

# IENICA

## Interactive European Network for Industrial Crops and their Applications

Forming Part of the IENICA-INFORM Project

### REPORT FROM THE STATE OF BULGARIA



INFORM-IENICA is a project funded under the Fifth Framework Programme by DG XII of the European Commission



---

**Prepared by:**

Dr. Alexandra Balabanova

AgroBioInstitute

8 Dragan Tzankov Blvd.

1164 Sofia

Bulgaria

Phone: +359 2 963 54 11

Fax: +359 2 963 54 08

E-mail: [alex\\_b@abi.bg](mailto:alex_b@abi.bg) or [ablbanova@hotmail.com](mailto:ablbanova@hotmail.com)

*in co-operation with institutions listed in Annex 2*

**SOFIA, 2004**

# CONTENTS

---

Methodology	iii
Executive Summary	iv
Introduction	1
<b>OIL CROPS</b>	<b>2</b>
1. Sunflower	2
1.1 Industry	3
1.2 Markets	3
1.3 Barriers to progress	4
2. Oilseed rape	4
2.1 Industry	5
2.2 Barriers to progress and future	5
<b>FIBRE CROPS</b>	<b>6</b>
1. Cotton	6
1.1 Industry	7
1.2 Markets	7
1.3 Barriers to progress	8
2. Flax	8
2.1 Industry	8
3. Hemp	9
<b>CARBOHYDRATE CROPS</b>	<b>10</b>
1. Cereals – wheat, maize, barley	10
1.1 Industry	11
1.2 Markets	12
1.3 Barriers to progress	12
2. Sugar Beet	13
3. Potatoes	13
<b>SPECIALITY CROPS</b>	<b>15</b>
1. Tobacco	15
2. Hops	16
3. Medicinal and Essential Oil Crops	16
<b>STATE SUPPORT FOR AGRICULTURE</b>	<b>20</b>
<b>Annex 1</b> Cultivation areas, average yields and total output of industrial crops	21
<b>Annex 2</b> List of contacts	27
<b>Annex 3</b> References	29

# METHODOLOGY

---

The aim of this report is to gather information about the status of industrial crops and their non-food uses in Bulgaria. Until now, the industrial crops and their non-food application have not been monitored in such a good way as food agricultural crops and products.

The information was collected by the following methods:

- Using agro-statistical data for areas, yields, production etc. presented in the Annual Reports of the Ministry of Agriculture and Forestry.
- Using National Statistical Institute (NSI) data.
- Direct contacts by phone, fax and email.

The information from several institutions, organisations and associations involved in the production and processing of industrial crops is used:

- Ministry of Agriculture and Forestry
- Ministry of Economy
- Union of Producers of Oil and Oil-products in Bulgaria
- Union of Brewers in Bulgaria
- Bulgarian National Association of Essential oils, perfumery and cosmetics
- Branch Chamber of Producers of Cotton, Flax and Hemp Industry

The AgroBioInstitute contacted the above-mentioned institutions, organisations and research institutes to prepare this report.

The report is composed of the following parts:

- Oil crops
- Fibre crops
- Carbohydrate crops
- Special crops

## EXECUTIVE SUMMARY

---

The development of the agrarian sector in Bulgaria is determined from both agro-ecological and economical conditions. Crop production plays an important role in the agricultural sector.

The agricultural land in Bulgaria is close to half the territory of the country. In 2001 the arable land was 60.9% of the agricultural land. The industrial and oil-bearing crops occupy about 18% of this. The irrigated areas during the last several years account for 4-9% of the total irrigable agricultural land.

This report includes crops with potential for industrial use, for both food and non-food use (sunflower, maize, wheat) and for non-food use only (tobacco, cotton, flax etc.). The following groups are presented: oil-bearing crops, fibre crops, carbohydrate crops and special crops.

The main oil-bearing crops in Bulgaria are sunflower (*Helianthus annuus* L.) and oilseed rape (*Brassica napus* L.). Sunflower covers 95.05% of the area of oil crops in Bulgaria. Generally the sunflower is used in the food sector, mainly for vegetable oil. The industrial utilisation of sunflower oil is in the canning industry and for the production of mayonnaises and margarines. The quantity for another industrial aims (producing paints, varnishes, soaps etc.) is about 2 thousand tonnes per year. Another oil-bearing crop is oilseed rape. The rapeseed areas have grown due to the fact that this crop better utilises the winter and spring moisture and gives a relatively higher yield. The rapeseed oil has utilisation in the food industry and could also be utilised as a raw material for biodiesel and lubricant producing, in the near future.

In the country there are a number of factories which produce vegetable oil. In Brusarci a processing factory to SAMPO Company with a capacity of 3000 tonnes of biodiesel per year has started to work.

The specific soil and climatic conditions in Bulgaria allow growing of three major fibre plants: cotton (*Gossypium hirsutum* L.), flax (*Linum usitatissimum* L.) and hemp (*Cannabis sativa* L.). Of the area under fibre crops, cotton occupies the largest part. The strongest aspects of the fibre crop production and processing in the country are that the textile industry is well developed, there are traditions and good experience of the producers, capacity of industry and well-kept, durable

equipment. The fibre crops are suitable for good crop rotation and they are good alternative crops for Bulgarian agriculture.

The carbohydrate crops section includes crops for both food and non-food applications, raw material for starch and ethanol production. From the cereals the main crops are wheat, maize and barley, plus potatoes and sugar beet. The cereals, as wheat and maize, are the main source for starch production. Barley is a raw material for brewery. The sugar beet and some cereals are a source for ethanol production. Potato utilisation in the industry is small and limited to chips and frozen potato production.

The major financial tool of the State policy in the area of agriculture is the State Fund 'Agriculture', established in 1995 with the Act for protection of growers. State Fund 'Agriculture' realises running financial support of growers through preferential credit lines. The financial support and encouragement of investment activity of growers, based on 8 investment programs, are the main priorities of the policy of State Fund 'Agriculture'. The users can be eligible persons, registered as 'agricultural producers', which adherence the legislative requirements can create or extend the agriculture producing, organised by them.

Another fund is the 'Tobacco' Fund, which leads a policy for supporting tobacco producers.

The industrial crops in Bulgaria up to now are not so well monitored as food crops.

Several research institutes in the country have been focusing their R&D activities towards the development of breeding and agro-technology of the industrial crops. The work is funded by government and also by international grants.

The cultivation of industrial crops does not have a negative environmental impact and in actual fact some of them can be used for the bioremediation of soils contaminated with heavy metals and as good alternative crops for rural regions of the country.

