

# ASIAN SEED

THE OFFICIAL PUBLICATION OF THE ASIA & PACIFIC SEED ASSOCIATION



## **ASRT 2 Meeting**

Asian Solanaceous  
Round Table meeting  
23-25 Feb in Bangkok



## **Climate Change**

Past, present and  
future of the world's  
weather and climate



## **APSA, WorldVeg Consortium**

New pepper and  
tomato breeding lines



## **Seed for Thought**

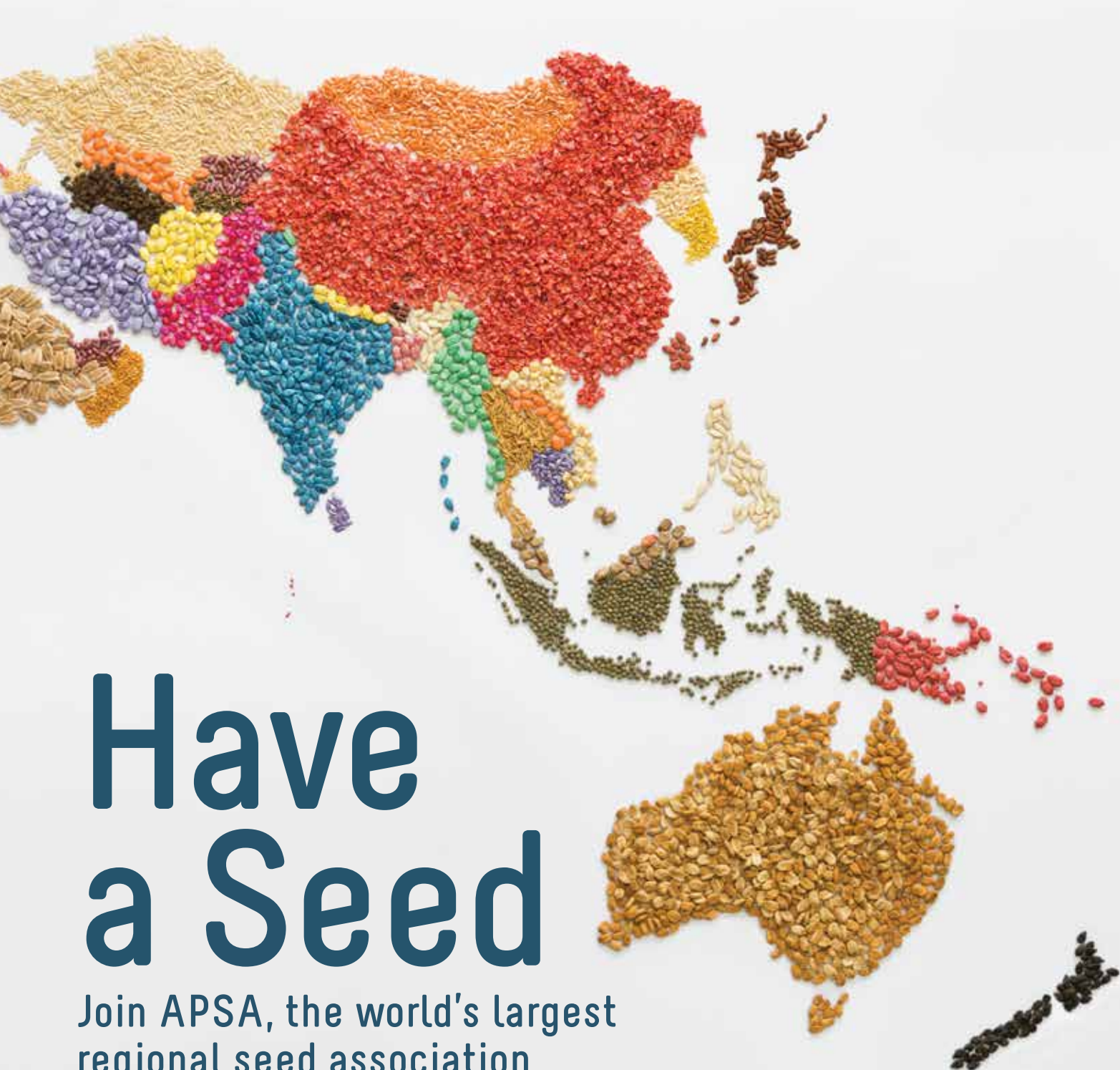
Anke van den Hurk  
reflects on lessons  
in good breeding

