



Global Council for Innovation in Rapeseed and Canola

“Building a World community for Innovation on Rapeseed and Canola”

N° 12, June 2022

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Editorial

Greetings and welcome to GCIRC Newsletter N°12, June 2022.

Supply constraints for oilseeds continue as the impact of the war in Ukraine affects global sunflower and rapeseed supplies. Our thoughts go out to our colleagues in Ukraine who are applying best endeavours to maintain supply chains for oilseeds and veg oils under the most challenging conditions. Thoughts also extend to oilseed farmers who are determined to plant crops despite the dangers involved and the uncertainty of being able to harvest.

Reports on World production of rapeseed/canola see expected increase in many regions. European production is expected to reach 18.3mmt, up 8% on last year. Double digit growth in production is expected in France (up 16%) and Germany (13%) while most other major European production states are reporting an increase in area sown to rapeseed. (Source: EU Commission. AMI).

Canadian canola production will be significantly up on last year's very low tonnage, but they are experiencing variable growing conditions with some regions quite dry, while other production areas are wet. Current estimates place Canadian production in line with 2020 at 19-20mmt. (Source: Greg Kostal)

Australia is forecasting another above average (10-year average) production year but not expected to be as high as 2021-22 record year, with latest estimates of 5.2mmt. (Source: AOF)

The on-going COVID-19 continues to provide challenges impacting our day-to-day activities such as the restrictions around close contacts and the resulting disruptions on the work force

as a whole (depending on country rules and regulations). Globally the world is learning to live with COVID, and a return to pre-COVID levels for the rapeseed/canola-using hospitality and transport sectors is pleasing to see. Good news is that we are increasingly able to go about business in what is described the 'new normal' which is great news as we head towards 2023 and in particular for IRC-16 in September.

As a global organisation, GCIRC will embark on many scientific and industry challenges, some of which that may not be present today, while other such as changing climatic conditions, carbon footprint, protein applications and nitrogen use command much research focus right now. IRC-16 and future Congresses will be key platforms to showcase the development in these extremely important areas.

As I highlighted in the January newsletter, while IRC-16 Sydney 'Global Crop – Golden Opportunities' will be utilising a hybrid format, there will be a strong focus (need) for active delegate presence at the Congress and pre-congress field tour. Please keep an eye on your inbox for news on the Congress, which will also appear on the newly launched website, <https://www.ircsydney2023.com>

Robert Wilson, GCIRC President

Activity/ News of the association:

16th IRC in Sydney, Australia

IRC-16 Sydney 2023 – September 24-27

15 months and counting down IRC-16. 'Global Crop – Golden Opportunities' planning and execution is progressing well.

Congress Executive Committee - meeting regularly, hitting timelines for activities.

- Congress venue booked
- Sponsors prospectus completed and approaches commenced
- Writing up expression of interest for Registration
- Budget (work in progress)
- Developing list of key Congress speakers (Government, Industry etc.)
- New website launched: <https://www.ircsydney2023.com>

Thematic Committee Chairs - (Australia) finalised. They have been requested to form their committees engaging both local and international members that will prepare the program including list of potential plenary speakers.

- GENETICS, GENOMICS and BREEDING Chair: Prof Wallace Cowling
- CROP PROTECTION Chair: Prof Jacqui Batley
- AGRONOMY, PHYSIOLOGY & CROP MANAGEMENT Chair: Dr John Kirkegaard
- QUALITY & PRODUCTS Chair: Dr Allan Green
Science and technical focus on oil and protein for food, feed & industrial
- END USE / CONSUMPTION Chair: Nick Goddard
Current needs from end users for - food, feed and fuels
- ECONOMY & MARKETS Chair: Rosemary Richards
Big picture on global oils and fats markets/climate/policies

Call for Abstracts: This will open in the next 2 months – watch your inbox for notifications.

Pre-congress Field Tour Committee – Core members engaged, planning underway.

We look forward to welcoming as many friends and colleagues as possible to Australia in September 2023. Remember, Sydney – ***“it’s closer than you think.”***

For further info go to <https://www.ircsydney2023.com>

News from the GCIRC Board

The new GCIRC Board has begun to work actively since its appointment by the General Assembly, on 30th September 2021, with regular online meetings (13th December 2021, 14th February, and 23rd May 2022). The first meeting was devoted mainly to mutual presentations in a Board team that has known and important turn over. The next sessions reviewed past and future activities, accounts, budgets, memberships and progress of the International Rapeseed Congress organization and related issues.

Welcome to New GCIRC members

Since last January we have welcomed four new members:

HEMKER	Reinhard	oil seed rape breeder, Limagrains GmbH	GERMANY
JAUVION	Vincent	Head of seed and cake analysis laboratory, Terres Inovia	FRANCE
RUCK	Laurent	Head of insecticides evaluation, Terres Inovia	FRANCE
YADAV	Shankar Lal	Plant breeder, SEEDWORKS	INDIA

You may visit their personal pages on the GCIRC website directory, to better know their fields of interest. We take this opportunity to remind all members that they can modify their personal page, especially indicating their fields of interest in order to facilitate interactions.

GCIRC Technical Meeting 2021: insect pest session

September 28th-29th, 2021, the GCIRC held online its Technical Meeting initially scheduled to be held in Poznan (Poland). It focussed on two thematic issues: «insect pest management in rapeseed, technical situation and research progress towards sustainable control» and «rapeseed protein production and added value: research issues from agronomy to product quality and process».

Dr Samantha Cook, from Rothamsted Research (UK) coordinated the first session on insect pests assisted by **Prof Andreas von Tiedemann**, University of Göttingen (Germany) to animate the discussion live session.

Samantha Cook introduced the insect pests control issue for rapeseed by reminding that insects love rapeseed citing a recent study that revealed 151 different insect species could be found on rapeseed in UK. Insects may attack the crop at different stages of their life cycle, which makes it difficult for producers to control them as they have to keep abreast of their field surveys to maintain an optimal pest management for the crop. Fortunately, most of the insects found in rapeseed can be considered benign or even beneficial. They can include some natural enemies of other crop pests allowing some pest control for free for the producers. Pollinators, such as bees and butterflies, can improve the yield of the crop and therefore benefit producers. Other species like detritivores are also very important for decomposition and soil improvement processes. Moreover, all insects provide very important food resources for farmland birds, making oilseed rape very important in the agri environment. Unfortunately, this importance has taken a long time to come to emerge: 20 years ago, in 1999, the GCIRC 10th international rapeseed Congress in Canberra (Australia) included 25 sessions and only one of them had anything to do with insects and integrated pest management. There were only five presentations in that session with one additional presentation from the breeding for resistance session on flea beetle. There was very little interest on insects back then. Today, 2021, the GCIRC Technical Meeting dedicated a whole session to insects with speakers for every GCIRC committee and there was enough to fill an entire session as there will be at the next rapeseed international Congress in Sydney (Australia) in 2023. Today, most regions in the world know insect pests control problems. In Europe notably, oilseed rape has stagnated in the recent period due to yield instability, maybe due to issues regarding nitrogen fertilisation, susceptibility of insect pests and lack of alternatives to insecticides, scarcer for some and losing efficacy for others due to insects' resistance.

