



### Editorial

*This third issue of the ISA Newsletter puts a light on confection sunflower, and more precisely confection sunflower in China, taking the occasion of the Confection Sunflower Technology and Production symposium held in Wu Yuan, Inner Mongolia.*

*Sunflower is one of the important oil crop in China, its planting areas is around 0.8-1.0 million hectares annually. Inner Mongolia is the biggest sunflower planting region in China, especially for confectionary sunflower, the planting areas is around 0.43 million hectares, followed by Xinjiang, Heilongjiang, Jilin and Gansu etc.*



Sunflower planting area map in China (left Yellow color) and sunflower planting in Bayannur ( Right).

*Inner Mongolia is located in the north border of China, neighbor with Russia and Mongolia. The altitude of this region is around 1100-1300 meters and the total area is 18.3 million hectares. Mongolia minority is the main residence and the total population is 28.7 million. Beside sunflower, potato, maize and oats are also the main crops in this region.*

*Bayannur is located in the western part of the Inner Mongolia Region, with a total area of 65 thousand square kilometers and a population size of 1.7 million. Wuyuan, as one of towns of Bayannur, has become the largest sunflower planting base and distribution center in the western part of the country. More than 70% of the sunflower in the country is bred and distributed from here, which makes here the hub for distributing sunflower seeds and also the vane of the sunflower seeds*



price in China. Besides these, this small town hosted 120 roasted seeds and nut processing enterprises such as Sanrui, Xinlian, Sanpangdan and other leading enterprises, which produce a series of high-quality sunflower seed products that have entered the high-end market. The Sunflower industry plays an important role in building Hetao high-tech green organic agricultural and sunflower processing export base in Bayannoer.

Now, China invested plenty of efforts on sunflower research, breeding and also processing. The best example is the China Sunflower Research System (CSRS). It is set up in 2008 and gathered researchers who are experts on sunflower breeding, pest control, cultivation, fertilization and also mechanization into one big research team, and invested energies on the bottle neck factors which limited the development of sunflower industry in China. Meanwhile, 10 sunflower stations also established and distributed in the sunflower planting regions. These stations undertake the tasks to demonstrate the sunflower new varieties, new technologies which invested by above researchers to the local farmers. This research system plays a vital role on convoying the development of sunflower industry in China now.

Sanrui is a large sunflower confectionary seed company in China and stands in the leading position in Chinese sunflower network. It owned Sunflower Research College, breeding base, powerful selling network and also big processing factory. The confectionary varieties Sanrui 363 and Sanrui361 has become the most popular new sunflower varieties on the seed market now. The Sanrui company is officially candidate to organize the ISC in 2024 in Bayannoer, and, doing so, ready to help in building up a bridge for Chinese and foreign researchers on multi- dimensional collaborations on Sunflower.

Prof. Dr. Jun Zhao

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## **Activity and News of the association:**

### **The Wuyuan Symposium on Confection Sunflower Technology and Production – August 2018**

Last summer, ISA gave its institutional support to the 2018 International Symposium on Confection Sunflower Technology and Production, which was held on August 8-10, in Wu Yuan, Inner Mongolia, China. This symposium was organised by the Sanrui Sunflower AgriTech Company, with the support of the Inner Mongolia Autonomous Region, Agricultural University, Inner Mongolia Academic Institution of Agric and Animal Husbandry Science, the Government of Wuyuan County and Bayannoer City. This symposium is also a part of open ceremony for Sunflower Festival, which is a major touristic event in this region.





The Wuyuan County, located at the northernmost part of the “Z-shaped” bay of the Yellow River, occupies a total area of 2544 square kilometers, with a total population of 300,000, including an agricultural population of 200,000. Located in Hetao Plain, the Wuyuan County has 154 000 ha of cultivated land, and Yellow River is the main source for the irrigation. .



*Symposium site, Wuyuan county Hotel*



*International diversity in sunflower research, Beijing*

The symposium gathered about 200 people, among them 35 foreign guests from 17 countries. On the science and innovation side, 20 oral presentation and 12 posters have been offered. It was open by the institutional speeches of the Wu Yuan County Governor, the Bayannor City Governor and by the head of the Chinese Sunflower network, Mr Zhang Yongping.







