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# ***Spring Crops in Bulgaria Damaged by 1996 Summer Drought***

Studies suggest there is a decreasing trend in precipitation in both north and south Bulgaria because of precipitation deficiencies in the 1940s and since the 1970s. Bulgaria has experienced several summer drought episodes during the last century, most notably in the 1940s and 1980s. There has been a decreasing trend in precipitation during the potential crop-growing season since the end of the 1970s, and the number of 10-day dry spells during this season has increased since the beginning of the 1970s. In the course of the last 3 decades, there was a decreasing trend in precipitation during the nongrowing season below a base of 5°–10°C. There was also a tendency toward more precipitation deficit periods during the actual growing season of spring crops (from sowing to full maturity).

A large deficiency in precipitation was observed during the summer of 1992. The 1992 drought persisted through 1993. In fact, from 1984 to 1993, the country experienced more than 5 years of drought conditions of various intensities, depending on location. There is no doubt that climate in Bulgaria has become drier in recent years.

Annual precipitation in the country during 1996 was between 450 mm and 650 mm. In some regions of southeastern Bulgaria, annual precipitation was 720 mm; in the mountain regions, it was predominantly between 700 mm and 800 mm (between 75% and 115% of normal). Thus, after normal precipitation during 1994 and 1995, relatively low precipitation occurred again in 1996.

At the beginning of January 1996, air temperatures sharply decreased and snowfall occurred. In most of the country, the snow cover remained. After January 24, the air temperature fell below -20°C, and a long spell of cold weather hit primarily the eastern part of Bulgaria, where in the superficial soil layer the temperature fell to -25°C. The winter season persisted in February and March. The cold weather kept the

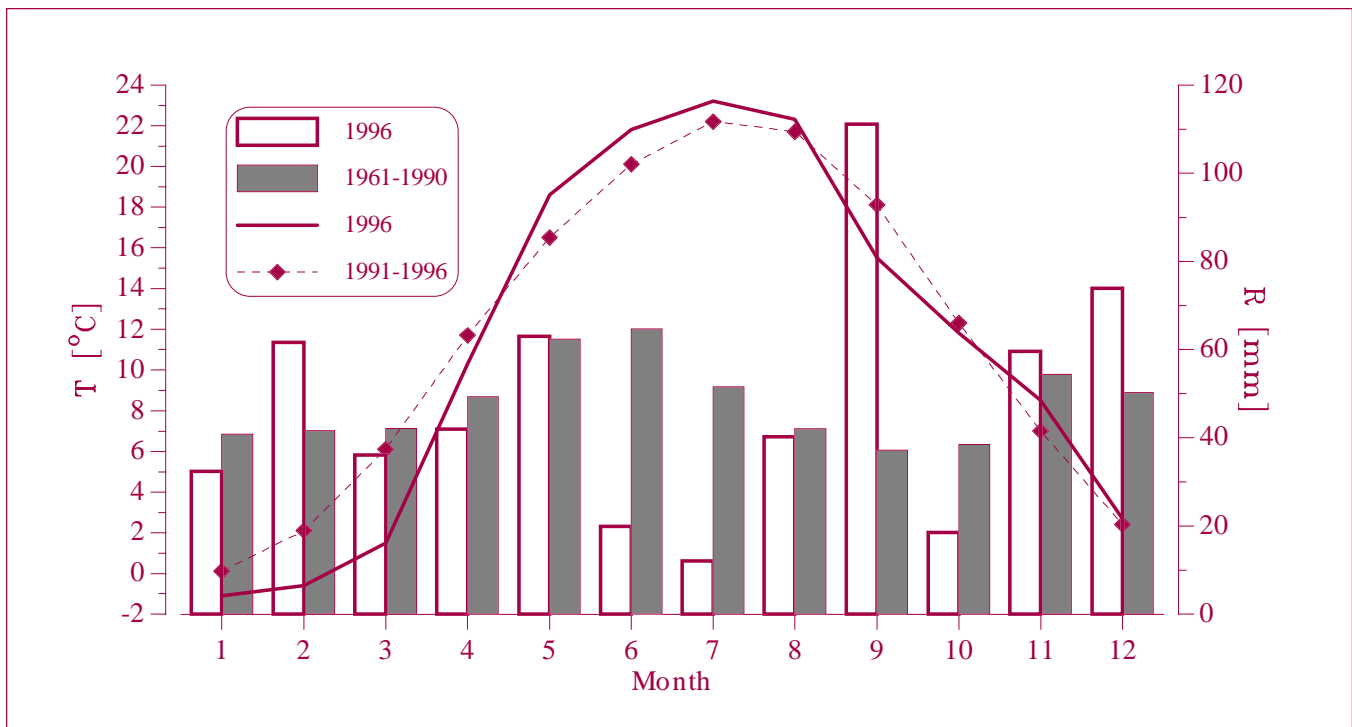
crops dormant and the snow cover preserved them (Figure 1).