Samantha Cook gave a summary of the presentations to introduce the live debate. The first speaker was Dr Sabine Andert from the University of Rostock in Germany who talked about a survey on future farmer perspectives and their management of winter oilseed rape in North-Eastern Germany: there is a clear trend that growers are starting to stop growing oilseed rape or reduce it, mainly due to insect pests in autumn, as number one reason and spring pests, as the number two reason. Farmers in Northern Germany tend to replace OSR by maize or winter cereals. By not replacing OSR by other flowering crops, it raises questions about the effects on bees and crop pollination. Samantha Cook observed that farmers did not consider Turnip Yellow virus as a very big problem, seemingly because of the recent availability of resistant cultivars. Andreas von Tiedemann expressed doubts about the relevance of lengthening the rotation to better control insects: once there are enough oilseed rape fields in a region, it will allow pests to perform their life cycle since it originates on the landscape level as they're roaming around and are mobile. Sabine Andert answered that beside insect pests in autumn and spring, farmers gave more answers regarding the main reasons of OSR cropping decline: if with a very high share of

WOSR, the main reason for decrease are insect pests from the perspective of farmers, however clubroot, weather extremes or nitrogen fertilizer uses are other main reasons for OSR cropping decline. The other crops are not always more profitable; however, they are more manageable for the farmers and that is also a main reason for some of them.

Is it a relevant answer regarding insect pests? and is integrated pest management part of the answer? These issues were discussed

Different speakers from all around the globe presented the situation in the major rapeseed producing countries, informing on the main pests and the control situation that each of these regions are facing, and what are the main alternative control methods available in these countries. **Dr Sarina Mac Fadyen** (CSIRO), **Dr Boyd Mori** (University of Alberta), **Dr Meike Brandes** (Julius Kühn-Institut), **Dr Sarwan Kumar** (Punjab Agricultural university) and **Prof Shu-Min Hou** (Anhui Academy of Agricultural Sciences) spoke for Australia, Canada, Europe, India, and China respectively. It was clear that insect rapeseed pests are diverse in the different regions with different pest problems due to the different climatic and cropping practices. Meike Brandes showed very clearly that even within a region of the world, different countries have very different problems making the management of the pests within the crop really difficult. It was clear that all regions have very high reliance on insecticides, particularly the broad-spectrum type that are less pensive. This is a main reason why we are starting to see pest problems due to widespread resistance in some of those regions, particularly those relying likely one or two active ingredients. The most interesting was of the mention of new pests, maybe emerging as a result of insect resistance or because crop surveys are increased. Sarina Mc Fadyen mentioned ear wigs, Boyd Mori and his team have identified a new species of midge that is a problem in Canada.

Everybody mentioned that agronomic practices for pest reduction are available and quite common. Early sowing being a particular strategy, farmers sowing their crops early to try to avoid pest infestation. Only a handful of commercially available alternatives to insecticides are available: an important point for discussion in future research.

The open debate following these presentations focussed on several issues:

- **The use of neonicotinoids** insecticides used in various regions of the world, notably to control aphids: In Canada, they are currently used, but not for aphids, they are not a problem there; in case of aphids' attacks at the end of the season, the seed treatment would already worn off. Neonics are banned in Europe, notably on rapeseed. In the case of India, Sarwan Kumar mentioned that even if neonics are banned of the pool of solutions, there are still **alternatives** in India such as chlorpyrifos and dimethoate, but for a sustainable pest management, host plant resistance needs more testing, and varieties with moderate levels of resistance could significantly help at reducing the insecticide applications on the crop. Samantha Cook observed that farmers want to replace those insecticides with cultivars that do not need insecticides, because it is easy, but at the moment they go in the fields to physically pick off the infected racemes with aphids. It is enormous physical effort and surely Indian farmers would be more willing to adopt strategies like trapping or intercropping strategies that take a little bit more effort than just spraying insecticides. Sarwan Kumar said that most of the farmers in India are small farmers with small fields: in the presented study, they do this kind of strategy early in the season and populations are very low. Moreover, in the areas where fields are available in the season, early planting is very useful and can lead to asynchrony between the aphid population and the flowering of the oilseed brassicas. If the fields are available early in the season,

farmers can go for early planting and the crop can simply escape from aphids that way. For insecticide application, practically just one application is sufficient in India to manage aphids, the second peak would start when fields are already mature and near harvesting.

- On the example Swede midge in Canada, for which winter canola seems to be more resistant, a question was asked about the possibility to escape some pest attacks by **moving winter canola to the north to replace spring canola**, playing on the different flowering phenology of these crops: Boys Mori answered that winter hardiness would really need a significant improvement to survive to the low temperatures. In southern Ontario, with its moderate climate, winter canola acreage is increasing, but is still minor crop in that region. Even with a yield increase for winter canola compared to spring canola. in the south of Canada, winter canola yields remain limited, around 5 to 10 Bu/acre more than spring canola.

Albin Gunnarson mentioned that in Sweden, both spring and winter oilseed rape are grown, and that winter oilseed rape has been increasing over the last 10-20 years and tends to move to more northern areas, spring oilseed rape also being affected by the neonicotinoids ban. Major insect problems are observed in the border zone where both spring and winter oilseed rape are present, and where pollen beetles can have up to 4 generations. Problems are lessened in regions where only spring or winter oilseed rapes are grown. The two must be kept apart. Similar observations were made in UK, Germany, and France.