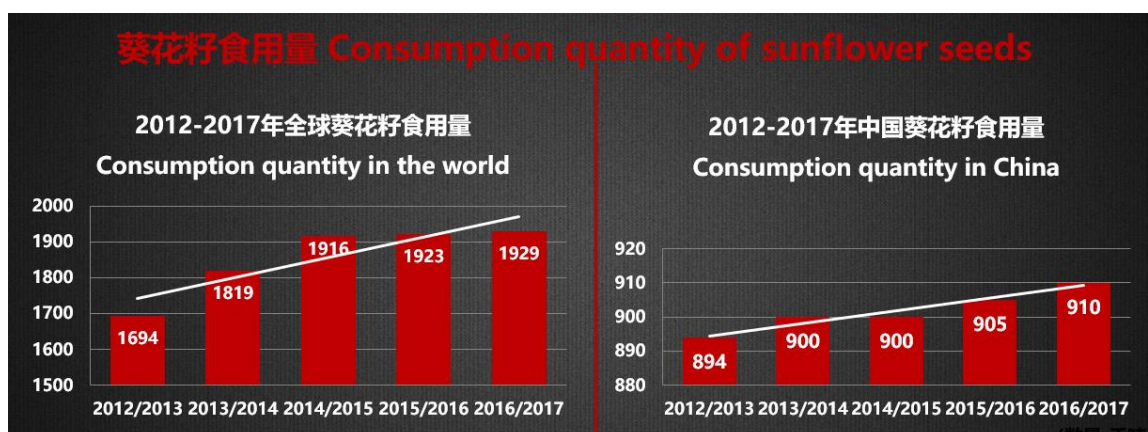
*Attentive attendance during the symposium*

*Presentation of ISA*

The symposium was organized in 3 main sessions: a) Sunflower production and processing, b) Weed, Insect and disease resistance, c) Molecular breeding and marker assisted selection. Thanks to the efforts of the organizing team (particularly Chao-Chien Jan, Jiuhuan Feng and all the Sanrui team), the symposium was pleasant, smooth for communication, and the slideshows were in bilingual Chinese and English, meeting the needs of all participants.

In the first session, John Swanson introduced the US National Sunflower Association, inclusive of all parts of sunflower industry in US, and explained how the NSA works and supports the research and innovation through grants to projects, which was considered as important part for the industry and keeps and oversight of breeding lines used in the industry. He presented the importance of the licensing and fees system as a good way to get additional desirable traits for the industry and of the regulation on intellectual property rights: long-term availability to get access to advanced germplasm depends on providing a return for the costs of developing lines. More Chinese companies are now investing in breeding programs and to keep this trend going, they need a return on their investment: the sunflower industry in China must develop a system to limit theft of lines, now China have the most important confection sunflower acreage compared with the other any country. Zhang Yongping then presented the Chinese confection sunflower value chain (see information in the section Value Chains and Regional News). E. Pilorgé gave an overview of the sunflower in the world and presented the ISA and its activities. The representative of Qiaqia Food Company explained the industrial production and quality process of this company, and gave some trends of the confection sunflower markets in China and at world scale, of consumers tastes and demand and maturity of market. This market of “leisure food” is still expanding with specific demands: one of the tasks of the industry is to meet the demand for new forms of retailing and innovation in flavors. Keeping the seeds fresh is also an issue for which Qiaqia developed conditioning under nitrogen atmosphere (under patent).





Zhao Jie, from Dafeng Co presented also elements on exports of confection seeds from the Wuyuan region, specially to Iran and Turkey, and other consuming countries (Egypt, Middle East, Vietnam, Myanmar, Japan, South Korea...), in the turmoil of international relations and concluded on the interest of a unified brand for export. Mohamad Dastpak (Adak Tejaratazhand Co) and Mohamad Reza Zare (Kiyabod Food Co) informed about the Iranian production (40000 tons) and market.