The special legislative framework for producing and utilising industrial crops is practically absent in Bulgaria, except for plants from the group of Hemp (*Cannabis*) and Opium poppy (*Papaver*).

The trade policy in the agrarian sector during the last several years is oriented towards increasing the competitive power of Bulgarian agricultural production, the encouragement of export and more quickly integration of Bulgaria to European and world markets.

Leading of custom and trade policy through an application of foreign-trade law and custom tariff is a part of the all restructuring of the national economy, with the aim of stability and growth.

# INTRODUCTION

---

The national economy of Bulgaria has sustained an upward trend in the last few years. The improvement of the main macroeconomic indicators reflects the further economic stability in the country. The development of the agrarian sector, one of the main sectors in the Bulgarian economy, suffered from both adverse weather conditions in the last years and some economic aspects during the transition period.

Crop production plays an important role in the agricultural sector. Its main purpose is to provide the sufficient quantities of food products for the country's population, and to ensure raw material for the agro-food and non-food industries and for animal feeding. The following parts of this report included more detailed information on industrial crops and their applications.

**Table 1      Structure of the crops (food & non-food and non-food) for industrial use in Bulgaria (2002, 2003\*)**

Crop	Area of cultivation ('000 ha)	
	2002	2003*
<b>A. Crops for food &amp; non-food use</b>		
<b>Cereals</b>	<b>2,061.4</b>	<b>1654.0*</b>
winter wheat	1,368.6	903.0 *
maize	304.0	489.0*
barley	388.8	262.0*
<b>Potatoes</b>	<b>51.9</b>	
<b>Sugar beet</b>	<b>2.2</b>	
<b>Oil crops</b>	<b>481.2</b>	<b>737.6*</b>
sunflower	471.0	726.0*
rapeseed	10.2	11.6*
<b>B. Crops for non-food use</b>		
<b>Fibrous crops</b>	<b>7.3</b>	<b>2.36*</b>
cotton	6.8	2.0*
flax	0.5	0.36*
<b>Tobacco</b>	<b>39.3</b>	<b>36.5</b>
<b>Hop</b>	<b>0.2</b>	<b>0.2</b>
<b>Medicinal &amp; essential oil crops</b>	<b>32.0</b>	
<b>TOTAL</b>	<b>2,675.5</b>	

Source: Annual report 2003 MAF; Brewery association, \* Anticipated data

# OIL CROPS

---

The main oil-bearing crops in Bulgaria are sunflower (*Helianthus annuus* L.) and oilseed rape (*Brassica napus* L.). Sunflower covers 95.05% of the area of oil crops in Bulgaria. Several crops were grown as oil crops in the past in Bulgaria: soy-bean (*Soya hispida*), castor-oil plant (*Ricinus macrocarpus*), peanuts (*Arachis hypogaea*), but currently the areas of these crops are reduced. The castor-oil plant is not grown as an industrial crop, regardless of the fact that castor oil can widely use in industry and medicine. It has a high viscosity and high boiling point (310°C), and has applications in the leather industry, for producing of artificial rubber, in textile, for producing alizarin etc. The growing of peanuts is for food and food products mainly. The area of soy-bean for 2002 was 2,900 ha, and for 2003 (anticipated data) is 800 ha. The production for the above-mentioned years is 4,000 tonnes and 900 tonnes (not definitive data) respectively.

## **1 Sunflower (*Helianthus annuus* L.)**

The main oil crop grown in Bulgaria is sunflower (*Helianthus annuus* L.). 97.4% of the total area of oil crops grown in the country is under sunflower. It occupies 477,000 ha in 2002, 18% more than in 2001, and is a major crop for oil producing and seeds export. The average yield of seeds for 2002 is 1.4 tonnes per ha. According to preliminary data (Annual Report, MAF, 2003) the sown areas in 2003 was 736,000 ha. In the spring of 2004 the expected area under sunflower is 505,000 ha (anticipated data).

Domestic and introduced hybrids and varieties are grown. The most important hybrids grown in Bulgaria are San Luka, Albena, Merkuri and Musala, and from cultivars – Favorit. Albena and San Luka varieties are grown on 80% of the sunflower area.

During the last years there is one major problem in the agro-technology of sunflower – sown areas are not optimal for the country. A 5-year crop rotation is optimal, and if not adhered to yields are reduced and the phytosanitary status of the soils is reduced. In 2000 and 2001 9.9% of sunflower was grown on the same areas without rotation. The negative impact over the crops grown after sunflower is that different Broom-rape races are increasingly appearing.

Intensive research work connected with the selection of new sunflower hybrids and varieties and the development of agro-technology is taking place in Dobrudja Agricultural Institute, General Toshevo, AgroBioInstitute, Sofia and some other institutes. The breeding programs are

concentrated upon yield growth, oil quality and quantity and also on resistance to diseases. Also bred are the lines with high oleic acid content for industrial purposes especially, but these do not have market realisation still.

## **1.1 Industry**

15 companies, 14 of which are private, work in the oil-production sector. 70 new factories processed mainly sunflower seed and also some other oil-bearing raw materials. The majority of them have a small production capacity. The capacity for oilseed processing reached about 800,000–850,000 tonnes per year.

Some of the main oilseed oil producers in Bulgaria are “Papas olio” AD Jambol, “Bisser oliva” AD Stara Zagora, “Kaliakra” AD Dobrich, “Niva” AD Kostinbrod, “Zvezda” AD Dolna Mitropolia, “Rosa” AD Popovo, “Oliva” EAD Knezha, “Zlatna Trakia” AD Harmanly, “Pliska” OOD Shumen, “Rastma may” AD.

The industrial utilisation of sunflower oil includes its utilisation in the canning industry, for the production of food oil products (mayonnaises and margarines) and for technical aims (producing paints, varnishes, etc.). During 2001/02 the industrial utilisation of sunflower oil decreased to about 24,000 tonnes. The utilisation in the canning industry is about 7,000 tonnes, for other industrial aims (paints, varnishes, soaps etc.) 2000 tonnes and for the production of margarine and mayonnaise about 15,000 tonnes. The utilisation of sunflower oil for producing margarines and mayonnaises fluctuates widely, from 40% to 80%. During the 2002/03 market year the industrial utilisation of sunflower oil is 28,000 tonnes and it is expected to increase during the season 2003/04 (anticipated data).