- **On the development of new pest species** observed notably in Australia, Andreas von Tiedemann wondered how manageable the situation was and if having a multitude of insecticides could drive the emergence of new species, perhaps because they eradicate the traditional ones. She questioned if that a theory had weight or what else peoples were thinking we're going through? Sarina Mc Fadyen developed this question in an interesting way; she did not think some of these new pests were due to insecticide uses but maybe to agronomic practise changes over many years. European earwigs have been present in Australian systems for many years and only they are becoming a pest. Some of these pests, particularly detritivores and omnivores, are very hard to manage because some of them there have no registered pesticides, and the rest would probably be not very effective. It is really a relationship between how we are changing the farm environment as a resource for detritivores and omnivores, more generally around stubble management, changing our seeding patterns, and then how those rotation systems keep biomass on the field throughout the whole year. Insecticides are probably not causing new issues, but the key problem around insecticides is that there is a chance that European earwigs already have resistance, because even though there's nothing registered for them, they are in the field the whole year, and so they get exposed to a lot of various insecticide applications. The concern is that if they are now becoming a pest and are moving from a beneficial category into a pest one, then they get a decent level of resistance, we can really create a problem that potentially could have been avoided if we had done other management strategies early on. There is a table that shows the propensity of different species, at least theoretically, to develop resistance and actually European earwig is relatively high. Keeping that it is not targeted, it should not really have any target sprays, but because it gets so many non- targeted applications, it is at risk. There is now no evidence that European earwigs are resistant, it has not been tested, but it would not be a surprise: they have a long-life cycle, not like aphids that has a very short life cycle. Therefore, there is a much bigger risk. Resistance testing is limited on specific species, and we do not have a coordinated approach for resistance monitoring across our invertebrate pest species. Andreas von Tiedemann ob-

served that the use a broad range with different modes of action could lead to multiple resistance. Sarina Mc Fadyen agreed but added that considering the numbers of modes of action is one thing and what farmers use each year in the field is another thing. If there is a couple of modes that are really popular because the products are very inexpensive, they will get used more frequently. In this case, it is likely that there will be resistance. The second aspect is that we also have resistance management plans for a number of invertebrate pests for other crops than canola, but we cannot say whether those resistance management plans are scientifically sound. We do not have strong evidence to say that if you implement this plan, you will delay the development of resistance in that species.

- Concerning agronomical practices, earlier sowing interest on aphids as disease vector may depend on the population growth or movement, and on climate conditions. Early sowing may also interact with stubble management. Some studies in Australia suggested that stubble higher than the germinating canola crop may reduce aphids landing on the green canola plants, but it has to be confirmed, it is not certain that it will actually reduce the aphid transmission of viruses. Samantha Cook added that a small study on stubble management in UK against cabbage stem flea beetle has shown that long stubbles reduced flea beetle landing... There is something to study further in this kind of techniques.

Wish list of every country was a call for resistant cultivars. This is what **Dr Maxime Hervé** (Inrae, France) talked about, observing that developing insect resistant cultivars is very challenging, and that a major bottleneck for breeding process as it is the difficulty for phenotyping at large scales (insects' availability, labour intensive, mobility of insects and spatial effects in fields...) with added with the scarcity of major resistance genes. It is probably the reason why we have not got any insect resistant variety yet. Several approaches have been tried:

- Transgenes: (Bt, protein inhibitors, lectins, chitinases... Hairy canola has been most successful, but we still have not got any commercial varieties with that strategy.
- resistance in *Brassica napus*: screening of available genotypes and genetic variations has been worked out. There has been some success with stem weevil, pollen beetle, aphids, cabbage root fly. There is actually quite a lot of ongoing work across Europe, in particular to find resistant varieties for cabbage stem flea beetle, but it is a long way to go. Maxim Hervé wondered if the mission was possible.
- Resynthesized lines integrating two types of brassicas (*B. Oleracea* x *B. alba*) may be an alternative solution to this problem,
- Introgression: may be the best strategy so far is to introgress lines. *Synapis alba* seems to be resistant to most of the pests tested, giving a real hope for the future.

Resistance mechanisms involved in *Synapis alba* resistance: it probably involved flavonoids but has not clarified yet. Transferring genes from *Synapis* species to Brassicas has been done with some successes in creating hybrids or additional lines, but hardly leading to brassica lines. The major problem seemed to be the wide genetic distance between the various Brassica species to transfer genes; even crosses between *B. rapa* and *B. Oleracea* being difficult. Works carried out in Poland (Janetta Niemann) on resistance to cabbage root fly did not identified resistance in *Synapis alba* for this pest, but *B. fruticulosa* and *B. carinata* may be a source. Rod Snowdon confirmed that successes to introgress from *S. alba* to *B. napus* and other brassicas with actual chromosome integration are limited. He considers that two strategies are possible: (1) to focus on chromosomes, and break up the *Synapis* chromosomes to get them in Brassicas, via a chromosome engineering approach - a slow and long way, seemingly

adopted by a French team and (2) to focus genetic studies on *Synapis* in order to identify the responsible genes and try gene editing approaches, maybe GM, to get it in canola... still with the uncertainties regarding GM or even gene editing in Europe.

Andreas von Tiedemann mentioned that in Germany, Bernd Ulber tried an approach looking for a relationship between glucosinolates patterns and resistance to insects with apparently some lines looking better than other. A von Tiedemann raised another issue on the durability of resistances: if we find resistances in the gene pool, the third challenge is how to design a resistance which will not be overcome very quickly when established in cultivars. The management of Bt transgenic varieties in Canada and Australia keeping 10% acreage with sensible varieties as refuge zones is the only reference at present, but results may depend on the types of resistance. A. von Tiedemann observed that from a European perspective with many pest species, a single resistance to a specie would not solve the problem of insecticides applications. Hairy canola seems to be the less specific type of resistance.

Maxim Hervé also concluded that diversity is needed, especially including within field and crop diversity strategies. These last aspects are central in what **Mrs Celine Robert** from Terres Inovia (France) talked about in agronomy. She presented different strategies that farmers can implement for agronomical methods for insect suppression. Farmers can try to avoid the problem in the first place by companion planting: planting different frost sensitive legumes to help the crop grow faster during its susceptible stage. Farmers also practice early tillage after harvest to preserve moisture in field and sowing early, timed with rain. Plant tolerance to insect attacks is very important, and maybe these frost sensitive legumes are giving plants an extra nutrition, helping the biomasses of these plants to increase. Céline Robert and her team found that increased biomass in oilseed rape led to less damage. Early vigour was important, robust plants that grow through the winter and that can get growing again in the spring was really important and there was difference between cultivars regarding early vigour. Maybe there is some hope for tolerance, if not resistance. She presented an innovative agroEcological system, which included a 9-years rotation with barley or durum wheat as a preceding crop, direct seeding, deep non inversion tillage and the use of these cover crops and companion planting with legumes, and found that these systems could increase the biomass of the plants, increase yield, increase the profit margin at the farmer and reduce the availability of use of insecticides, which reveals a strong potential for these agronomical methods to manage insect pests. Céline Robert commented was that there is great potential for beneficial insects by habitat and landscape management, which leads into an actor's tool.

The mechanism of the effects of companion plants on insects is not understood yet: we do not know if there is a repellent effect or only disturbance, but less larvae on rapeseed were observed with companion plants. Hector Carcamo mentioned the new practice of intercropping canola with peas ("peola") in the Canadian Prairies with farmers reporting that they have less pest problems with intercrops. Such techniques are also tested in UK (spring canola and peas) and Finland (with beans).