In the third 10 days of April, a period of accelerated development and growth of winter wheat began. Because of the unusually long winter (November–March) and the late spring, the crops, although not frozen, were weak and poorly developed. Cold weather in March and April and snowmelt resulting in oversaturated soil prevented the timely sowing of spring crops by more than a month. By the end of the third 10 days of April, no rainfall had occurred.

In May, a spell of sharply warmer weather (especially during the second 10 days, when maximum air temperatures reached 30–35°C) increased the development of all agricultural crops. However, higher temperatures caused a great thermal gradient between air and soil temperatures, which slowed crop growth and development.

In June, agrometeorological conditions created additional troubles with above-normal thermal conditions, because mean monthly air temperature was about 2°C above the mean multiannual value (Figure 1). In June, when climatic conditions usually lead to maximum precipitation amounts in the country, precipitation was only a third of normal (1961–90 normals) and a soil drought had set in. In the top 1 m of the soil layer, total water reserves of the cereal crops had reached critical values. Because of this, heads of winter wheat remained small and wheat grains were undersized and underfed. Furthermore, some winter wheat crops died. During the period of the current climate normals (1961–90), the national annual winter wheat grain production in Bulgaria was 3,488,000 tons, with an average yield of 3,290 kg/ha, but in 1996, total production was only 1,757,000 tons and average yield was only 1,840 kg/ha, with low baking qualities.

In July, agrometeorological conditions were characterized by high temperatures, with maximum val-



**Figure 1. Current and 1996 climatic values of monthly air temperature (lines) and precipitation (bar charts) in Bulgaria.**

ues reaching 33–35°C. Atmospheric drought hit the entire country. Precipitation for the month was only 5–10 mm, and at the beginning and end of July no precipitation fell (Figure 1). At the end of the month, the water reserves of the spring crops reached 30–40 mm in the top 1 m of the soil layer, which limited crop development and hampered the growth of all spring crops. As a result, crop reproductive organs were not well developed. The warm and dry weather continued into August.

Generally, the summer was characterized by unfavorable agrometeorological conditions, which led to important aberrations in spring crop production. During the 1961–90 period, the annual average yield of maize, Bulgaria’s main forage crop, amounted to 2,252,000 tons, with an average yield of 3,754 kg/ha. In 1996, total maize production was only 998,000 tons, with an average yield of 2,790 kg/ha. Precipitation at the end of August and the beginning of September made harvesting the scanty crops difficult.

The 1996 summer precipitation deficit in Bulgaria was the third drought occurrence during the spring crop-growing season for the last ten years. These

droughts were combined with significant daily variations of air temperature. The large air temperature amplitudes caused stress for agricultural crops. As a result, the crop physiological processes, formation of reproductive organs, and (above all) grain filling were disturbed. These unfavorable meteorological conditions caused decreases in yields of major agricultural crops, which in turn affected the food supplies of the Bulgarian population.

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