## **1.2 Markets**

The main factors which determine the supply of sunflower are initial commodity availability, production and imports. The factors which determine the utilisation of sunflower, are utilisation of seed for sowing, utilisation for oil production, another utilisation and exports.

According to the unofficial data of ‘Agro-statistic’ (Current analysis for oil crops and vegetable oils for 2002/03 and perspectives 2004, February 2004) the import of sunflower seed is expected to reach 6,000 tonnes in the 2003/04 market year, and export – 230,000 tonnes. For the needs of

the domestic market, about 130,000 tonnes are required, 102,000 tonnes or about 75% for direct consumption and about 28,000 tonnes for the industry (anticipated data of 'Agro-statistic').

The tendency of increasing sunflower areas is result of a good market and prices of sunflower seeds. The sunflower products are seeds, vegetable edible oil, food oil products, sunflower cake for animal feed and by-products (biomass of stalk residues and the non-seed part of the sunflower heads).

There are no special environmental issues connected with the production of sunflower crops and products.

### **1.3 Barriers to progress**

The main reasons for decreasing sunflower production are connected with unfavourable agro-climatic conditions. In 2001 the lost areas were 2.1%. Economically the production depends on the prices and subsidies. The policy of State Fund 'Agriculture' is to support and give credits to the sunflower producers. The support lines are for fertilisation, for pesticides and for sowing seeds.

## **2 Oilseed rape (*Brassica napus* L.)**

In the last few years, another representative of the oil-bearing crops has enjoyed a growing popularity among producers: winter oil-bearing rape. The areas under winter rapeseed have grown due to the fact that this crop utilises the winter and spring moisture better and gives a relatively higher yield. In 2000 the area under winter rapeseed was 8,000 ha and in 2001 it was 17,200 ha (but only 16,700 ha of this was harvested). The average yield and total amount of output was, respectively, 1.130 t/ha and 19,000 tonnes (according data of "Agro-statistic"). In 2002 the sown area was 10,200 ha. The cropped areas were 6,900 ha, or about 40% less compared with 2001 due to very low temperatures during the winter, which caused a frostbite. The average yield for 2003 was 1.17 t/ha and total output was 8,000 tonnes (anticipated data).

In 2003 the following varieties and hybrids of oilseed rape are sown: Express, Ramus, Orkan, Buffallo-Panter, Elite, Elvis.

The R&D activity for rapeseed is connected mainly with variety testing, the development of agro-technology and technologies for processing.

## **2.1 Industry**

It is expected that the interest in the winter rapeseed will grow because of increased demands for processing and export.

The rapeseed oil, which is produced by cold pressing the seeds, is utilised in the food industry and could also be used a raw material for biodiesel and lubricant producing. The rapeseed in Bulgaria is processed to edible oil, rape meal and could be processed to biodiesel fuel (methyl ester) and engine oils in the near future.

The high-value protein by-products after pressing are used for animal feed and forage's additives.

The processing plant of the SAMPO Company, with a capacity of 3000 tonnes of biodiesel per year, started to work in Brusarci, and currently uses mainly used-vegetable oils i.e. those which have already been used in the food industry.

## **2.2 Barriers to progress and future**

The further main goals, which appears on this stage as barriers for active development of Renewable Energy Sources (RES) are:

- Elaboration of national indicative aims of consumption of energy from RES which to provide for harmonisation with the main aims in directive 2001/77EC.
- Elaboration of mechanisms in confirmation of RES on national level
- Changes in legislation for the encouragement of investments and development of RES.
- Step-by-step liberalisation of the energy market, introducing a reform for the increase of the role of market principles in balance of energy production and energy consumption.

## FIBRE CROPS

The fibre crops are traditional for Bulgaria. The specific soil and climatic conditions allow growing of three main fibre plants: cotton (*Gossypium hirsutum*), flax (*Linum usitatissimum* L.) and hemp (*Cannabis sativa* L.). The area of fibre crops in 2002 was 6,800 ha. In the structure of the areas under fibre crops, the relative part of cotton is highest, followed by flax (Table 2).

**Table 2**  
**Structure of the fibre crops in Bulgaria (1980 – 2002)**

<b>Year</b>	<b>Area of fibre crops (‘000 ha)</b>	<b>Cotton (% of the total area)</b>	<b>Flax (% of the total area)</b>	<b>Hemp (% of the total area)</b>
<b>1980</b>	21.9	56.6	25.6	17.8
<b>1985</b>	25.6	56.2	22.8	21.0
<b>1990</b>	12.3	73.2	22.6	4.2
<b>1995</b>	11.8	94.9	5.1	- **
<b>2000</b>	10.1	97.0	3.0	-**
<b>2001</b>	14.7	98.4	1.6	-**
<b>2002</b>	6.8	93.1	6.9	-**
<b>2003</b>	2.36*	84.7*	15.3*	-**

\*Undefinitive data

\*\* Only experimental fields of hemp have been grown since 1995

### **1 Cotton** (*Gossypium hirsutum* L.)

Cotton is an old known crop grown in Bulgaria. During the last few years the interest of the textile industry in cotton has increased. The cotton production in Bulgaria has been facilitated by the favourable weather and soil conditions and by the exceptional achievements in the local selection of medium-fibre varieties.

In the last 6 years the areas of cotton, the average yield and total output are not stable. The total area under cotton has decreased due to low farm-gate prices and highly competitive imports of long-fibre cotton. The average yield fluctuates widely as predominantly non-irrigated lands are used for cotton production. According to the data of ‘Agro-statistic’ of the Ministry of Agriculture and Forestry (MAF) in 2001 the area under cotton was 14,700 ha. The area under cotton in 2002 was 6,300 ha and in 2003 was 2,000 ha only (undefinitive data). Despite lower yields in 2001 -

0.690 tonnes per ha (in 2000 – 0.740 tonnes per ha), the total output was increased by 41.4% and reached 10,000 tonnes (in 2000 – 7,000 tonnes). The production was 10,000 tonnes in 2002 and 2,000 tonnes in 2003 (undefinitive data). The reasons for the decline are not only unfavourable conditions, but also missing of irrigation for the biggest part of the areas.

Suitable soil and climatic conditions for growing cotton can be found in the Haskovo region, Stara Zagora region, Bourgas, Sliven and Veliko Turnovo regions.

Bulgarian cotton varieties are mainly grown. The main varieties are: Chirpan 539, Chirpan 603, Avangard 264, Perla 267, Beli Lom, Beli Iskar, Vega. There are introduced Israeli varieties for testing under Bulgarian conditions.