Would agronomical techniques allow to grow rapeseed without insecticides? Céline Robert observed that getting robust crops limits the harmfulness of autumn insects, especially when plants can restart early at spring, but may be insufficient against flea beetle larvae when winter lasts longer, and insecticides are still needed in these situations.

Dr Sandra Lindström (Sweden) looked at the effect of bees and pollination on yield and quality of rapeseed. Interestingly, pollination is not currently considered as macroeconomic planning process due to the lack of studies on pollination. Most rapeseed cultivars are wind pollinated and the effect of

pollination has been neglected. Sandra Lindström reviewed the literature and found that pollination in oilseed rape can increase the oil content by 2% in spring cultivars and 7% in winter cultivars. Bee pollination increases seed yield by 10 to 50% pending on literature references. In her study, she found a yield effect which depended on crop cultivar. Open pollinated cultivars responded better than hybrids. It supports Samantha Cook's own research that showed that on genetic male sterility hybrids produce more nectar than cytoplasmic male sterility hybrids and open pollinated hybrids. So maybe there's some possibilities to manipulate or to improve the value of oilseed rape crop through pollination via flower visiting insects. Sandra Lindström make the hypothesis that for OP cultivars, increased pollination would increase cross pollination and create more heterosis, and higher oil content. She recommends integrating pollination in cultivars trials to compare all cultivars in equal terms.

Lastly, Sandra Lindström found that insecticides could actually increase yields due to improved pollination. An example with a treatment against pollen beetle during bud stage showed that insecticide helped the bees because there were more flowers were produced with less damages, there was more nectar per flowers or more pollinators and there were less pollinator visits without nectar foraging. Selected insecticides could actually increase yields due to pollination and not necessarily due to impact on or improved pest regulation. This concept would deserve more attention. Sandra Lindström's constant comment was that we need insecticides that do not directly harm pollinators.

Regarding alternatives that are coming now through the research pipeline, Hector Carcamo (Agriculture and Agri-Food Canada) presented classical biological control research, trying to control seed pod weevil by *Trichomalus perfectus*, an introduced species which has established itself in Canada, and the Lygus bug with *Perisenus digoneutis*, which is another parasitoid that was present in America as a native species, and also species that come from America. Research is looking very closely at their safety requirements: can we release these species into Canada without causing problems to the native insects? Hector Carcamo considers that within Quebec province, where ecosystems are more or less similar, risks are limited, but that the issue may be quite different in the perspective to extend to Western Canada Prairies with very different ecosystems and very different species of parasitoids: it would need to have better ideas about the potential impact on the native weevils here and potential indirect effects on native parasitoids. Another issue is the capacity of (introduced) parasitoids to survive in the environment, which would deserve specific studies for better understanding and imagine management.

Would parasitoids allow to reduce insecticides uses? The situation in Quebec reveals quite high levels of parasitism – more than 50% - in some cases when farmers have reduced the use of insecticides, but they never rely on a single lever: combined techniques and more integrated approaches are needed.

Dr Perran Stott-Ross (Australia) looked to harnessing endosymbiotic bacteria and aphids crop protection, so aphids have bugs within them, which is mostly doing good and something that didn't harm. He found a diverse range of endosymbionts with positive and negative effects, which can be manipulated for pest management. We could add them to insects, or we can knock them out by use of antibiotics and for example. They showed that *Rhizobium* causes colour changes which reduces natural reproductive behaviour, and *Buchnera* is essential since without it, insects become infertile. So, this lead to nice potential future control strategies, but research is still needed to deliver this approach in fields. Also, these techniques are limited to aphids, each aphid species having its particular strains.

Prof Eve Veromann (Estonia University for Life Sciences) presented RNAi technology that silenced genes. Her team showed the possibility of developing an RNAi approach, based on the coatomer protein alpha-COP, using micro injection and sucrose nectar feeding bioassays. They showed that they could kill 100% of pollen beetles that were tested. However, when the RNAi test was applied to the buds (spray induced gene silencing approach), to mimic how the crops behave, there was less mortality, but it was still good; growers could likely use it for control. Interestingly, they showed that with simulated chronic feeding (host induced gene silencing) simulating a GM approach, beetles died faster than when it was sprayed on the outside of the bud (short term feeding). Genetic approach in a plant would perform better than a spray approach. In similar works under way in Canada (University of Manitoba) against flea beetle, sprayable application is looking more effective than transgenes.

Lastly, **Prof Guy Smagghe** (Ghent University, Belgium) looked at registration process of an RNAi, which is really complicated, and changes greatly between the USA, Europe and the rest of the world and is especially frustrating in New Zealand. It depends on how the RNAi technologies are assessed, fine chemicals pesticides or just other natural products.

To conclude the session, Samantha Cook drew the following wrap-ups:

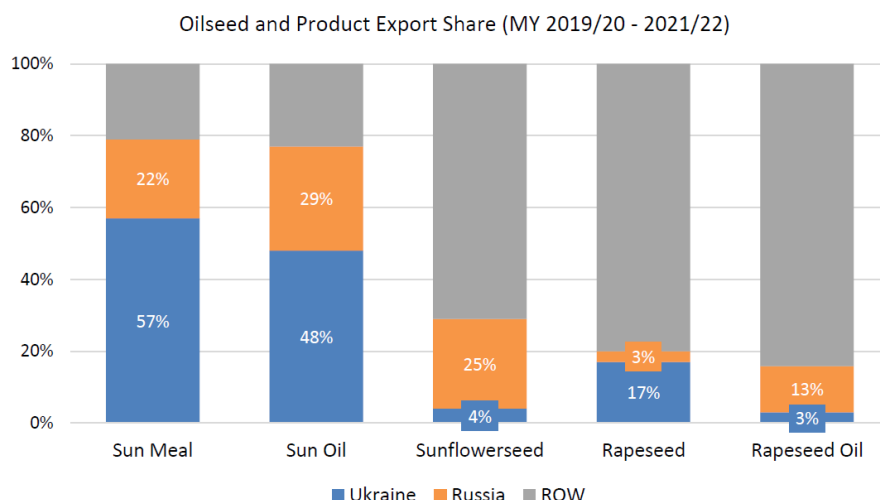
- 1) Is a lack of (synthetic) active ingredients driving pest problems via resistance? Yes, likely for some species. The lack of synthetic active ingredients is probably driving resistance in some species, but it is probably not the case globally.
- 2) Can we grow rapeseed without insecticides? And what tools do we have now in the pipeline that are most likely to enable it? Yes, we could grow without insecticides, but it is difficult. If yields have to be maintained, insecticides have their place in modern agriculture and new technologies like RNAi or endosymbiotic bacteria offer possibilities if we work on the methods to deliver them in the fields. Regarding other alternatives like trap cropping, biological control... we should think collectively about the most likely technologies.
- 3) what are the main barriers to achieve sustainable production at the moment? Beyond understanding biology, we need to understand farmers' behaviour more, in order to implement alternatives on the market. IPM has a lot of potential, but more work is needed to deliver it is still really hard for full IPM on any species in rapeseed.

