

ANNEX 19

Products from plants by species
and primary market sector

Table 1 Crop species and their characteristics

Species	Special plant-products	Possible application	Evaluation
<i>Cardamine impatiens</i>	hydroxy-fatty acids	polyethylene, lubricants, rubber	stunted growth, bi-annual
<i>Dimorphotheca pluvialis*</i>	hydroxy-fatty acids	coatings, paints, varnish, plastic, lubricants, polymers and surfactants.	lodging, seed-shed, variable seed-set, low oil content, reasonable seed production, no pests and diseases.
<i>Dimorphotheca sinuata</i>	hydroxy-fatty acids	coatings, paints, varnish, plastic, lubricants, polymers and surfactants.	lodging, seed-shed, variable seed-set, low oil content, reasonable seed production, no pests and diseases.
<i>Crepis alpina</i>	crepenine-acid	coatings, resins and lubricants	low oil content
<i>Crepis rubra</i>	crepenine-acid	coatings, resins and lubricants	very low oil content
<i>Crepis foetida</i>	crepenine-acid	coatings, resins and lubricants	hardly any yield
<i>Crepis biennis</i>	vernol-acid	polymers, membranes, paints, lacquer, embedding electrical parts	only few of the entries produced seed
<i>Crepis vesicaria</i>	vernol-acid	polymers, membranes, paints, lacquer, embedding electrical parts	seed shed, variable seed-set, low seed-yield
<i>Crepis capillaris</i>	vernol-acid	polymers, membranes, paints, lacquer, embedding electrical parts	seed shed, variable seed-set, low seed-yield
<i>Crepis sibirica</i>	vernol-acid	polymers, membranes, paints, lacquer, embedding electrical parts	no germination
<i>Crepis auria</i>	vernol-acid	polymers, membranes, paints, lacquer, embedding electrical parts	no germination
<i>Stokesia laevis</i>	vernol-acid	polymers, membranes, paints, lacquer, embedding electrical parts	no germination of seed
<i>Vernonia spp</i>	vernol-acid	polymers, membranes, paints, lacquer, embedding electrical parts	no flower initiation, stunted growth
<i>Borago officinalis</i>	̑-linolenin-acid (GleA)	pharmaceuticals, food additives, health care	high seed shed, high GleA content, high in proteins
<i>Boraginaceae</i>	̑-linolenin-acid (GleA)	pharmaceuticals, food additives, health care	seed shed
<i>Oenothera spp.</i>	̑-linolenin-acid (GleA)	pharmaceuticals, food additives, health care	seed shed
<i>Oenothera biennis</i>	̑-linolenin-acid (GleA)	pharmaceuticals, food additives, health care	high hield potential, high linolenic acid content
<i>Oenothera lamarckiana</i>	̑-linolenin-acid (GleA)	pharmaceuticals, food additives, health care	high hield potential, high linolenic acid content

Table 1 Crop species and their characteristics continued.....

Species	Special plant-products	Possible application	Evaluation
<i>Limnanthes spp.</i>	unique and long fatty-acids	lubricants, detergents, cosmetics, softeners	seed shed
<i>Limnanthes alba</i>*	unique and long fatty-acids	lubricants, detergents, cosmetics, softeners	high potential yield, irregular flowering and seed set, seed shed
<i>Limnanthes douglasii</i>	unique and long fatty-acids	lubricants, detergents, cosmetics, softeners	high potential yield, irregular flowering and seed set, seed shed
<i>Cuphea spp.</i>	short to medium size fatty-acids (C6 to C14)	detergents, soaps, plasticisers, lubricants	irregular flowering, seed shed, difficult yield process
<i>Malva spp.</i>	short to medium size fatty-acids (C6 to C14)	lubricants, detergents, cosmetics, softeners	low oil content, general oil content
<i>Arabis hirsuta</i>	long fatty-acids C16 to C18)	food oils, paints	bi-annual
<i>Camelina sativa</i>	long fatty-acids C16 to C18)	food oils, paints	large spectrum of fatty acids, high seed yield
<i>Cucurbita foetidissima</i>	long fatty-acids C16 to C18)	food oils, paints	germination and establishment problems, no flower-initiation.
<i>Euphorbia lathyris</i>	long fatty-acids C16 to C18)	food oils, paints	bi-annual, high oil content seed, late maturing
<i>Helianthus annuus</i>*	long fatty-acids C16 to C18)	food oils, paints	sensitive to Botrytis and Sclerotinia
<i>Hesperis matronalis</i>	long fatty-acids C16 to C18)	food oils, paints	bi-annual
<i>Lallemantia iberica</i>	long fatty-acids C16 to C18)	food oils, paints	low oil yields
<i>Althaea spp.</i>	extremely long fatty acids (C20 to C24; eg eruca-acid)	polymers, lubricants, synthetic rubber, wax	stunted growth, lodging and irregular maturation
<i>Brassica carinata</i>	extremely long fatty acids (C20 to C24; eg eruca-acid)	polymers, lubricants, synthetic rubber, wax	reasonable yield eruca-acid
<i>Conringia orientalis</i>	extremely long fatty acids (C20 to C24; eg eruca-acid)	polymers, lubricants, synthetic rubber, wax	host for beet-cyste nematode, low seed content eruca-acid
<i>Crambe abyssinica</i>*	extremely long fatty acids (C20 to C24; eg eruca-acid)	polymers, lubricants, synthetic rubber, wax	host for beet-cyste nematode, reasonable yield of eruca-acid
<i>Eruca sativa</i>	extremely long fatty acids (C20 to C24; eg eruca-acid)	polymers, lubricants, synthetic rubber, wax	yield stable (self-pollination), reasonable eruca-acid yield
<i>Lunaria annua</i>	extremely long fatty acids (C20 to C24; eg eruca-acid)	polymers, lubricants, synthetic rubber, wax	bi-annual but some entries are annual
<i>Thlaspi arvense</i>	extremely long fatty acids (C20 to C24; eg eruca-acid)	polymers, lubricants, synthetic rubber, wax	low eruca-acid content seed, seed shed