The optimal amount of land under cotton in Bulgaria is determined from the biological features of the crop, environmental conditions and economic factors. It is not regulated from the needs of the textile industry. Bulgaria has suitable conditions for growing 60,000–65,000 ha of cotton. The conditions in Bulgaria are suitable for cotton production; enough to supply only 50% of the capacity of the Bulgarian cotton industry.

The main tasks of cotton breeding are creating varieties with a fibre length 32–34 mm, good strength, fineness, high yield and resistant to the main biotic stress factors, suitable for mechanised harvesting. The aims of agro-technology are to stabilise and increase the level of average yield and to diminish the production cost. The Bulgarian technology is distinguishing with specificity and it is suitable for all cotton producing regions in the country.

## **1.1 Industry**

Cotton fibre produced in 2001 was 10,000 tonnes, in 2002 it was 10,000 tonnes and in 2003 it was 2,000 tonnes (undefinitive data). The reasons for the decline are not only unfavourable conditions, but also missing of irrigation for the biggest part of the areas. The capacity of the cotton industry in Bulgaria is 82,000 tonnes of yarn. The main cotton factories are “Trakia cotton” Ltd. Stara Zagora, “Textile fibres” Ltd Haskovo., “Sirma” Ltd. Plovdiv.

## **1.2 Markets**

Because of a strong developed textile industry and comparatively low production of cotton fibre in the country, currently Bulgaria imports about 90% of cotton fibre.

The prices, which depend on international costs, and the price proportion of cotton to other agricultural crops, influence the amount of growing areas.

### **1.3 Barriers to progress**

Despite the fact that the textile industry in Bulgaria is well developed, currently the sector is in crisis because of low prices and unsatisfactory profitability.

Cotton is not so environmentally friendly because of the high level of pesticides utilisation. It is the aim to use suitable varieties and to change the agro-technology.

## **2 Flax (*Linum usitatissimum* L.)**

The geographical location and climatic conditions of Bulgaria are suitable for the development of flax growing. The flax production developed on the base of introduced varieties mainly: Nike, (Poland), Laura (Netherlands), Texa, Jitka (Czech Republic).

After 1999 a restoration of flax growing started (about 200–300 ha per year). The tendency is towards enlargement of areas. The average yield varies between 1.2 t/ha and 3 t/ha of deseeded straw.

### **2.1 Industry**

The capacity of flax processing factories is 3,000–3,500 tonnes of flax fibre per year. Flax and flax textiles are produced in 5 plants. Two of them are for retting and fibre extraction only. Water retting technology is used. It is not a problem for ecology because of the cleaning of waste-waters. They produce long and short flax fibre. Another two factories have equipment for weaving and spinning for processing short flax fibres and producing crude heavy textiles. The biggest flax factory in Bulgaria is “Rilski len” Ltd. Samokov. This is only one factory, which uses long flax fibre. Currently the long fibre mill consumption is about 250–300 tonnes per year. The “Rilski len” factory is with capacity and possibilities for closed cycle producing – from retting to ready-made clothes. The water retting technology for fibre extraction is applied. Traditional flax technologies for processing the flax fibres are used. The fabrics are of qualities fit for different applications: heavy textiles, interior textiles, fabrics for cloths. Technologies are developed for the production of materials with special qualities: fire-resistant, of anti-decay and anti-bacterial treatments, water resistant etc.

**Table 3      Production and markets of flax products (1994 – 1998, 2001)**

<b>Items</b>	<b>1994</b>	<b>1995</b>	<b>1996</b>	<b>1997</b>	<b>1998</b>	<b>2001</b>
Long fibre production (t)	5	69	29	12	12	25
Short fibre production (t)	13	133	341	33	49	57
Yarn production (t) (wet & dry spinning)	636	986	1045	456	398	84
Mill consumption of flax (t)			1471		697	116
Production of textiles (1000 m)	1922	2705	2598	973	1935	1080
Export of linen textiles (fabrics) (1000 m)	500	111	257	350	577	600

**Source:** FAOSTAT

The prerequisites for further development of flax growing and processing:

- traditions in flax growing and processing
- suitable soil and climatic conditions
- existing equipment and machinery
- existing technologies
- possibilities for financial support from the State fund ‘Agriculture’

### **3      Hemp (*Cannabis sativa*)**

In the best years (the period 1980-1985) hemp occupied about 20% of the total area of fibre crops. The variety grown was the Bulgarian variety “Silistrenski”. Currently only experimental fields are grown in Bulgaria and there is no hemp breeding in the country at the present moment. The future for hemp growing is to develop it as a source of raw material for non-textile applications. A restoration of hemp growing is expected.

# CARBOHYDRATE CROPS

---

This section includes crops for both food and non-food applications, raw material for starch and ethanol production. From the cereals the main crops are wheat, maize and barley. Potatoes and sugar beet are also included. The cereals as wheat and maize are the main source for starch production. Barley is a raw material for brewery. Sugar beet and some cereals are a source for ethanol production. Potato utilisation in the industry is small and limited to chips and frozen potatoes producing.

## 1 Cereals

The production of cereals has currently tended to increase. This is obligated mainly on increasing areas under winter cereals at the expense of spring crops. This is a result of unfavourable agro-climatic conditions occurring during the spring–summer period, when the lack of moisture is the most tangible. The areas under cereals cover 39.9% of the country's arable land.

### *Wheat*

Of the cereals, wheat has the biggest relative share. The area under wheat in 2001 was 1,366,000 ha - 24.9% of the cropped agricultural land. In 2002 it was 1,369,000 ha - 1.19% more than 2001. The growth of the area under wheat was at the expense of the areas under maize and sunflower. Total output in 2002 was 4,123,000 tonnes; 1.13% more than 2001. The area under wheat decreased in 2003 to 903,000 ha (anticipated data) due to unfavourable climatic conditions on the time of sowing. The average yield for the last few years is relatively constant.

The crop rotation is at an acceptable level. Wheat was grown as a single crop on 28% of the areas. The most widely used wheat varieties are Yantur (31%), Sadovo (14%), Pobeda (10%), Todora (7.2%), and Pryaspa (6%). The varieties Preslav, Aglika, Milena, Crystal, Enola, Katya, Miryana, and Vratza are used within the range of 1% to 5%. Eight other varieties are used at less than 1%.