Value chains and regional news

War in Ukraine and vegetable oils and oilseeds markets

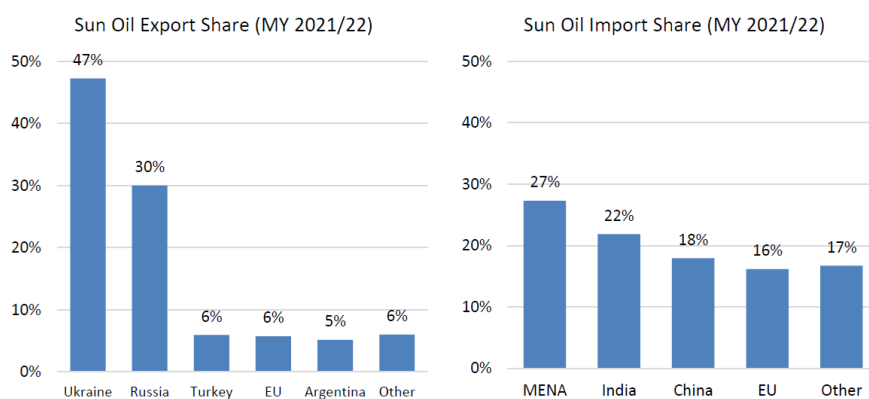
The war in Ukraine which started on 24th February affects the main sunflower producing and exporting region in the world. Ukraine alone represents 30% of the world sunflower seed production and 33% of the sunflower oil production. The major part of this production is processed in the country, Ukraine is the first sunflower oil exporter in the world with almost half of the sunflower oil exports. Ukraine also produces other oilseeds about 4500kT of soybeans and 1250-2000 kT of rapeseed.

USDA NIFA March report summarizes the situation regarding importance of Ukraine and Russia on Sunflower and Rapeseed/Canola markets with the next charts (see: <https://usda.library.cornell.edu/concern/publications/tx31qh68h?locale=en>):



Concerning the rapeseed issue, The March NIFA report commented: “Together, Ukraine and Russia account for about one-fifth of rapeseed exports and a little more than 15 percent of rapeseed oil exports. Ukraine rapeseed and product exports are frontloaded during the marketing year, and as a result were largely shipped prior to the conflict. Hence, Ukraine rapeseed exports are unchanged this Month as nearly all were shipped between July 2021 and December 2021. Similarly, rapeseed meal and oil export forecasts are unchanged this month. Conversely, Russia rapeseed exports are down 33 percent this month on weak exports to China over the first half of the marketing year. However, Russia rapeseed crush and oil exports are both forecast up this month on lower rapeseed exports and strong rapeseed oil sales to China and Norway in 2021.”

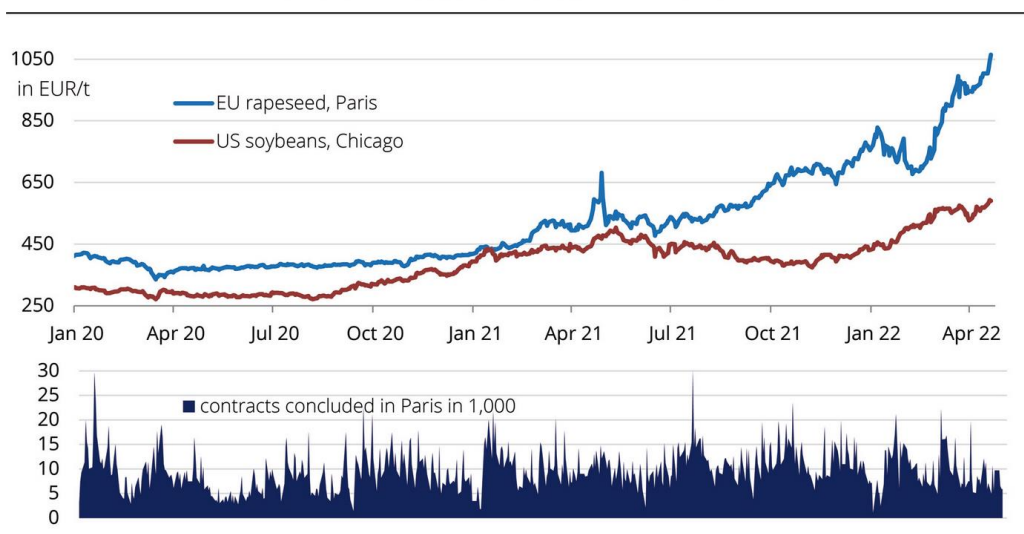
Global Vegetable Oil Markets Tighten Further on Disruption in Black Sea Exports



These events in Ukraine came to reinforce the higher price trends on vegetable oils and oilseeds markets, resulting in exceptionally high prices. The Ufop Chart of the Week 17 2022 (see https://www.ufop.de/english/news/chart-week/#kw18_2022 and Chart 15 on vegetable oils prices) showed this recent evolution of soybean and rapeseed prices. UFOP commented “The main reason for the strong price surge over the past few weeks is the crisis in the Black Sea region, which was sparked

by the Russian invasion in February 2022. Reports about the war in Eastern Europe fueled prices at the international futures markets every minute at a time when prices were rising anyway due to tight supply to the market. Shortages in supply due to the absence of contractual delivery volumes from Ukrainian ports of export are now having a bearing on the entire global market. Concerns about global supply bottlenecks have also led to export restrictions or even bans, like the one the Indonesian government imposed on 28 April 2022. This situation caused rapeseed prices at the Paris stock exchange to explode. According to investigations conducted by Agrarmarkt Informations-Gesellschaft (mbH), price fluctuations, of up to EUR 68 per tonne in one day, were the order of the day in March 2022. Currently, stock exchange prices are driven by snow and cold spells in Canada, where rapeseed sowings should be underway. Prices exceeded the level of EUR 1,000 per tonne for the first time. More specifically, the May 2022 nearby closed at EUR 1,064.50 per tonne on 21 April 2022. The close compares to EUR 561.75 per tonne at the same time a year earlier and as little as EUR 366.75 per tonne in April 2020. This means that stock exchange prices almost tripled within two years.”

