di rapa	49.50	93.0	8005310	Rapa maggio tardive	33.00	34.0
8005349	Broccoletto di rapa - cinquantino	80.50	88.0	8005307	Rapa natalino	65.50	99.0
8005323	- novantino	79.70	92.0	8005412	Rapa spontana	25.50	66.0
8005321	- quarantino	65.60	96.0	9005445	Ravanella	14.00	96.00
8005322	- sessantino	66.50	87.0	9005333	Ravanello – a forma di oliva	76.20	59.0
8005247	Broccoletto o cima di rapa – centoventina (marzo)	68.18	100.0	9005439	- burro gigante	53.70	98.0
8005248	- cinquantina	63.05	77.0	9005356	- candela di fuoco	76.50	97.0
8005249	- quarantina	63.04	70.0	9005302	- candela di ghiaccio	38.60	99.0
8005250	- sessantina a cima grande	69.11	94.0	9005303	- candela fuoco lungo rosso	37.70	93.0
				1025			

- 203 -

Acc No.	CROP and CULTIVAR	Seed Wt	Germ %	Acc. No.	CROP and CU	ULTIVAR	Seed Wt	Germ %
9005438	Ravanello - candela fuoco lungo rosso	22,50	99.0	3004828	Cavolfiore di jesi		21.50	98.0
9005459	- cerasella	39,10	100.0	3004829	Cavolfiore precoce di jesi		7.50	96.0
9005390	- grossa	96.50	61.0	3004830	Cavolfiore di jesi		2.00	
9005446	- longe	30,10	98.0	3004831	Cavolfiore precoce di toscana		42.00	75.0
9005335	- mezzo lungo rosso a punta bianca	68.50	98.0	3004832	Cavolo fiore toscano		2.50	
9005355	- non plus ultra	70.50	88.0	3004833	Cavolfiore toscano		5.00	97.0
9005369	- non plus ultra	131.60	99.0	3004834	Cavolfiore gigante di napoli *	* tardivo	8.50	98.0
9005460	- non plus ultra	46.50	100.0	3004835	Cavolfiore palla di neve		55.50	98.0
9005374	- rosso gigante	9.90	100.0	3004836	129 Cavolfiore marzaiolo		13.00	99.0
9005334	- rosso lungo	74.29	99.0	3004837	Cavolfiore palla di neve *	* tardivo	6.50	79.0
9005286	- rosso tondo a punta bianca	73.70	100.0	3004838	Cavolfiore di napoli		6.00	94.0
9005399	- rotondo rosso guarantino nostrale	36.50	73.0	3004839	Cavolfiore gigante di Napoli *	* precoce	4.50	85.0
9005262	- saxa	59.40	98.0	3004840	Cavolfiore napoletano *	* gennarese	9.00	72.0
9005287	- saxa	75.50	93.0	3004841	Cavolfiore gennarese	. · · ·	24.00	80.0
9005461	- saxa	29,50	100.0	3004842	Cavolfiore natalino		24.50	70.0
9005332	- tondo cherry belle	87.50	99.0	3004843	Cavolfiore toscano precoce		3.00	
9005437	- tondo rosso a grande punta bianca	52.10	100.0	3004844	Cavolfiore di jesi		6.50	92.0
8005291	Ravizzone	73.60	0.0	3004845	Cavolo o cima verde barese		90.00	100.0
9005304	Rosso tondo a piccola punta bianca	76.10	94.0	3004846	Cavolo fiore di macerata	<i>i</i>	3.50	
19005407	Senapa	22.60	78.0	3004847	Cavolfiore verde di macerata		29.50	99.0
19005292	Senape	72.90	0.0	3004848	Cavolfiore verde di macerata		5.00	
3004812	Cavolofiore febbrarese * * napoletane	92.50	92.0	3004849	Cavolfiore vero verde *	* Marchigiano	18.50	0.0
3004813	Cavolofiore marzatico * * napoletane	91.50	97.0	3004850	Cavolo broccolo di albenga		2.00	
3004 814	Cavolofiore bianco napoletane * * natalili	91.50	91.0	3004851	Cavolfiore di macerata verde		8.00	91.0
3004815	Cavolofiore precoce toscano	80.50	4.0	3004852	Cavolfiore verde di macerata		8.00	86.0
3004816	Cavolfiore sicilia	46.00	58.0	3004853	Broccolo verde romanesco *	* Tardivo Romanesco type	5.50	
3004817	Cavolfiore fanese mezzo * * precoce	9.50	98.0	3004854	Heading of molfetta		30.00	94.0
300 4818	Cavolfiore tardivo metropole	1.50	96.0	3004855	Cavolo broccolo romanesco	romanesco type	101.00	0.0
3004819	Cavolfiore gigante di napoli	4.00	75.0	3004856	Cavolo broccolo romanesco *	<pre>* tandino romanesco type</pre>	38.50	85.0
3004820	Cavolfiore di napoli tardivo	2.50		3004857	Cavold broccclo romanesco *	<pre>* precoce romanesco type</pre>	85.00	95.0
3004821	Cavolfiore Genarese	27.00	94.0	3004858	Cavolo broccolo romanesco *	<pre>x 1/2 precoce romanesco turo</pre>	20 00	99 0
3004822	Cavolfiore palla di neve	1.50				суре	37.00	22.0
3004823	Cavolfiore toscano precoce	3.00		3004859	Cavolo proccolo romanesco *	<pre>% gennarese romanesco type</pre>	4.50	
3004824	Cavolfiore gigante di napoli	33.50	97.0	3004860	Cavolo broccolo verde *	<pre>% romanesco type</pre>	36.00	99.0
3004825	Cavolfiore di jesi	16.00	99.0	3004861	Cavolo broccolo romanesco *	* natalino	2.00	
3004826	Cavolo fiore precoce di jesi	78.00	94.0	3004862	Cavolo broccolo romanesco *	* natalino	1.00	
3004827	Cavolfiore precoce di jesi	7.00	13.0					

