SUNFLOWER SEED PRODUCTION DEVELOPMENT IN SPAIN

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The growing necessity for vegetable oils with the traditional search of Spanish farmers for dry farming plants, are the main reason motivating the rapid increase of the cultivated area with sunflower in Spain.

Despite some isolated experiments in 1960 with sunflower varieties and the necessary techniques for its cultivation under our conditions, we consider the year 1968 as the starting point of this new period in sunflower production.

From 1968 until now there has been an enormous increase of the sunflower cultivated surface. In that year it was 30,000 Ha, reaching two years later, 170,000 Ha. In 1973, the surface was about 470,000 Ha. Therefore, in the last years, the sunflower production increased, reaching in 1973 430,000 tons of grains, putting Spain as one of the world's top sunflower producers.

The sunflower plantations have covered a considerable surface of the Spanish dry farming soils, particularly in Western Andalusia where the best results are being obtained.

Among others, this success is mainly due to the Government's agricultural policy on this specific crop as well as the excellent adaptation of the Russian varieties. From the very beginning, the Russian varieties demonstrated that sunflower is a profitable crop on the Andalusian dry farming soils.

Seed production. The necessity of selected seeds, derived from the rapid increase of sunflower areas, has provided the means of getting in the shortest possible time, not only the self supply of sowing seeds but also the supply of basic seed required for all the varieties already planted throughout the country. Those two targets were reached within a period of four years and the final production was so good that we exported 8,967 tons of seeds to the U.S.A., Portugal and South America.

The sunflower seed production in Spain is carried out by private firms under the direct control of the I.N.S.P.V., which is a special de-

partment of the Ministry of Agriculture. These firms, duly authorized by the Government have all the economic and technical resources such as laboratories etc.

The seed production is regulated by a certification scheme recently passed by the Government which includes not only sunflower but also safflower, rape seed, peanut, turnip seed and soya.

During their growing cycle, the sunflower fields are visited at least twice by Institute's inspectors in order fo find out whether the certification scheme requirements have been fulfilled or not.

A sample of each lot of all the certified seeds has to be analized at the Institute's Seed Testing Station and it is strictly forbidden to trade with those seeds whose samples haven't been analysed. Only the varieties included in the National List can be produced and commercialized in Spain. A variety inclusion in the aforementioned list requieres a perfect knowledge of its agronomic value. This agronomic value is obtained through an evaluation test which has to last a period of at least three years.

The Variety List is published by the Ministry of Agriculture with the agreement of the Institute. The varieties actually included in the List are Armavirski 9345, Issanka, Peredovik, Record, Smena, VNIIMK-6540 and VNIIMK-8883.

Many varieties from different countries, such as USA, Romania, Canada, France, etc. have been tested and introduced in Spain. In the last years we tested hybrid from Romania, France and USA, but in comparison with the varieties already cultivated and as far as profitability is concerned there are not important differences. More than 90% of the sunflower area is planted with the varieties Peredovik and Smena. It is important to point out that the varieties originally planted, after three or four years of massal selection, have been greatly improved in productivity and in oil content.

The best hybrids tested so far, being in some cases even better than the Peredovik variety, are the Romanian HS 52 and the American *HS 200. In 1972 we imported 30 tons of the aforementioned Romanian* variety Record and we are testing them in different parts of the country with very goods results. As far as the second variety is concerned and after having produced 10.000 kg last year the tests have demonstrated that unfortunately this variety as the HS-52 are not resistant to the mildew disease. This is the reason why these hybrid varieties have not been included in the Variety List.

The firm producers have started important investigation programmes in order to gest Spanish mildew resistant three-way hybrids.

These experimental three-way hybrids are obtained by sowing in a completely isolated field a very high number of single hybrids with cytoplasmic male sterility and inserting restorer lines with mildew resistance.