Oilseed futures closing prices and contracts concluded in Paris



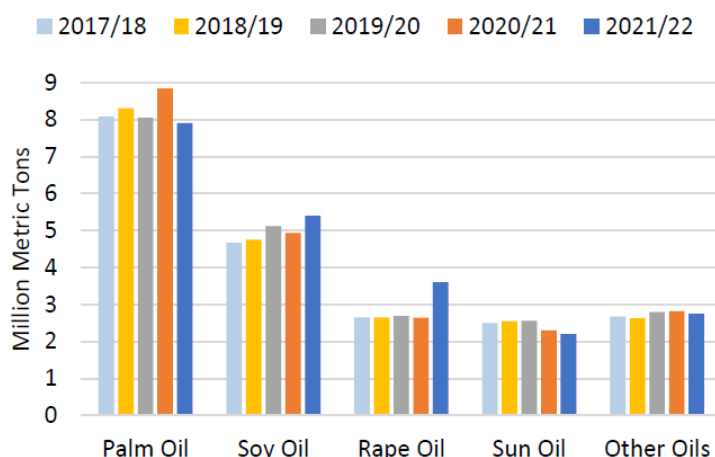
Source: CME, NYSE Liffe, AMI

Note: US prices converted to EUR

“Finding alternative vegetable oils will be a challenge in a market that has been facing tight supplies even before the events in Ukraine.” USDA NIFA April report informed about India, which is turning to soybean and rapeseed oil to meet food use demand: “India is the world’s second-largest consumer of vegetable oil for food and is forecast to consume 21.8 million tons in 2021/22 (...) and imported two-thirds of food use consumption over the past 5 years. In a typical year, palm oil (40%) and sunflower seed oil (11%) comprise more than half of India vegetable oil food consumption. However, over the past 4 months, the combined forecast for palm and sunflower seed oil imports have been cut nearly 1.5 million tons on high edible oil prices, gains in domestic rapeseed production, restrictive Indonesia palm oil trade policies, and disruptions to sunflower seed oil trade as a result of the Russian invasion of Ukraine.

In order to meet food use demand, India has been purchasing soybean oil at the highest rate since 2015/16 when a disappointing rapeseed crop the prior season drove higher imports.

India Vegetable Oil Food Use Consumption



In addition, India will likely rely more heavily on rapeseed oil in 2021/22 than in prior years. India has already begun to harvest a record rapeseed crop. Normally, the new crop is sold to domestic crushers in March and April and the resulting oil is consumed domestically almost entirely for food. As a result of the bumper crop, India is forecasted to produce an additional 800,000 tons of rapeseed oil which would help offset diminished imports of sunflower seed oil and palm oil. Soybean oil imports are likely to slow as rapeseed crush ramps up and the resulting rapeseed oil hits the shelves.”

Australia: best results in 2021 and optimism for 2022 harvest

The last AOF crop report of May 2022 (see http://www.australianoilseeds.com/about_aof/news/another-strong-year-for-canola-ahead) confirms the excellent results of the 2021 harvest, not far from the January estimate : finally 6 329 000 tonnes compared to the 10 years average of 3 460 000 t.

For the 2022 campaign, « A strong start to new season plantings has been realised with timely rainfall across many districts in NSW, VIC, and WA in the first three months of 2022. SA is the exception with most canola growing regions still waiting for a general autumn break. Across the east coast, favourable seasonal conditions may continue into mid- to late- winter, with a weakening La Nina persisting longer than previously forecast. Optimism in growing conditions and continuing firm prices in the 2022-23 season is reflected in the estimated 12% aggregate increase in canola area planted on last year » reaching 3 320 000 ha compared to 2 970 000 in 2021.

Canada: Cargill set to build canola crushing plant after buying land at inland port in Saskatchewan

Canada implemented its canola development strategy explained during the 2021 Canola Week and reported in our last GCIRC newsletter. “Canada’s Saskatchewan province has sold land at its inland port to global agribusiness giant Cargill for a canola crushing plant, the Saskatoon Star Phoenix reported. The Global Transportation Hub (GTH) authority in Regina, Saskatchewan – one of Canada’s inland ports – sold the land to Cargill for US\$38M, according to the 6 April report. Cargill announced plans for the new 1M tonnes/year canola plant last April saying it expected to begin construction this year with plans to become operational by early 2024 (...) Alongside plans for the US\$350M Regina

canola plant, Cargill said it would also be updating its canola facilities in Camrose and Clavet to increase production.”

Source: Oils & Fats international news 11th May 2022: <https://www.ofimagazine.com/news/cargill-set-to-build-canola-crushing-plant-after-buying-land-at-inland-port-in-saskatchewan>

Status and trends of oilseeds sector in India. Spatial Expansion of Rapeseed-Mustard over the Time: Growth Performance

*Dr PD Meena shares with us this short text by his colleagues **RK Yogi, AK Sharma, Vinod Kumar & PK Rai, of ICAR-Directorate of Rapeseed Mustard Research, Bharatpur, Rajasthan India, on the evolution and performances of rapeseed-mustard in the context of the oil crops sector in India:***

“South Asia is the home to about one-fifth of the world’s population and the countries in the region differ considerably in terms of size of population (24% of the world's population), geographical area (3.5% of the world's land surface area) and economic performance. India is the largest and fastest growing economy in the region with about 1.36 billion population and GDP of about US \$ 2875.14 billion. However, India’s per capita GDP (\$2006) is lower than of Maldives (\$10331), Sri Lanka (\$4081) and Bhutan (\$3243). Pakistan is the second largest economy in terms of GDP (US \$ 224 billion) but is 5th in terms of GDP per capita (\$1482) in the region followed by Nepal (\$1039). India is also the largest agrarian economy with the highest gross value-added in agriculture (GDP) followed by Pakistan and Bangladesh.

Indian agriculture has undergone a radical transition from traditional to high-value agriculture during recent years. The economy has also witnessed shifting of consumption pattern from traditional cereals to a more holistic and nutritious diet of fruit and vegetables, milk, fish, meat, and poultry products due to rapid growth of the economy. According to Economic Survey of 2018-19, India continues to remain the fastest growing major economy in the world in 2018- 19, despite a slight moderation in its GDP growth from 7.2 % in 2017-18 to 6.8 % in 2018-19. On the other hand, the world output growth declined from 3.8 % in 2017 to 3.6 % in 2018. Real growth in ‘Agriculture & allied’ sector was lower in 2018- 19 at 2.9 %, after two years of good agriculture growth. Backed by good monsoon, India has attained a record food grain production of 305.44 million tons during 2020-21. The total oilseeds production is expected to be 36.57 million tons during 2020-21.