Concerning crop protection, Bai Quanjiang (Inner Mongolia Academic Institution of Agricultural and Animal Husbandry Science) exposed the situation of sunflower sanitary situation and specially broomrape in Inner Mongolia. Before 2010, the distribution area of *O. Cumana* in Inner Mongolia was very limited, near the Yellow River; but at the end of 2013, its distribution area expanded to all planting areas in Hetao Irrigation Area, reaching 0.013 million hectares; in 2014 it increased to 0.02 million hectares, with situations of very heavy damages in Baotou, Ulanhabu and some new planting areas. The monitoring of the infestation started in 2012 until present, through field scouting, interviews and sampling, showing some regions heavily infested, with more than 50% of infested fields in 3 districts, up to 80%. The monitoring revealed mainly races G, the most virulent, and E, then A and B, these denominations needing to be harmonized for international comparisons (cf Buccarest symposium). It is observed that different irrigation methods would have contrasted effects on broomrape infestations: perhaps flood irrigation would present negative effects to infestations. Several control methods have been presented, including genetic resistance and use of IMI herbicides on tolerant varieties. Experiments with sprays of chemical elicitors at different stages and dilutions have been achieved, permitting interesting observations.

Leonardo Veslaco (CSIC, Spain) reminded of the history and evolutions of *Orobanch* and echoed the proposal of Martin Sanz 2018 for a characterization of *Orobanches* races through a set of differentialsunflower varieties and described the complexity of the races situation. Traditionally, the broomrape variability has been attributed to mutations, but recent studies have shown the existence of a certain level of cross fertilization and genetic recombination between individuals of different genes pools: the rate of cross fertilization could range by 15 up to 40% in field conditions. It was later observed that increased virulence was associated with increased variability; in Black Sea area of Bulgaria, it was found that genes flows exist between populations parasitizing sunflowers and populations on wild hosts... L. Velasco detailed the possible and complementary research strategies.

Emmanuel Byamukama (US, South Dakota State Univ.) offered a review of the major sunflower diseases and their management in USA. Larry Charlet (formerly USDA Fargo) gave also a review presentation of the insects pest management in sunflower. The sunflower species originating from America, many pests are specific of sunflower in the USA.

Jun Zhao (Inner Mongolia Agricultural Univ.) presented an update on *Verticillium Dahliae* and its transmission. The disease has been first reported in China in 2010 and spread quickly, with important yield



losses in all sunflower growing regions in China. A study has been carried out in controlled conditions on the roots infection process, using GFP (Green Fluorescent Proteins) labelled *V. dahliae* strains, and on the seeds contamination detection on MNP-10 medium. The conclusion is that seeds coat is the main tissue for the colonization of *V.dahliae* and this could be the main reason for the long distance expanding of Sunflower Verticillium Wilt. Then samples of 71 varieties (confection and oil types) have been analysed regarding seeds contamination, showing a variability in seeds contamination ratios and that seed coats were also colonized by other pathogens (*Alternaria*, *Rhizopus*).

Stevan Masirevic (European Center for Peace and Development, Novi Sad, Serbia) offered a quite complete review of the latest sunflower diseases research progress and management, starting with an impressive classification of 112 sunflower diseases, involving fungi and oomycetes, bacteria, phytoplasmas, nematodes, viruses and parasitic plants.

Bilig Bater (Wulaateqianqi New Century Seeds LLC) presented the results of IMI herbicides trials in China against broomrape.

Kong Shengli (Henan Jiyuan Baiyun Industry Co) presented the KEYUN biocontrol products and the company Supported by the Chinese Academy of Sciences, the company developed biopesticides, special viral pesticides, with 4 production lines allowing to cover 3.3 million ha, and 3 production lines for natural enemy rearing. The company is leader on biological products against the larvae of cotton bollworm, also produces products for vegetables, pheromone traps and trichogramma to control borers on rice, corn and sorghum (combined use of pheromone traps and trichogramma). Its products are exported to many countries. Specially for sunflower, the company focusses on *Homoeosoma nebulella* and *Helicoverpa armigera*, two insect species attacking the floral buds and causing damage to seeds. The challenge is to identify methods selective of bees and pollinators. To control *Helicoverpa armigera* on sunflower and other crops, the company proposes a viral biopesticide based on a nucleopolyhedrovirus HaNPV.