In the autumn of 1973 and using the aforementioned system 500 single hybrids were planted in the Canary Islands. Because of their mild climatic conditions, the sunflower sowing in autumn is perfectly

possible in the Canary Islands. In this way we can get a couple of harvests yearly, one of them during the summer in Andalusia and the other one in the Canary Islands during the autumn. By using this system we can save a considerable amount of time extremely useful for the investigation programmes.

The resistant three-way hybrids obtained will be tested in various locations for the evaluation of their agronomic values, productivity, richness in oil, disease resistance, etc., in comparison with standard varieties.

The best combinations will be selected for extensive tests. The production planning establishes for 1976 the total amount of 500 tons of mildew resistant three-way hybrid seeds.

The production of new experimental single hybrids is expected to continue on a big scale.

The following table shows the availability of sunflower certified seeds in Spain since 1968, pointing out not only the seed origin but also the self-supply level reached in every campaign (table 1).

Table 1

Sunflower seed supply (tons) in Spain

Year	Domestic production	Imported seed	Total tons	% of domestic production
1968	14.94	77.00	91.94	16.2
1969	375.45	109.00	484.45	77.5
1970	1,665.00	23.00	1,668.00	98.6
1971	5,285.85	171.61	5,457.46	96.8
1972	5,558.15	144.28	5,702.43	97.4
1973	5,733.14	35.00	5,678.14	99.4
1974	6,500.00	—	6,500.00	100.0

It is important to make clear that the self-supply of certified seed was completely reached in 1970 and since then the imports have been limited to new varieties for trial and to decreasing amounts of basic seeds every year until 1972 when we also achieved the self-supply of this kind of seed.

The 1973 production of this type of seed reached 250,000 kg which means an increase of 312% in comparison with the previous year. From those 250,000 kg 70% belongs to Peredovik variety, 25% to Smena and the remainder 5% to different earlier varieties like Issanka.

The short cycle varieties are very useful for two reasons ; on the one hand because they permit their cultivation in the northern part of the country where the climatic conditions shortened the period available for sunflower cultivation, and on the other hand because a second harvest is possible in Andalusia just after the winter cereal harvesting, obtaining in this way a better use of the land.

The basic seed production is made by using the method of mass selection during a period of four years. The aforementioned process has the following phases.

First year. Selection of a big number of plants ranging from 3,000 to 5,000 in an isolated plot of enough space isolation starting in this way the variety maintenance process. The selection is made taking into account the agronomic characteristics such as precocity, development, disease resistance, etc.

Afterwards all the chosen heads are individually analysed and 80% of them are normally eliminated because of their physiological characteristics, mainly the oil content of the seeds.

Second year. The seed of the non-eliminated plants is divided into three equal parts keeping one of them in adequate conditions.

The two remaining parts are planted maintaining their pedegree in two or three fields of sufficient homogeneity in order to carry out the genetic test, evaluating the capacity of productivity and resistance to diseases of a joined number of plants deriving from the seed of only one plant. The offsprings not eliminated in the field are analysed in laboratory in order to determine their physiological characteristics.

Third year. The seed in reserve of the plants whose offsprings were neither eliminated in the field nor in the laboratory during the test of the last year, constitute the generation zero and are planted for their multiplication in an isolated field controlled throughout the vegetative cycle, eliminating always before flowering, the plants or group of plants showing characteristics other than the variety to be conserved.

In this field of G-O the appropiate plants are selected in order to start again the cycle.

Fourth year. Last year crop (generation G-1) is multiplied in the other two fields in order to avoid the total loss of the crop, thus obtaining the generation G-2 or the basic seed.

In order to obtain the commercial seed, the basic seed is multiplied once again, the result of which is the certified seed as being the first multiplication (R-1).

The National Institute of Seeds and Nursery Plants which is a section of the Ministry of Agriculture dedicated to seeds, controls the above mentioned phases, certifying not only the basic and commercial seeds but also the generation prior to the basic seed (G-1).