India is one of the major oilseeds’ grower and importer of edible oils. India’s vegetable oil economy is world’s fourth largest after USA, China & Brazil. Rapeseed & Mustard is widely grown in majority of continents with largest area of 8 million ha in Canada followed by China (7 million ha) and India (6 million ha). Majority of the countries grow rapeseed, whereas India has largest area under mustard. The diverse agro-ecological conditions in the country are favorable for growing 9 annual oilseed crops, which include 7 edible oilseeds (groundnut, rapeseed & mustard, soybean, sunflower, sesame, safflower and niger) and two non-edible oilseeds (castor and linseed ¹). Oil Palm is comparatively a new crop in India and is the highest vegetable oil yielding perennial crop. With quality planting materials, irrigation and proper management, there is potential of achieving 20-30 MT Fresh Fruit Bunches (FFBs) per ha after attaining the age of 5 years.

¹ In several countries including EU and Canada, linseed is recognized as edible.

Oilseeds cultivation is undertaken across the country in about 27 million hectares mainly on marginal lands, of which 72% is confined to rainfed farming. The oilseed accounts for 13% of the Gross Cropped Area, 3% of the Gross National Product and 10% value of all agricultural commodities.

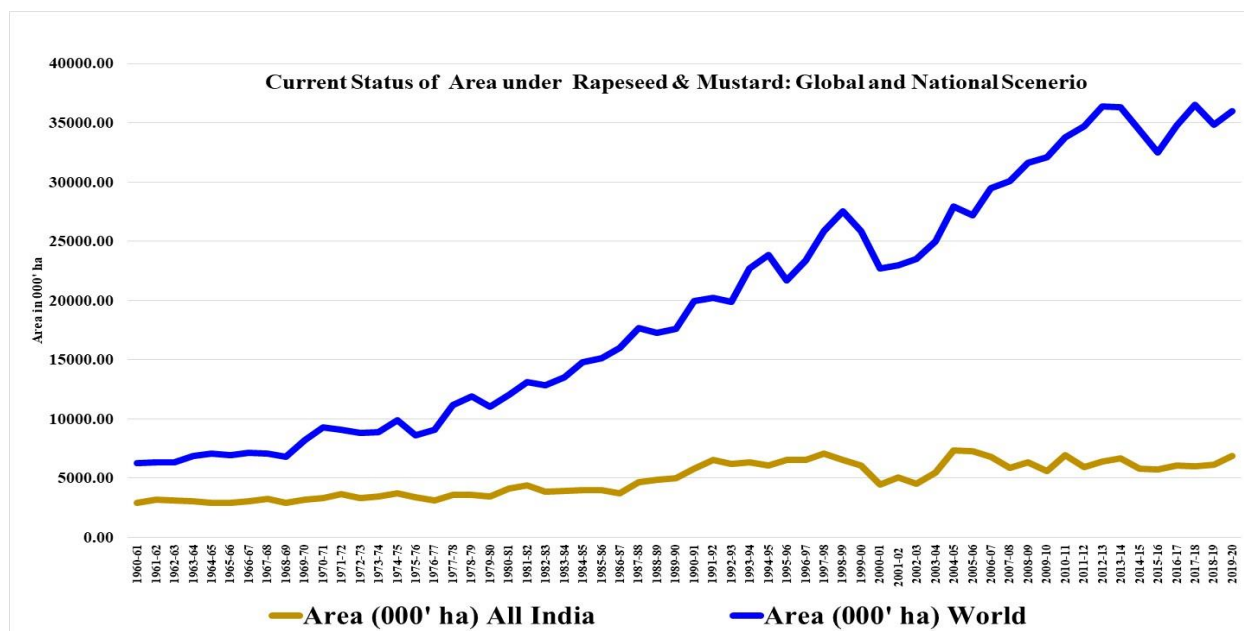
With per capita consumption of vegetable oils @16 kg/year/person for a projected population of 1.64 billion, the total vegetable oils demand is likely to touch 26.22 million tons by 2050 (UNO Report). But, during the last few years, the domestic consumption of edible oils has increased substantially and has touched the level of 24.07 million tons in 2019-20 and is likely to increase further. A substantial portion of our requirement of edible oil is met through import of palm oil from Indonesia and Malaysia (NMOOP, GOI).

Globally, Rapeseed & Mustard is processed into vegetable oil for human consumption and meal for livestock feed and few examples are also of industrial use. Rapeseed & Mustard has recorded annual growth rate of area, production, and yield @ 0.32%, 2.45% and 2.13% respectively during last decade (2009-10 to 2019-20). The productivity of India is the lowest among the major rapeseed mustard growing countries (Kumar *et al* 2019).

Table 1 Growth Performance of the Spatial expansion of rapeseed-mustard over the time

Year	All India (In 000' hectares)	World (In 000' hectares)	India's Share in Total Area (In %)
1960-61 to 1969-70	3034.24	6889.79	44.04
1970-71 to 1979-80	3445.88	9751.42	35.34
1980-81 to 1989-90	4231.62	14984.40	28.24
1990-91 to 1999-00	6354.90	23089.07	27.52
2000-01 to 2009-10	5861.63	27267.18	21.50
2010-11 to 2019-20	6237.81	35014.87	17.81

As against the World average of 2002 kg/ha, highest productivity of 4795 kg/ha of European Union, the Indian average yield was only 1161 kg/ha during 2010-11 to 2019-20. Longer crop duration and



high carbon content in the soil are the major factors attributing to high productivity of rapeseed in Western part of the World (Status Report R&M, 2017, NMOOP, GOI). Total area, production, and yield of rapeseed-mustard in world during 2019-20 was 35.95 million ha, 71.49 million tons (mt) and 1990 kg/ha, respectively.

Figure 1. Trends in the area under Rapeseed & Mustard at Global and National Level

There has been a considerable increase in production and productivity from 2013-14 to 2019-20. There was slight decrease in production and productivity from 2017-18 to 2018-19. However, there was slight increase in area, production, and productivity in 2019-20. The rapeseed-mustard acreage increased from 6.12 mha (2018-19) to 6.86 mha (2019-20). However, production slightly decreased from 9.26 mt (2018-19) to 9.12 mt (2019-20). The rapeseed-mustard yield slightly decreased during 2019-20 as compared to the previous years.