Dragan Skoric (Serbian Academy of Science and Arts, Serbia) exposed the specificities of breeding for confection sunflowers, with targets depending on different types of consumers' preferences. Increasing the protein content is an important target One of the difficulties being that germplasms for confection types are relatively scarce compared to oil types, with a limited number of breeding centers and multiple objectives. Branislav Dozet (Syngenta Seeds) insisted on the need to identify key traits to focus the breeding efforts, develop the importance to be precise and accurate in the breeding process, in order to make genetic gain, and not only release cultivars.

Xiao Jinhua (Huazhi Rice Biotech Co) reminded of the history of the evolution and use of molecular breeding technologies for commercial crops.

Michail Christov (Dobroudja institute, Mihsan Ltd, Bulgaria) presented a synthesis of 30 years experience in interspecific and intergeneric hybridization for the sunflower breeding, working on 36 species of *Helianthus* and 28 species of other genera of the Compositae family, and results on new sources of resistance or CMS.

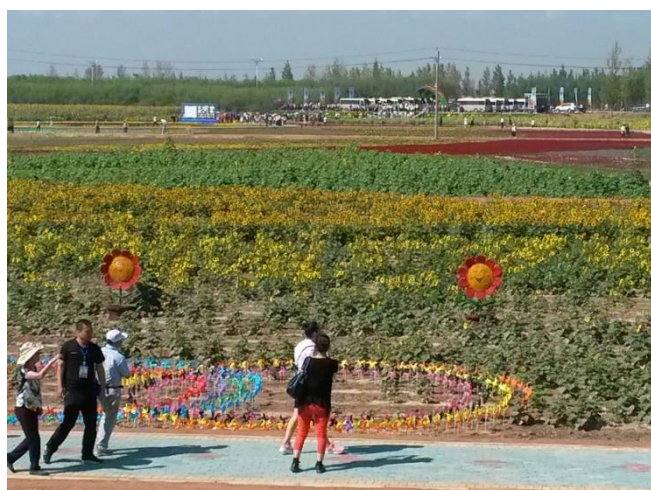
Finally, Li Lianshe (Sanrui Agritec Co) proposed an overview on the progress and research direction of sunflower breeding, and breeding strategies in China.

At the occasion of this symposium, the Chinese institutional and economic actors of Inner Mongolia expressed their wish for an active collaboration with the international sunflower community and to participate actively in the near future to the activities of ISA, in order to strengthen exchanges and cooperation, develop research and innovation, deepen cooperation and partnership. The region is officially candidate to host the ISC in 2024 in Bayannoer. No doubt that it will contribute to the dynamics of ISA and to a better consideration of the specificities of the confection sunflowers types in its works.





*The slides presentations of the symposium will be available in the ISA website members' space.*



*Sunflower expo park*



*International sunflower tourism and culture festival*

## **20th International Sunflower Conference in Novi Sad, Serbia on June 22-25, 2020**

The Conference organizing Committee recently launched the Conference Website : follow it on <https://isc2020.com/program/program-overview/>

## **Value chains and regional news**

### **China, Confectionary Sunflower Production and Markets**

The Wuyuan symposium was completed with a number of visits making understand the economic and cultural importance of sunflower in the region: the sunflower expo garden, the Hetao Agricultural Museum.

A number of visits aside the symposium held on August 8-10, 2018, offered a valuable illustration of the complete regional confectionary sunflower value chain: Sanrui labs and breeding site, Dafeng grain and oil conditioning plant, and Hetao e-commerce industrial park- showing a well-coordinated organisation from the sowing seeds to merchandizing of the final products, with a significant input in research and innovation.



*Visit of Dafeng Grain and Oil company*



*Visit of the Hetao e-commerce industrial zone*



Zhang Yongping, CEO of Sanrui, main organizer of the symposium, offered an overview of the confection sunflower sector in China.