- 205 -

Acc. No	CROP and CU	LTIVAR	Seed Wt	Germ %
			4 0 0	
3004863	Cavolo broccolo romanesco *	* natalino	6.00	04 0
3004864	Cavolo broccolo romanesco *	* ottobrino	47.00	94.0
3004865	Cavolo broccolo verde *	* romanesco	85.50	91.0
3004866	Cavolo broccolo verde *	<pre>* romanesco medio precoce o natalino</pre>	26.00	96.0
3004867	Cavolo broccolo romanesco *	* precoce	35.50	99.0
4004700	Cavolo broccolo romoso *	<pre>% calabrese</pre>	27.0	94.0
4004701	Cavolo broccolo ramoso *	<pre>% calabrese</pre>	96.50	59.0
4004702	Cavolo broccolo verde *	<pre>* calabrese precoce</pre>	89.50	61.0
4004703	Cavolo broccolo verde *	<pre>% calabrese</pre>	7.50	84.0
4004704	Cavolo broccolo ramoso *	<pre>% calabrese verde</pre>	4.50	75.0
4004705	Cavolo ramoso calabrese *	* precoce	26.00	99.0
4004706	Cavolo broccolo verde *	* calabrese	45.50	64.0
4004707	Broccolo ramoso atlantic	local - not the usual atlantic	48.00	84.0
4004708	Cavolo broccolo ramoso *	* calabrese	27.50	91.0
4004709	Cavolo broccolo ramoso *	* calabrese	5.50	95.0
4004710	Cavolo ramoso calabrese *	* precoce	30.00	98.0
4004711	Cavolo broccolo ramoso *	<pre>% calabrese verde</pre>	4.00	76.0
4004712	Broccolo neri a cespuglio		93.00	44.0
4004716	Cavolo broccolo tardivo		6.50	19.0
4004717	Broccoli neri		35.50	70.0
4004718	Broccolo natale pied grande *	* liscio	90.00	100.0
4004721	Cavolo broccolo natalino di *	* sarno	93.00	97.0
4004729	Cavolo broccolo natalino di *	* napoli	5.00	97.0
4004740	Cavolo broccolo di sarno		95.50	80.0
4004744	Cavolo broccolo di sarno		38.00	93.0
4004868	Cime nataline		59.50	68.0
4004869	Cime tardive marzatiche		56.50	72.0
4004870	Cavolo broccolo precoce		76.50	61.0
4004871	Cavolfiore di sicilia violetto		99.0	69.0
4004872	N.610 Cavolfiore di sicilia *	* violetto	8.00	47.0
4004873	Cavolo fiore di sicilia *	<pre>% violetto tardivo</pre>	90.00	67.0
4004874	Cavolfiore di sicilia violetto		14.00	66.0
4004875	Cavolo broccolo bronzino di *	* albenga	12.50	72.0
4004876	Cavolfiore violetto di sicilia		0.85	
4004877	Cavolfiore di sicilia violetto		2.00	
4004878	Cavolo o cima violetta *	* natalino	3.00	
4004879	Cavolfiore violetto di sicilia		490.00	61.0