### *Maize*

Maize is the second most important cereal crop in Bulgaria. In 2002 the area under maize was 304,000 hectares, which is 22.72% less compared with 2001. Production in 2002 was 873,000 tonnes. According to the preliminary data of 'Agro-statistic', MAF, the total output of maize for 2003 was 1,159,000 tonnes. The sown area was 489,000 ha.

In Bulgaria, mainly domestic hybrids and varieties are grown, plus some introduced ones. The most popular are Kneja 509, MF-444, Kneja 423, Kneja 613, Pc 464, Kneja 614 etc. The Bulgarian maize hybrids and varieties have a high quality and advantageous prices.

In Bulgaria the intensive R&D activity connected with maize is led mainly by the Institute of Maize in Kneja.

### ***Barley***

The area under barley in 2002 was 389,000 ha. The areas, average yield and harvest for 2003 are respectively 262,000 ha, 2.26 t/ha and 569,000 tonnes (undefinitive data). The regular rainfall provides for an optimum growth of the crop and average yield of approximately 3.1t/ha.

The seeds, used for the sowing of barley in 2002, amount to approximately 70,000 tonnes, which is 21% more than in 2001. The prevailing varieties are Obzor, Alpha, Hemus, Pleasant, Izgrev, etc.

### **1.1 Industry**

The utilisation of wheat is mainly for seed, food, feed, export and government stock. In the last few years (2000–2003) the farmers utilised more wheat for feed due to the shortage of maize and barley. The smaller crop of maize and its comparatively higher price is the reason for the increased consumption of feed wheat.

The industrial use of wheat is for producing of starch, wheat germ oil and gluten. The major by-product - wheat straw - is a potential biomass source.

In 2001/02 250,000 tonnes of maize grain were used for industrial applications. This quantity is the same for the 2002/03 market year (anticipated data). The main products from maize processing are starch, glucose, maize meal, maize oil and semolina. A part of these products are realized on the international markets. There is no information on the amount of starch for industrial utilisation.

The major utilisation of barley is as raw material for brewery industry.

## **1.2 Markets**

The quantity of maize realized on the market is not so big. The consumption in the country reduced because of a reduction in its use for animal feeding.

The import of maize (market year 2001/02) reached 115,000 tonnes. In the first 4 months of the market year 2003/04 5,782.1 tonnes of maize were imported, mainly for industrial processing (preliminary data of 'Agro-statistic'). "Amilum-Bulgaria" is the biggest producer of starch and the main importer of maize in Bulgaria.

The biggest part of the exported maize products are starch and maize oil. During 2001, 4,300 tonnes of starch and 2,000 tonnes of maize oil were exported. According to undefinitive data during the 2002/03 market year the export of maize starch was 9,300 tonnes. The biggest export is to Turkey, Albania and Romania. The export of maize oil during the 2002/03 market year is 3,990 tonnes, mainly to Turkey and Greece.

Bulgaria is a net exporter of barley and the imported grain (between 5,000 and 7,000 tonnes) is for the breweries. Regardless of the increased export during the last three years and the reduced supply, the amounts of barley, which remain for consumption in the country, are sufficient for the needs of the animal breeding sector and the processing industry.

## **1.3 Barriers to progress**

The percentage of farmers who use their own planting materials remains high, which inevitably reflects on the yields and quality of the wheat. The inquiry indicated that two main varieties of wheat were grown.

The unfavourable climatic conditions in the country during recent years influenced negatively the yields of maize for grain. This provokes retirement of farmers from maize production because of the big losses. The tendency towards reducing of areas under maize changed in 2003 and the area increased to 489,000 ha.

From the agro-meteorology point of view the maize is the most risky crop, which must be grown under irrigation. The drought during recent years had an extremely unfavourable influence on the crop. The extremely high summer temperatures accompanied with a long period of no rain resulted in a part of the area to fail.

The destroyed irrigation systems and the fact that farmers do not have enough finances to pay the price of irrigation water, do not allow its utilisation where it is necessary. In recent years the maize cropping under irrigation occupied only 10% from all areas. The yield from these areas is nearly twice as high compared with the yield from non-irrigated areas.

The programs of the **State Fund ‘Agriculture’** are foreseen to provide aid to wheat producers. The State Fund ‘Agriculture’ also subsidises the maize production in Bulgaria.

## **2 Sugar beet**

In the last several years (1996–2001) sugar beet growing as a source for sugar production decreased considerably. According to the data of ‘Agro-statistic’ of MAF, 18,900 tonnes of sugar beet had been produced in 2001, which was 19.3% less than that produced in 2000. The total output of sugar beet in 2002 was 51,000 tonnes. The average yield is grown by 68.37%, which is result of the more favourable climatic conditions.

The production of about 2,000 tonnes of sugar beet molasses is utilised in the industry as raw material for ethanol production.

The reasons for the low interest of farmers to grow sugar beet are complex, connected with unfinished reform in the agrarian sector, the high expenses of materials and labour in sugar beet production and low profitability due to low yields and low prices, plus the old equipment of the processing factories.

## **3 Potatoes**

According to the data of ‘Agro-statistic’ in 2002 the total output of potatoes was 627,000 tonnes from 52,000 hectares. Because of unfavourable conditions (extremely high temperature during the vegetative period), in previous years the production was lower. The biggest potato producers are in Smolian, Sofia, Pazardgik, Plovdiv and Blagoevgrad regions.

Potato utilisation by industry is small; only 2% and limited to chips and frozen potatoes producing. No potatoes are used for non-food uses in Bulgaria.

**Table 4      Realisation of produced potatoes (%) for 2002**

<b>For consumption</b>	<b>For market</b>	<b>For industry</b>
45%	53%	2%

# SPECIALITY CROPS

## 1 Tobacco

The tobacco production in Bulgaria is a subject of pre-determined output quotas by regions, types, origins and varieties of tobacco, set out in a special ordinance by the Minister of Agriculture and Forestry, pursuant to the provisions of the Tobacco Act.

