# IRRIGATION OF SUNFLOWERS IN ROMANIA

G. ŞIPOŞ and RODICA PĂLTINEANU
(Romania)

Water, a very important natural resource, must be economically used. It takes 4000—5000 l of water in order to produce 1 liter of oil by a sunflower crop comparing with other industrial and agricultural products (table 1).

*Table 1*

**The quantity of water (l) used for 1 kilo of product**

| Industry | | Agriculture | | Food | l/kg |
|---|---|---|---|---|---|
| Steel | 150 | Sugar beet (root) | 120 | Sugar | 1000 |
| Paper | 250 | Maize (grains) | 600 | Flour | 700 |
| Aluminium | 1200 | Sunflower (grains) | 1500 | Oil (sunflower) | 4000 |

The annual evapotranspiration of sunflower is about 500 mm of water, beeing 100—300 mm less than the evapotranspiration of maize, soybean, sugarbeet and alfalfa.

The total consumptive use depends on the vegetation period and on the total amount of heat received by a sunflower crop. Dividing the total consumptive use by the number of days in the vegetation period results a daily evapotranspiration rate of 3—5 mm (figures 1 and 2).

Maximum daily evapotranspiration rate of sunflower is 5—6 mm and it is reached 8—12 days before maize. Because of earlier maturity sunflower suffers less than maize during the dryest summer period but realizes less overyields as a result of irrigation (figure 3).

The consumptive use of irrigated sunflower, in southern Romanian plain is covered 15—20% from the water stored in soil at planting time, 40—60% from rainfall between planting to maturity and 20—45% from irrigation.

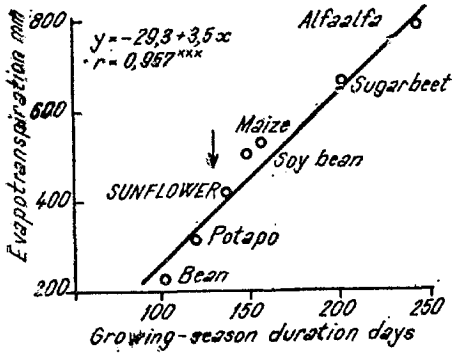


*Fig. 1* — Interrelationship between growing-season duration and evapotranspiration.

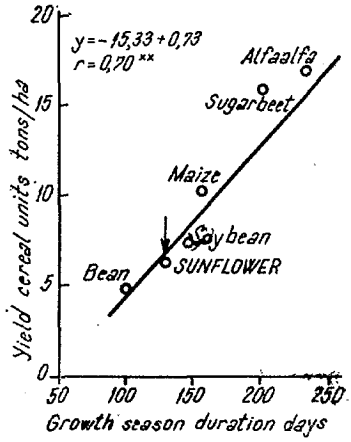


*Fig. 2* — Relation between growing-season duration and yield

The experimental results obtained during the last 10—12 years show (table 2) that sunflower yield in the southern part of the country increased by irrigation and fertilization from 20—25 q/ha to 35—40 q/ha.

The overyield determined by irrigation is 2—12 q/ha and depends on rainfall during the vegetation period. These overyields were obtained when the water content of the soil was maintained by irrigation over 50% of the available water on a depth of 80 cm of soil.

Irrigation increased the level of production and at the same time realized the yield stability year by year.

Scheduling of the irrigation needs can be done by a soil water balance. In order to obtain a good water-balance it is necessary to

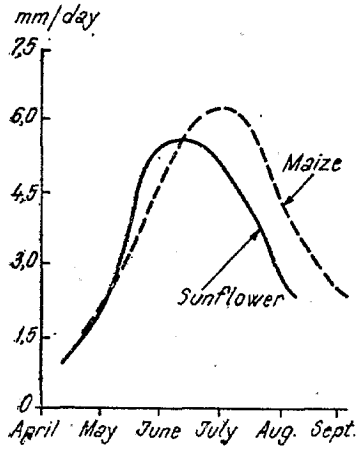


*Fig. 3* — Evapotranspiration of irrigated sunflower and maize at Fundulea.

*Table 2*

**The influence of irrigation and fertilizers on sunflower yield**

| Treatment | | Fundulea | | | Brăila | | |
|---|---|---|---|---|---|---|---|
| Irrigation >50% a.w. 80 cm 100—200 mm | Fertilizer N 80 $P_2O_5$ 80 kg/ha | Yield q/ha | Difference | | Yield q/ha | Difference | |
| | | | q/ha | % | | q/ha | % |
| — | — | 26,0 | — | — | 21,3 | — | — |
| + | — | 30,3 | 4,3 | 17 | 27,3 | 6,0 | 28 |
| — | + | 28,7 | — | — | 27,4 | — | — |
| + | + | 36,6 | 7,9 | 27 | 36,2 | 8,8 | 32 |
| (+ +) | (— —) | — | 10,6 | 40 | — | 14,9 | 70 |

know two principal elements of the balance : the input of water during the vegetation period and the evapotranspiration loss of sunflowers.

The input of water is determined by precipitation and irrigation. The evapotranspiration can be evaluated from multiannual evapotranspiration data obtained in the specific area, or can be calculated from evapotranspiration measured in lysimeters or from evaporimetric data, both of them corrected by coefficients.

By taking into consideration the growing stages of sunflower, irrigation can be lead to an increase of water use efficiency. In this case it is necessary to start irrigation during head formation period (half of June) and continue it at 12—15 day intervals until first part of August. If it rains during this period, for every 5 mm of rainfall, the next irrigation will be delayed with one day.

Following this procedure, sunflower receives 1—3 irrigations wich assure 90—95% of the maximum yield. There are difficulties in manual transportation of the irrigation equipment because of stalk height (150—180 cm) and plant lodging when strong winds follow after irrigation during seed filling period.

## CONCLUSIONS

1. Sunflowers consume large quantities of water. In order to produce 1 liter of sunflower oil, 4000—5000 l of water are necessary.

2. In southern Romanian plane, the water needs of sunflowers are covered 55—80% from soil water storage at planting time and rainfall during the vegetation period. In order to obtain maximum yield 20—45% of the water needs of the plants must be completed by irrigation.

3. The reaction of sunflower to irrigation is moderate because of the present varieties and hybrides wich have shorter vegetation period then other irrigated crops such as maize, soybean, sugar beet.

4. In order to increase the water use efficiency it is desirable to cultivate varieties with longer vegetation period and resistent to lodging.