CROP and CULTIVA Acc. No. 4004885 Cavolo broccolo nero * * S 4005005 Cime primitive violette di * * S 5004715 Cavolo cappuccio grosso * * t 5004751 Cavolo verza d'asti agostamo * V 5004752 Cavolo verza grosso delle * * V 5004753 Cavolo verza riccio d'asti 5004754 Cavolo verza grosso delle * * V 5004755 Cavolo verza quarantino 5004756 Cavolo verza quarantino * * р 5004757 Cavolo verza quarantino 5004758 Savoy curled 5004759 Savoy dark green 5004760 Wirsing von piancenza 5004761 Wirsing von piancenza 5004762 Cavolo verza riccio di * ж р. 5004763 Cavolo verza riccio di * ж р 5004764 Cavolo verza invernale s * ж ma 5004765 Cavolo verza grosso delle * *** V** 5004766 Cavolo verza testa di ferro 5004767 Cavolo verza d'estate 5004768 Cavolo verza quarantino * ж рі 5004769 Cavolo cappuccio cuor di bue * * gr 5004770 Cavolo cappuccio cuore di bue 5004771 Cavolo cappuccio medio * * na 5004772 Cavolo verza d'asti s.martino 5004773 Cavolo verza san giovanni 5004774 Cavolo verza d'asti pasqualino 5004775 Cavolo verza tardivo * * na 5004776 Cavolo verza di piacenza 5004777 Cavolo verza d'asti pasqualino 5004778 Cavolo verza riccio di * *** C**a 5004779 Cavolo verza tardivo gigante 6004780 Cavolo di bruxelles 6004781 Cavolo di bruxelles 6004782 Cavolo di bruxelles o catskill 6004783 Cavolo di bruxelles demi-nain 6004784 Cavolo di bruxelles 6004785 Cavolo di bruxelles precoce

- 207 -

R	Seed Wt	Germ %
pigariello	89.50	93.0
icilia	17.00	75.0
ardivo	96.00	47.0
irtu	6.00	60.0
irtu	11.00	96.0
	40.50	4.0
irtu	34.50	0.0
	3.00	83.0
recoce	104.00	100.0
	4.50	78.0
	2.50	
	3.50	0.0
	6.00	81.0
	4.50	0.0
iacenza	2.00	52.0
iacenza	37.50	88.0
artino	6.00	53.0
irtu	2.00	47.0
	40.50	18.0
- - -	12.00	49.0
recocissimo	47.50	57.0
rosso heart ox	50.00	41.0
	50.00	86.0
apaletane	46.00	89.0
	6.00	89.0
	6.00	43.0
	6.00	66.0
apoletano	87.50	91.0
	6.50	39.0
	3.00	84.0
astelnuovo	48.50	79.0
	100.50	62.0
	2.00	
	6.50	38.0
	4.00	53.0
	9.00	20.0
	13.00	23.0
	39.00	26.0