In 2001 the quota for tobacco production was 63,000 tonnes. In the same year the total output was 41,000 tonnes, or 65% of the quota. The main limiting factors for tobacco production are unfavourable climatic conditions and unrealistic high orders from dealers. In 2002 the tobacco production was 95% of the determined quota. The determined quotas for 2002, 2003 and 2004 are as follows: 61,700 tonnes, 68,400 tonnes and 64,700 tonnes respectively. Insufficient rainfall during the vegetative period and the appearance of diseases and insects as a result of changes for the worse in agro-technology leads to impossibility for execution of quotas for tobacco production

**Table 5 Areas under tobacco, average yields and output volume (1998–2002)**

<b>Years</b>	<b>Areas ('000ha)</b>	<b>Average yields (t/ha)</b>	<b>Output volumes (t)</b>
<b>1998</b>	59.9	1.14	68.3
<b>1999</b>	45.3	1.33	60.3
<b>2000</b>	48.2	1.11	53.7
<b>2001</b>	45.5	1.26	57.8
<b>2002</b>	39.3	1.58*	58.6*
<b>2003</b>	36.5*	1.17*	42.7*

Source: MAF, 'Agro-statistic': \* Fund "Tobacco"

The tobacco industry in Bulgaria is realised from one State controlled company – "Bulgartabac". It is one of the 6 leading tobacco companies in the world. It's privatisation started in 1994 but the process is not still finished. The biggest private tobacco companies are "Socotab Bulgaria" and "Diamond Bulgaria".

The tobacco industry is one of the priorities of the country. About 3% of the total Bulgarian export belongs to tobacco products.

## 2 Hops

Hop production in Bulgaria is concentrated in the Velingrad and Rakitovo regions, in the Southern part of the country. The total hop area is 220 ha after 2001. There are growing mainly American varieties Nugget, Chinook, CFJ – 8.

**Table 6 Areas under hop, average yield and output volume (1995 – 2001)**

Year	Areas (ha)	Average yields (Ztr/ha)	Output volumes (Ztr)
1995	430	15.84	6780
1996	300	16.46	4980
1997	380	18.62	7020
1998	400	11.38	4480
1999	320	22.38	7100
2000	260	13.66	3520
2001	250	17.46	4400
2002	220		

Source: Union of Brewers in Bulgaria

The Bulgarian hop production meets only 40–50% of the country's hop requirements. The other part is imported as a ready hop products.

## 3 Medicinal and Essential Oil Crops

In recent years the interest of producers in medicinal and essential oil crops has started to increase. In 2002 the essential oil crops occupied 32,000 ha. The cultivated areas for the more important essential oil crops are as follow: rose (*Rosa Kazanlika*) 1,500 ha; lavender (*Lavandula vera*) 2,900 ha; coriander 26,900 ha and mint (*Menta piperita*) 140 ha. From 1998 to 2001 350 ha of new fields of *R. Kazanlika* were created; in 2002 – 480 ha and in 2003 the new fields were 300 ha. The increasing of areas of essential oil crops is connected with increased interest of farmers and financial support through State fund 'Agriculture' and SAPARD program. The Program for development of alternative agriculture foresees the area of essential oil plants to grow in the future.

The data in Table 6 gives information on the structure of medicinal and essential oil crops.

**Table 7 Cultivation areas, output volumes and average yields of some essential oil and medicinal plants**

Crops	Cultivation area (ha)			Average Yields (t/ha)			Output Volumes (t)		
	2000	2001	2002	2000	2001	2002	2000	2001	2002
<i>Rosa Kazanlika</i>	1 325.0	1 415.1	1 483.3	2.32	2.80	1.84	3 079.0	3 965.0	2 742.0
<i>Lavandula vera</i>	2 221.4	2 353.1	2 904.8	1.53	1.65	1.73	3 407.0	3 893.0	5 025.0
<i>Mentha piperita</i>	44.7	62.2	141.9	7.76	5.56	1.99	347.0	346.0	283.0
Coriander	4 758.0	6 856.0	26 860.2	1.02	0.83	0.94	4 880.0	5 738.0	25 186.0
Silibum??	240.0	120.0	230.0	0.38	0.40	0.39	92.0	48.0	90.0
<i>Rosa sp.</i>	6.5	9.5	9.5	0.65	1.22	0.38	3.9	11.6	3.6
<i>Melissa officinalis</i>	5.7	26.5	41.1	2.98	1.06	0.17	17.0	28.0	29.0
Marigold	1.2	0.2	0.0	0.02	0.06	0.00	1.8	0.1	0.0
Thime	0.0	0.0	0.1	0.00	0.00	4.00	0.0	0.0	0.4
<i>Salvia officinalis</i>	487.7	150.0	279.0	3.37	3.50	2.39	1 644.0	525.0	667.0
Camomile	3.8	8.5	82.	0.30	0.74	0.54	1.1	6.3	44.6
<i>Althea officinalis</i>	0.0	0.0	2.5	0.00	0.00	1.72	0.0	0.0	4.3
Echinacea	0.3	0.3	0.3	1.80	2.00	2.00	0.5	0.6	0.6
<i>Hypericum perforatum</i>	39.2	36.8	42.2	1.65	1.85	0.20	65.0	68.0	8.4
Valeriana	2.1	2.0	0.0	1.70	1.50	0.00	3.5	3.0	0.0
Dill	0.0	0.0	1.0	0.00	0.00	1.00	0.0	0.0	1.0
Anise	0.0	0.0	1.0	0.00	0.00	0.40	0.0	0.0	0.4

Source: Annual Reports of MAF, 2003

The *Rosa Kazanlika* V.T. in 2001 totaled 1,400 ha; 500 ha of them are old (15–20 years). The average yield of flowers is 1.5–2 tonnes per ha and for new areas about 4–7 tonnes per ha. In the country there are 15 distilleries, 12 of them are private. The capacity of one distillery is 100 to 600 tonnes of rose flowers per season. Totally it is possible to process 43,000 tonnes for one season. The average output of rose oil for one year in Bulgaria is 3.9–4.3 tonnes. Rose oil is used mainly in the perfumery industry. The relative part of export is very high.

For the purposes of the pharmaceutical industry in Bulgaria several medicinal plants are grown. The advantages of medicinal plant cultivation are connected mainly with the protection of natural resources and keeping of biodiversity. The technologies for micro-propagation of medicinal plants are developing in the AgroBioInstitute, Sofia.