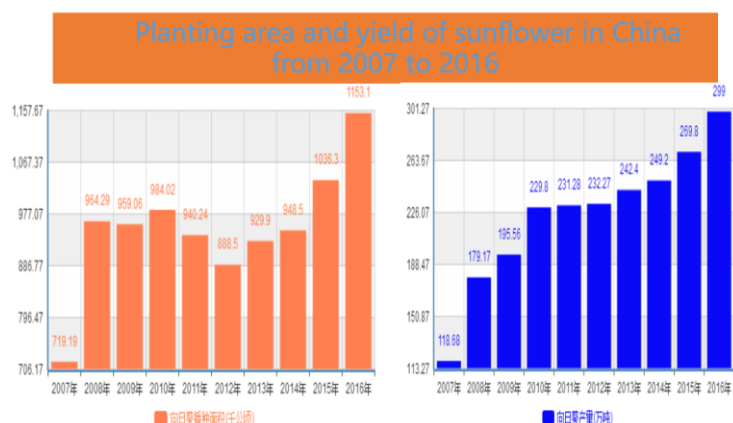
Sanrui is a large seed company in China, at the head of the Chinese sunflower network. The region is shifting from open pollination varieties to hybrids and the Bayannoer region alone grows 3.5 million Mu (234.000 ha) yearly, about 40% of the total national acreage of confection sunflower, which ranges by 520.000 to 660.000 ha. It represents 1 billion Yuan for the sowing seeds, 10 billion for farmers' seeds production, and 40 billion for the roasted sunflower seeds, making China the largest consumer in the world. At national level, the sunflower sector involves 1 million people. For the Bayannoer region, sunflower represents one third of the annual income of the farmers. The business for the seeds commodities and roasted seeds industry ranges by 51 million Yuans. 409.600 tons of confection sunflower seeds were exported from China in 2017, according to Sanrui.



*Agriculture exhibition hall: sunflower confection seeds and edible oil, roasted seeds boxes*







Evolution of Chinese confection sunflower acreages in 1000 acres (orange) and production in 10000 tons (blue)

If we refer to the Oil world statistics, the total sunflower acreage in China would be 1.080.000 ha, and the production 2.800.000 tons, meaning that confection types would represent 50 to 66% of the total acreage. In the region, confection sunflower offers 50% higher revenue to farmers than oil types, hence the success of this crop.

Like in many countries, sunflower is attacked by a number of pest and diseases, the most prejudicial being leaf spot, moths and broomrape.

According to Zhang Yongping, the main issues for sunflower in China are:

- The lack of rotation, inducing a trend of deterioration in sunflower production and quality, which affects farmers' income seriously,
- The development of broomrape, which tends to spread quickly and caused heavy problems on about 68.000 ha.
- The sclerotinia also affected a similar acreage.
- A new disease, named "grain watermark", strongly affects the seed quality, leading to 30% decrease in prices, and is expected to be a main restriction for the sustainable development of the crop.

They fully justify heavy research and innovation efforts to solve these problems.



Greenhouse devices in the institute of Sunflower Science and Technology, Sanrui Co





*Visit of Sanrui sunflower trials*



*sowing seeds*



*Post symposium visit in Huhhot region on farmers' fields with researchers and advisers*

## **Confection Sunflower breeding, production and processing in Serbia**

Confection sunflower seeds are used in Serbia for bakery products, but also in a number of natural health products, healthy snacks, as well as raw or backed for direct consumption. High-protein sunflower has a separate market from the oil-type and the percentage of confection sunflower hybrids in total area sown to this crop in Serbia is up to 5%.

In the world, currently, there are not a lot of institutes and companies that have a confectionery sunflower breeding program. Open-pollinated confection varieties "mezheumok" cover more than 700,000 hectares in Russia. Lakomka "mezheumok" type is classified as intermediate between oil and confectionary type. In Ukraine, confection sunflower segment is about 3-5% of the total production of sunflower seed. A decade ago, the most common variety was Donskoy, while in recent years, Lakomka has become more popular. High price and increased demand for confection sunflower led to appearance of confection hybrid breeding programs.

In Serbia confection sunflower breeding program was established at IFVCNS in mid-90ties with the aim of developing modern hybrids. The advantage of confection hybrids in comparison to varieties are crop uniformity, suitability for mechanized harvesting, optimal plant density for achieving the desired size, seed quality, colour suitability and higher seed yield. Within the breeding program, special attention is directed towards creating hybrids for specific market demands, purpose and manner of usage, human nutrition or bird



feed and conventional or organic production. Very important goals in breeding generally, but also for confection type, are the resistance or tolerance of hybrids to diseases, broomrape, herbicides and drought.