Table 2 Growth Performance of the Spatial expansion of rapeseed-mustard over the time

Plan	Plan Period	All India In 000' hectares)	World In 000' hectares)	India's Share in Total (In %)
Third Five Year Plan (1961 – 1966)	1961-62 to 1966-66	3034.00	6696.09	45.31
Annual Plan (1966 – 1969)	1966-67 to 1968-69	3039.93	6975.73	43.58
Fourth Five Year Plan (1969 – 1974)	1969-70 to 1973-74	3377.02	8833.88	38.23
Fifth Five Year Plan (1974 – 1979)	1974-75 to 1978-79	3455.16	10113.14	34.17
Rolling Plan (1978 – 1980)	1978-79 to 1979-80	3507.00	11431.51	30.68
Sixth Five Year Plan (1980 – 1985)	1980-81 to 1984-85	4039.86	13247.65	30.49
Seventh Five Year Plan (1985 – 1990)	1985-86 to 1989-90	4423.38	16721.15	26.45
Annual Plan (1990 – 1992)	1990-91 to 1991-92	6167.75	20086.35	30.71
Eighth Five Year Plan (1992 - 1997)	1992-93 to 1996-97	6326.50	22292.44	28.38
Ninth Five Year Plan (1997 – 2002)	1997-98 to 2001-02	5826.14	24992.69	23.31
Tenth Five Year Plan (2002 – 2007)	2002-03 to 2006-07	6271.00	26627.62	23.55
Eleventh Five Year Plan (2007 – 2012)	2007-08 to 2011-12	6101.12	32458.60	18.80
Twelfth Five Year Plan (2012 – 2017)	2012-13 to 2016-17	6125.35	34864.75	17.57
Annual Plan (2017 – 2020)	2017-18 to 2019-20	6319.12	35786.00	17.66

It is evident from the Fig 1 and Tables 1 2, that the average area under Rapeseed & Mustard at National level almost doubled from 30.34. lakh hectares during 1961-70 to 62.37 lakh hectare during 2011-20. However, it is doubled at global level in 20 years from 66.96 lakh hectares during 1961-70 to 149.84 lakh hectare during 1981-90. Further in next 40 years, it is crossed more than the double from 149.84 lakh hectares during 1981-90 to 350.14 lakh hectare during 2011-20. Tabular analysis revealed the

technological or policy intervention in India during the period of 1991-2000 which resulted the highest increase *i.e.* 20.00 lakh hectare area under Rapeseed & Mustard in a decade. The Oilseed Mission coupled with other exogenous factors including liberalization boosted the Nation in big way by doubling the average area from 3.03 million hectares during 1961-66 to 6.32 million hectares during 2017-20. However, the inconsistency in the oilseed production system over the years is a cause of concern for all of us. It is, therefore, necessary to exploit alternative domestic resources like palm oil and Tree Borne Oilseeds (TBOs) including sal, mahua, simarouba, kokum, olive, karanja, jatropha, neem, jojoba, cheura, wild apricot, walnut, tung *etc.* to maximize production to ensure edible oil security for the country. These TBOs are cultivated/grown in the country under different agro-climatic conditions in a scattered form in forest and non-forest areas as well as in waste land /deserts/hilly areas and also good source of vegetable oil and therefore need to be supported for cultivation.

Against the total domestic demand of 25.88 million tons of vegetable oils, India is able to meet hardly 10.53 million tons (40%) through its domestic production. Rest amount 15.35 million tons (60%) is meet through imports. An expenditure of \$ 75 billion (Rs 74996 Crore) was made on the import of vegetable oil during 2017-18. National Mission on Oilseeds and Oil Palm (NMOOP) is functional through its three pronged strategy including Mini Mission I (7 edible oilseeds including groundnut, rapeseed & mustard, soybean, sunflower, sesame, safflower, niger and two non-edible oilseeds including castor and linseed, Mini Mission II (Palm oil) and Mini Mission III (Tree Borne Oilseeds (TBOs) including sal, mahua, simarouba, kokum, olive, karanja, jatropha, neem, jojoba, cheura, wild apricot, walnut, tung *etc.*). There is an urgent need to intensify efforts for area expansion from the current area 6.3 million hectare to 10.00 million hectares under rapeseed-mustard to enhance production in the country by 2050. Availability, accessibility, and affordability of quality seeds of the suitable varieties among the farmers are very critical issues for food and nutritional security in India. Government policies regarding the development of irrigation facilities need to be revamped for addressing the major hurdle of rainfed farming system. Capacity building and skill development programs about the technical aspects including agronomic practices, nutrient and pest management among the farm households is essential for vertical as well as horizontal expansion of the sector.”

Brazil: overview of the rapeseed cultivation

In Brazil, information on the management of the crop is scarce, especially in regions with a predominant tropical climate. However, agronomic research on rapeseed is active and publication results are published in Portuguese.

“This work presents an overview of rapeseed cultivation, the result of the compilation of information on its cultivation in different regions of the country, especially the management technologies adopted, both in the field of experimentation and in commercial crops. It is evident that the canola crop has potential for cultivation in regions of the country with low latitudes, as a result of the development of genotypes less sensitive to photoperiod. In addition, it may be introduced as an out-of-season crop in continuous grain production systems, after the harvest of a first crop in summer. Despite the advances already achieved, it is necessary to continue with research, development and innovation that leverage the technical and scientific development of canola, to consolidate its tropicalization and ensure cultivation in much of Brazil”.

See full report in Portuguese at by EMBRAPA: <http://www.infoteca.cnptia.embrapa.br/infoteca/handle/doc/1140176>

Scientific news

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CROP PROTECTION

Prof Bruce Fitt, from the University of Hertfordshire, UK, informed us of the publication of the **proceedings of the AFCP Forum on Management of diseases and pests of oilseed rape**, that took place as a hybrid event on 16 June 2021. A report on the event for 'Outlooks on Pest Management' by Ken Pallett, University of Hertfordshire, is available [here](#).

[See here for a pdf of the Conference proceedings](#) and a recording of this event is also available [here](#). The Proceedings are now also available in paperback from [Amazon Books](#), price £10 plus postage. Posters highlighting some of the extensive research area on this topic are available [here](#).

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Upcoming international and national events

15-17 June 2022, Perugia (Italy) CONGRESS SISSG 2022 “Edible oils and fats: innovation and sustainability in production and control.”

<https://www.sissg.it/en/congresso-di-perugia-2022/>



26-29 June, 2022, 15th International Conference on Precision Agriculture Minneapolis, USA

<https://www.ispag.org/icpa>



10-15 July, 2022, Grenoble, France: The 25th International Symposium on Plant Lipids (ISPL2022)

<https://ispl2020.sciencesconf.org/>



August 29 – September 2, 2022, European Society of Agronomy Congress; Potsdam, Germany

https://esa-congress-potsdam2022.de/frontend/index.php?folder_id=4191&page_id=



27-30 September, 2022 in Wageningen: 7th International Plant Phenotyping Symposium

<https://www.plant-phenotyping.org/ipps7>



24-27 September, 2023, 16th International Rapeseed Congress, Sydney, Australia

For further info go to www.irc2023sydney.com



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