## Medicinal plants grown in Bulgaria for the pharmaceutical industry

<i>Leucosium aestivum</i>	<i>Alchemilla vulgaris</i>
<i>Primula veris</i>	<i>Hysopus officinalis</i>
<i>Lavandula vera</i>	<i>Mentha piperita</i>
<i>Glycyrrhiza glabra</i>	<i>Ossimum bassilicum</i>
<i>Origanum vulgare</i>	<i>Melissa officinalis</i>
<i>Hypericum perforatum</i>	<i>Achilea leptophylla</i>
<i>Thimus serpyllum</i>	<i>Valeriana officinalis</i>
<i>Centaurium umbelldtum</i>	<i>Tribulus terrestris</i>
<i>Levisticum officinale</i>	<i>Sideritis scardica</i>
<i>Salvia oficinalis</i>	<b><i>Gentiana ascepiadea</i></b>
<i>Tussilago farfara</i>	<i>Acorus calamus</i>
<i>Althaea officinalis</i>	<i>Leonurus cardiaca</i>
<i>Ruta graveolens</i>	<i>Cricus benedictus</i>
<i>Balsamita major</i>	<i>Inula helenium</i>
<i>Asarum europium</i>	<i>Arum maculatum</i>
<i>Geranium phaeum</i>	<i>Geranium silvaticum</i>
<i>Equisetum ravense</i>	<i>Satureja Montana</i>
<i>Calendula officinalis</i>	<i>Armoracia rusticana</i>
<i>Hyoscyamus niger</i>	<i>Plantago major</i>
<i>Dianthus</i>	<i>Adiantus</i>
<i>Teucrium chamaedrys</i>	

The medicinal and aromatic plants are used widely as drag-pharmaceutical preparations, tablets and extracts for pharmaceutical products. They are also use for tea preparations. A large amount of medicinal plants are exported as raw material.

Some of the Bulgarian pharmaceutical products, developed on the base of medicinal plants, are described in Table 7.

**Table 8. Medicinal plants using for the production of Bulgarian medicinal products**

Name of the plant	Name of the medicinal product	Indication
Atropa belladonna alcaloïda	BELLERGAMIN coat.tabl	Neuroses, sedativa
Glaucini hydrobromidum Oleum ocimi basilici	BRONCHOLYTIN syrup	Compounded treatment of the diseases causing cough
Glaucini hydrobromidum	GLAUVENT coat. tabl	Treatment of the diseases causing cough
Sylibum marianum	CARSIL coat. tabl 35 mg	Toxic liver disorders
Papaver somniferum	Morphine hydrochloride- Solution for injection	Analgetic
Leukojum aestivum	NIVALIN	Poliomyelitis, neuritis,

	Tablet: sol for injection NIVABEX sirup	Alzheimer's disease
Hypericum perforatum	PEFLAVIT C	Hemorrhages, capillarotoxicosis, chronic hepatitis
Alkaloid cytizine obtained from <i>Cytisus laburnum</i>	TABEX film coat. tablets	Smoking cessation in smokers
<i>Tribulus terrestris</i> L Furostanole saponins at Least 45%	TRIBESTAN film tablets	Non hormonal drug of stimulating effect on sexual function

# STATE SUPPORT FOR AGRICULTURE

---

## **State Fund ‘Agriculture’ Support**

The major financial tool of the State policy in the area of agriculture is the State Fund ‘Agriculture’, established in 1995 with the Act for protection of growers.

The function of the Fund is financial support of producers of agricultural products. The financial support and encouragement of investment activity of growers, based on 8 investment programs, are the main priorities of the policy of State Fund ‘Agriculture’. The users can be eligible persons, registered as ‘agricultural producers’, and adherence to the legislative requirements can create or extend the agricultural production, organised by them.

## **Fund ‘Tobacco’**

‘Tobacco’ Fund is another fund, which leads a policy for supporting tobacco producers.

**Cultivation areas, average yields and total output of industrial crops in Bulgaria****I. Oil crops****Sunflower: cultivation areas, yields and harvest**

<b>Year</b>	<b>Cultivation area (‘000 ha)</b>	<b>Yields (t/ha)</b>	<b>Harvest (‘000 t)</b>
<b>1994</b>	496	1.21	602
<b>1995</b>	586	1.31	767
<b>1996</b>	500	1.05	526
<b>1997</b>	453	0.97	438
<b>1998</b>	539	0.97	524
<b>1999</b>	592	1.02	606
<b>2000</b>	592	1.01	599
<b>2001</b>	389	1.04	405
<b>2002</b>	471	1.37	645
<b>2003</b>	726*	1.22*	761*
<b>2004</b>	505*		

Source: Annual Reports of MAF, 1998, 2000, 2001, 2002, 2003

\*Anticipated data

**Oilseed rape: cultivation areas, yields and harvest**

<b>Year</b>	<b>Cultivation area (‘000 ha)</b>	<b>Yields (t/ha)</b>	<b>Harvest (‘000 t)</b>
2000	8.0		
2001	17.2	1.13	19
2002	6.9	1.17	8
2003*	11.6*	0.9*	10*

Source: Annual Reports of MAF, 1998, 2000, 2001, 2002, 2003

\*Anticipated data

## II. Fibre crops

### Structure of the fibre crops in Bulgaria (1980-2002)

Year	Area of fibre crops (‘000 ha)	Cotton (% of the total area)	Flax (% of the total area)	Hemp (% of the total area)
1980	21.9	56.6	25.6	17.8
1985	25.6	56.2	22.8	21.0
1990	12.3	73.2	22.6	4.2
1995	11.8	94.9	5.1	-
2000	10.1	97.0	3.0	-
2001	14.7	98.4	1.6	-
2002	6.8	93.1	6.9	-
2003*	2.4*	84.7*	15.3*	-

\*Undefinitive data

### Cultivation areas, yields and harvest of cotton

Year	Cultivation area (‘000 ha)	Yields (t/ha)	Harvest (‘000 t)
1994	9	0.74	7
1995	11	1.21	14
1996	12	0.92	12
1997	14	0.63	9
1998	10	0.70	7
1999	8	1.20	10
2000	9	0.74	7
2001	15	0.69	10
2002	7	1.59	10
2003	2*	1.0*	2*

Source: Annual Reports of MAF, 1998, 2000, 2001, 2002, 2003

\*Anticipated data

**Production and markets of flax products (1994–1998, 2001)**

<b>Items</b>	<b>1994</b>	<b>1995</b>	<b>1996</b>	<b>1997</b>	<b>1998</b>	<b>2001</b>
Long fibre production (t)	5	69	29	12	12	25
Short fibre production (t)	13	133	341	33	49	57
Yarn production (t) (wet+dry spinning)	636	986	1045	456	398	84
Mill consumption of flax (t)			1471		697	116
Production of textiles (1000 m)	1922	2705	2598	973	1935	1080
Export of linen textiles (fabrics) (1000 m)	500	111	257	350	577	600