Confection varieties with large black seeds have mostly been replaced in Serbia by NS confection hybrids such as NS Gricko, NS Slatki, NS Garavi and NS Leviathan that are produced by many small farmers. The yield is on the same level as the yield of oil hybrids with over 4 t/ha and the price is up to double per kg, depending on the seed fraction, as the processing industry buys the large fraction seed for backing and packaging. Introduction of new NS confection hybrids contributed to the production stability and an increase in seed and protein yield in the conditions of intensive cultivation practices and mechanized harvesting. It is expected that confection hybrids will continue to spread in production worldwide and replace varieties.

## Scientific news

### Current works

**Master thesis defense/ Huhhot University, China, June 2019:** 1.The Rate of Soil and Seed-borne Pathogenic Infection among Different Sunflower Varieties and the Control Effect of Fungicide Pretreatment on Sunflower Seeds. 2.The set up of parasitic system between sunflower broomrape and Solanaceae.

### Publications

#### GENETICS AND BREEDING

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Characterization of the mitochondrial genome of the MAX1 type of cytoplasmic male-sterile sunflower. Maksim S. Makarenko, Alexander V. Usatov, Tatiana V. Tatarinova, Kirill V. Azarin, Maria D. Logacheva, Vera A. Gavrilova and Renate Horn. BMC Plant Biology 201919 (Suppl 1) :51. <https://doi.org/10.1186/s12870-019-1637-x>





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Evaluating an Interspecific *Helianthus annuus* × *Helianthus nuttallii* Line for Use in Sunflower Breeding Program. Roumiana Dimova Vassilevska-Ivanova, Ira Stancheva, Maria Geneva, Zoya Tcekova. . Turkish JAF Sci.Tech. . <https://doi.org/10.24925/turjaf.v6i12.1684-1689.1361>

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## **PATHOLOGY / CROP PROTECTION**

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## PROCESS AND PRODUCTS

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## ECONOMY AND MARKETS

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**IN HELIA: Ahead of prints:** see <https://www.degruyter.com/view/j/helia> (free access for ISA members through <http://isasunflower.org/> and login to Members Space.

Crop Yield and the Quality of Sunflower Seeds in the Use of Fertilizers and Growth Regulation Substances. Kvashin, A. A. / Neshchadim, N. N. / Yablonskay, E. K. / Gorpichenko, K. N.

Changing of Vegetative to Reproductive Ratio as a Response to Different Sowing Dates in Sunflower. Aliloo, Ali Asghar

## Coming International and national events

**5-8 May, 2019: AOCS Annual Meeting**, St Louis, Missouri, USA. <http://annualmeeting.aocs.org/>

**16-21. June 2019, 60th Conference on Production And Processing Of Oilseeds.** Herceg Novi, Montenegro

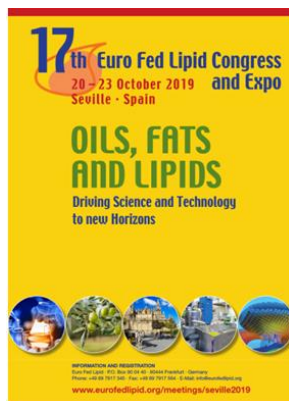
**7-10 July 2019, 9th European Symposium on Plant Lipids** Marseille, France

**July 30-August 2: National Verticillium Symposium**, Huhhot, China

**18-21 September 2019: European Conference on crop diversification.** Budapest, Hungary. <https://www.cropdiversification2019.net/call-for-abstracts.html>

**20-23 October 2019 17th Euro Fed Lipid Congress and Expo.** Sevilla, Spain

[https://veranstaltungen.gdch.de/tms/frontend/index.cfm?l=8455&sp\\_id=2](https://veranstaltungen.gdch.de/tms/frontend/index.cfm?l=8455&sp_id=2)



9-12 February 2020. World congress on oils and fats. Sidney, Australia. [www.wcofsydney2020.com](http://www.wcofsydney2020.com)

22-25 June 2020, 20th International Sunflower Conference, Novi Sad, Serbia  
<https://isc2020.com/program/program-overview/>



**We invite all the persons who read this newsletter to share information with the Sunflower community:  
let us know the scientific projects, events organized in your country, crops performances or any  
information of interest for sunflower R&D.**

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