Acc. No	CROP and CU	LTIVAR	Seed Wt	Germ %	Acc. No	CROP and CUL	TIVAR	Seed Wt	Germ %
6004786	Cavolo di bruxelles mezzo *	* nano	12.00	18.0	8004750	Broccoletto o cima di rapa *	* marzatica tardiva		
7004787	Cavolo rapa violetto		22.00	82.0			barese	217.00	63.0
7004788	Cavolo rapa rosso		8.00	96.0	8004880	Rapa testa gro ss a bianca da x	* foraggio	99.50	93.0
7004789	Cavolo rapa delicatezz a *	* Bianco	4.50	94.0	8004881	Rapa palla di neve		88.00	98.0
7004790	Cavolo rapa bianco		3.50	91.0	8004882	Rapa bianca piatta quarantina		92.50	100.0
7004791	Cavolo rapa violetto		75.00	60.0	8004883	Rapa di milano bianca a *	<pre>* colletto viola</pre>	5.00	
5004886	Cavolo da fiore miscuglio		0.24		8004889	Rape tardive		30.50	96.0
8004713	Cima di rapa sele quarantina		96.00	99.0	9004792	Ravanello tondo rosso saxa		8.00	51.0
8004714	Cima di rapa sessantina a *	* testa grossa	93.50	99.0	9004793	Ravanello rosso tondo *	<pre>* precocissimo</pre>	41.50	53.0
8004719	Broccoletto o cima di rapa *	* sessantina	87.00	68.0	9004794	Ravanello tondo rosso ciliegia		23.00	86.0
8004720	Broccoletto o cima di rapa *	* quarantina	4.50	81.0	9004795	Ravanello rosso gigante		30.50	84.0
8004722	Broccoletto o cima di rapa *	* novantina	4.00	100.0	9004796	Ravanello rosso tonda a *	* grande punta bianca	4.50	61.0
8004723	Broccoletto o cima di rapa *	<pre>% novantina</pre>	11.00	100.0	9004797	Ravanello tondo rosso a g.p.b.		8.50	97.0
8004724	Broccoletto o cima di rapa *	* cinquantina	13.50	93.0	9004798	Ravanello tondo a punta bianca		11.50.	95.0
8004725	Broccoletto o cima di rapa *	<pre>% centoventina</pre>	3.50	0.0	9004799	Ravanello mezzo lungo rosso *	* punta bianca	13.00	97.0
8004726	Broccoletto o cima di rapa *	<pre>% centoventina</pre>	91.00	48.0	9004800	Ravanello candela di chiaccio		3.50	99.0
8004727	Cime di rapa bradano novantina		96.50	100.0	9004801	Ravanello candeladi ghiaccio		48.00	100.0
8004728	Broccoletto o cima di rapa *	* novantina	88.50	98.0	9004802	Ravanello candela di ghiaccio *	* eiszapfen	8.50	99.0
8004730	Broccoletto o cima di rapa *	<pre>% centoventina</pre>	5.50	99.0	9004803	Ravanello lungo bianco		4.50	96.0
8004731	Rapa da cima 120 na gennarese		50.00	88.0	9004804	Ravanello candela di ghiaccio		8.50	99.0
8004732	Broccoletto o cima di rapa *	* quarantina	2.00	96.0	9004805	Ravanello candela di fuoco		9.00	99.0
8004733	Broccoletto di rapa tardivo		3.00	57.0	9004806	Ravanello candela di fuoco		4.50	98.0
8004734	Broccoletto o cima di rapa *	* tardiva di marzo a ci	ma		9004807	Ravanello 1/2 lungo rosso di *	* napoli	12.00	95.0
		grande	\$9.00	93.0	9004808	Ravanello candela fuoco lungo *	* rosso	46.00	98.0
8004735	Rapa da cima 60 na		29.00	91.0	9004809	Ravanello lungo rosso		17.00	100.0
8004736	Broccoletto di rapa quarantino		3.00	80.0	9004810	Ravanello rosso lungo candela 🛪	* di fuoco	95.00	96.0
8004737	Broccoletto di rapa natalino		3.00	88.0	9004811	Romaloccio nero tondo *	* d'inverno	36.00	95.0
8004738	Broccoletto di rapa quarantino		8.00	84.0	2004887	Cavolo palmizio nero di *	* toscana	3.50	
8004739	Cima di rapa centoventina a *	* testa grossa	91.00	100.0	2004888	Cavolo nero di toscana 0 *	* senza testa	19.00	89.0
8004741	Broccoletto o cima di rapa ж	* sessantina	4.00	99.0	20004884	Annual watercress		0.50	
8004742	Broccoletto o cima di rapa *	* sessantina	14.00	83.0	20004890	Rucola		6.50	71.0
8004743	Cima di rapa o broccoletto		7.00	63.0	20004891	Rucola da orta		89.50	74.0
8004745	Broccoletto di rapa novantino		7.50	79.0	20004892	Rucola coltivata		16.00	97.0
8004746	Rapa da cima 90 na		30.00	88.0	20004893	Rucola coltivata		8.00	84.0
8004747	Broccoletto o cima di rapa *	<pre>* novantino</pre>	37.00	93.0	20004894	Rucola coltivata		240.00	98.0
8004748	Cime di rapa		95.50	91.0	20004895	Rucola o ruchetta coltivata		41.00	88.0
8004749	Cima di rapa novantina a *	* cima grossa	96.50	100.0	20004896	Rucola o ruchetta coltivata		11.00	85.0

• • •

- 209 -
| Acc. No | (| CROP and | CULTIVAR | Seed Wt | Germ % |
|----------|------------------------|----------|--------------|---------|--------|
| 20004897 | Rucola-ruchetta peso r | netto * | * grammi 100 | 91.00 | 95.0 |
| 20004898 | Rucola da orta | | | 21.00 | 93.0 |
| 20004899 | Rucola da orta | | | 12.00 | 88.0 |