Source: FAOSTAT

### III. Carbohydrate crops

#### Cultivation areas, yields and harvest of wheat

<b>Year</b>	<b>Cultivation area (‘000 ha)</b>	<b>Yields (t/ha)</b>	<b>Harvest (‘000 t)</b>
<b>1994</b>	1 320	2.84	3 754
<b>1995</b>	1 181	2.91	3 435
<b>1996</b>	958	1.88	1 802
<b>1997</b>	1 212	2.95	3 575
<b>1998</b>	1 142	2.80	3 203
<b>1999</b>	966	2.74	2 643
<b>2000</b>	1 122	3.04	3 406
<b>2001</b>	1 366	3.01	4 077
<b>2002</b>	1 369	3.01	4 123
<b>2003*</b>	903*	2.61*	2 243*

Source: Annual Reports of MAF, 1998, 2000, 2001, 2002, 2003; \*Anticipated data

#### Cultivation areas, yields and harvest of maize

<b>Years</b>	<b>Cultivation area (‘000 ha)</b>	<b>Yields (t/ha)</b>	<b>Harvest (‘000 t)</b>
<b>1994</b>	493	2.82	1 384
<b>1995</b>	475	3.82	1 817
<b>1996</b>	478	2.18	1 042
<b>1997</b>	464	3.58	1 659
<b>1998</b>	477	2.73	1 303
<b>1999</b>	455	3.82	1 740
<b>2000</b>	577	1.90	1 098
<b>2001</b>	353	2.47	873
<b>2002</b>	304	4.24	1 288
<b>2003</b>	489*		1 159*

**Cultivation areas, yields and harvest of barley**

<b>Year</b>	<b>Cultivation area (‘000 ha)</b>	<b>Yields (t/ha)</b>	<b>Harvest (‘000 t)</b>
<b>1994</b>	390	2.93	1 143
<b>1995</b>	396	2.96	1 173
<b>1996</b>	260	1.75	457
<b>1997</b>	291	2.78	810
<b>1998</b>	290	2.47	717
<b>1999</b>	295	2.57	654
<b>2000</b>	227	2.81	636
<b>2001</b>	293	3.19	931
<b>2002</b>	389	3.12	1 211
<b>2003</b>	262*	2.26*	569*

Source: Annual Reports of MAF, 1998, 2000, 2001, 2002, 2003

**Cultivation areas, yields and harvest of sugar beet**

<b>Year</b>	<b>Cultivation area (‘000 ha)</b>	<b>Yields (t/ha)</b>	<b>Harvest (‘000 t)</b>
<b>1994</b>	8	13.93	112
<b>1995</b>	9	17.12	158
<b>1996</b>	8	10.37	87
<b>1997</b>	5	15.62	80
<b>1998</b>	4	14.92	62
<b>1999</b>	3	17.04	54
<b>2000</b>	2	10.62	35
<b>2001</b>	1	14.10	19
<b>2002</b>	2	23.74	51

Source: Annual Reports of MAF, 1998, 2000, 2001, 2002, 2003

### Cultivation areas, yields and harvest of potatoes

<b>Years</b>	<b>Cultivation area</b> <b>(‘000 ha)</b>	<b>Yields</b> <b>(t/ha)</b>	<b>Harvest</b> <b>(‘000 t)</b>
<b>1994</b>	47	10.51	497
<b>1995</b>	56	11.66	649
<b>1996</b>	40	8.06	319
<b>1997</b>	44	10.45	463
<b>1998</b>	51	9.37	478
<b>1999</b>	52	10.83	566
<b>2000</b>	53	7.52	398
<b>2001</b>	48	12.39	600
<b>2002</b>	52	12.09	627

Source: Annual Reports of MAF, 1998, 2000, 2001, 2002, 2003

### Realization of produced potatoes (%) for 2002

<b>For consumption</b>	<b>For market</b>	<b>For industry</b>
45%	53%	2%

### List of contacts

Ministry of Agriculture and Forestry

55 Christo Botev Blvd.

1040 Sofia

Phone: +359 2 985 11 548

Fax: +359 2 980 22 36

<http://www.mzgar.government.bg>

Ministry of Economy

8 Slavianska St..

1046 Sofia

Phone: +359 2 940 7286

Fax: +359 2 987 2190

E-mail: [G.Zahariev@mi.government.bg](mailto:G.Zahariev@mi.government.bg)

AgroBioInstitute

8 Dragan Tzankov Blvd.

1164 Sofia

Phone: +359 2 963 54 11

Fax: +359 2 963 54 08

E-mail: [alex\\_b@abi.bg](mailto:alex_b@abi.bg)

[ablbanova@hotmail.com](mailto:ablbanova@hotmail.com)

Union of producers of Oil and Oil-products in Bulgaria

47 Vitosha Blvd.

1000 Sofia

Phone: +359 2 989 94 81

Fax: +359 2 989 24 08

E-mail: [sunoil@mb.bia-bg.com](mailto:sunoil@mb.bia-bg.com)

Union of Brewers in Bulgaria

18 Serdika St..

Phone/Fax: +359 2 986 50 90

E-mail: [ubb@I-n.net](mailto:ubb@I-n.net)

Dobrudja Agricultural Institute

9520 General Toshevo

Phone: +359 58 27454, 43786

Fax: +359 5731 4448

Institute of Cotton and Durum Wheat

6200 Chirpan

Phone: +359 416 6201, 2345

Fax: +359 416 3133

Institute of Maize

3230 Kneja

Phone: +359 9132 2163, 2211

Fax: +359 9132 2711

### References

1. Annual Report of Ministry of Agriculture and Forestry, 1999.
2. Annual Report of Ministry of Agriculture and Forestry, 2000.
3. Annual Report of Ministry of Agriculture and Forestry, 2001.
4. Annual Report of Ministry of Agriculture and Forestry, 2002.
5. Annual Report of Ministry of Agriculture and Forestry, 2003.
6. Balabanova, A., Second Global Workshop Bast Plants in the New Millennium, Borovets, Bulgaria, June, 2001, pp. 207-211.
7. Biannual Report of ABI, 2001- 2002.
8. Euroflax Newsletter, No 2 (16), December, 2001.
8. National Plan for Development of Agriculture and Rural regions (2000 – 2006).
9. Popov, At., Pavlov, K., Popov, P., Plant Growing, Sofia, 1966.
10. Program for Development of Alternative Agriculture in Rodopi region, 2003.
11. Strategy for Development of Fibre Crops in Bulgaria, MAF, 2003.
12. Current analysis of oil crops and vegetable oils for 2002/03 and prognosis for 2004., MAF, February, 2004.
13. Current analysis of maize for marketing year 2002/03 and prognosis for 2004, MAF, February, 2004.