Table 1 Crop species and their characteristics continued.....

Species	Special plant-products	Possible application	Evaluation
<i>Amaranthus spp.</i>	proteins/carbohydrates/oil	health food, starch	no industrial demand, low yields, bird damage at maturity, cost for beet-cyst nematode
<i>Chenopodium quinoa</i>*	proteins/carbohydrates/oil	shampoos, chocolate	no industrial demand, low yields, bird damage at maturity, cost for beet-cyst nematode
<i>Cichorium intybus</i>	inulin	sweetener, polymers, epoxides, resins	good growth, adapted to heavy soils
<i>Helianthus tuberosus</i>*	inulin	sweetener, polymers, epoxides, resins	large gene pool available, adapted to light soils
<i>Cannabis sativa</i>*	fibres, wood, oil	paper, cellulose, textile, composites, pharmacy, etc	needs some adaption to Dutch circumstances (flowering time)
<i>Mentha pulegium</i>	etheric oil (pulegon)	pharmacy, aromaticcs and flavouring compounds	creeping growth, difficult to harvest leaves
<i>Mentha spicata</i>	etheric oil (carvon)	sprouting inhibitor	

Species of which the names are printed in bold were further evaluated in research programmes from 1988-1990 (derived from Meijer *et al*, 1989). Species of which the names are printed in bold are marked with a * were considered in research programmes from 1988-1994.

Table 2 Crop species and their characteristics as evaluated in national research during 1990-1995

Species	Special Plant-Products	Possible Non-Food application	Current State (1998)
<i>Calendula officinalis</i> L.	conjugated triens	coatings, cosmetica	pilot-project
<i>Cannabis sativa</i> L	fibres, wood, oil, carvon	paper, cellulose, textile, composites, etc.	commercially applied
<i>Carum carvi</i> L	carvon	sprout-inhibitor, fragrances and flavouring	commercially applied
<i>Chenopodium quinoa</i> Wild	proteins/carbohydrates/oil	shampoos, chocolate, animal feed	commercial application stopped
<i>Coriandrum sativum</i> L	petrosilic acid	oleochemistry	more research needed
<i>Crambe abyssinica</i> Hochst. ex Fries	long chains	eleochemistry	pilot project stopped
<i>Dimorphotheca pluvialis</i> (L) Mnch.	hydroxy fatty acids	coatings, paints, varnish, plastic, lubricants, polymers and surfactants	more research needed
<i>Euphorbia lagascae</i> Sprengel	epoxy fatty acids	coatings, polymers	more research needed
<i>Helianthus annuus</i> L		spice oil	more research needed
<i>Helianthus tuberosus</i> L	inulin	sweetener, polymers, epoxides, resins	commercially applied
<i>Lesquerella</i> spp (<i>L grandiflora</i> and <i>L densipila</i>)	lesquerol acid, densipol acid	fragrances and flavourings, coatings, lubricants	more research needed
<i>Limnanthes alba</i> Benth	unique and long fatty acids	lubricants, detergents, cosmetics, softeners	more research needed
<i>Linum usitatissimum</i> L	fibre, wood, oil	paper, cellulose, textile, composites etc	commercially applied
<i>Lunaria annua</i> L.	long chains	oleochemistry	more research needed
<i>Osteospermum</i> spp.	conjugated oils	paints, varnish, polymers, lubricants	more research needed

Species of which the names are printed in bold are currently (1998) grown on a commercial scale.