VOL.23 NO.1  
JAN/FEB 17  
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## CLIMATE CHANGE REPORT 2017





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For details please contact: [apsa@apsaseed.org](mailto:apsa@apsaseed.org)



# ASIAN SEED

THE OFFICIAL PUBLICATION OF THE ASIA & PACIFIC SEED ASSOCIATION

Asian Seed & Planting Material  
Volume 23, No. 1, Jan/Feb 2017

Official Publication  
ISSN 0859-1776

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*Asian Seed & Planting Material* is published bi-monthly as the official publication of the Asia & Pacific Seed Association (APSA). APSA is a provident organisation dedicated to the promotion and improvement of the seed industry in Asia Pacific.

*Asian Seed* has a pass-on readership of 3,500 worldwide. Eighty per cent of our subscribers reside in the Asia-Pacific region and include senior executives in seed enterprises, government agencies, universities and national seed associations.

Subscriptions are available on the APSA website or from the Secretariat.

Editorial contributions and advertising enquiries should be sent to the Secretariat or by email to [apsa@apsaseed.org](mailto:apsa@apsaseed.org). APSA holds the right to accept or reject contributions.

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## In this issue

### 10 ASRT 2 in Bangkok

Confirmed: Programme, speakers and schedule for the second edition of the Asian Solanaceous Round Table meeting 23-25 Feb



### 14 Climate Change

An in-depth look into erratic weather, extreme climate trends and the implications of the past, present and future on warm, dry, wet, cool, hot and cold climates



### 30 Breed to Feed

Now accepting applications from breeders to join a new vegetable breeding consortium, commencing with a workshop in May



### 34 Seed for Thought

EC alumni Anke van den Hurk reflects on fundamental lessons in breeding gained from Mexico, Syria, Turkey, Africa, APSA and Plantum



# Calling All Members! Make the Most of Your APSA Membership in the New Year



Brenda Dossey, APSA President

**Greetings of 2017 to my fellow APSA members. I wish you a very good year going forward. A new year is a time to make a new start, a fresh beginning. Upon reflection, I think that all of us in the seed business must be believers in new beginnings. Seed is all about beginnings. Perhaps that is why the beginning of a new year is so appealing to me.**

Whether you celebrate the new year on 1 January or celebrate your new year later on, I would like to encourage you to make the most of your APSA membership this year. Following are some ideas for a few ways you can increase your APSA membership experience.

The first stop is the APSA website, [apsaseed.org](http://apsaseed.org). If you haven't visited the website for a while, why not lock it into your favourites and plan to visit the website on a regular basis? The APSA website has been redesigned and has lots of features you might not realise are there for you to tap into.

Our APSA Communications Officer, Steven Layne, has been regularly updating the APSA website with news features that relate to our industry, along with APSA event news. There is always something new coming along. It is there for the reading. If you have some news, contact Steven and let him know. He is happy to assist with getting information out to the members.

The new feature I have just been introduced to and really like is the new searchable Membership Database in the APSA website. Please log in and give it a go as it is something that members have been asking about for a long time. The APSA Office Bearers just met this month and we all tried it. I had to reset my password, which is much easier than you would think. Once you log in, it is recommended to go to the members only area and check out your membership profile. This is something that will only improve as all of us log in and update our details. You can also upload your company logo.

Everyone will now be able to access the database and do searches. You can find out how many APSA members are in a particular country or you can search for APSA members who trade in the same general product groups that you are involved in. You can even search for all members involved in a particular product group that is different to your own. Like all databases, it is very important that all members log in and update their company profiles. By doing that, we will all have current, searchable information that everyone will be able to see.

Not sure about doing that? You may not be alone. Give it a try and if you have any issues, please contact the APSA Secretariat.

They are there to help you and can walk you through the steps if needed. Speaking of which, the APSA Secretariat phones now have a voice mail feature. I have more than once tried to reach APSA during a holiday or at off hours due to time differences. Well now there is no need to worry, you can simply leave a voice message.

Did you know that Facebook has over 1.79 billion active users as of the end of 2016? As an APSA member, you can be part of that community. APSA has a Facebook page that Steven maintains as well. As of writing this, the page has over 3,000 likes. Jump in this year and check out the APSA Facebook page for updates and lots of photographs. The link is: [www.facebook.com/seedapsa](http://www.facebook.com/seedapsa).

The annual Asian Seed Congress this new year is going to be held in Manila. We have selected a congress venue that I think is going to be very appealing for one and all. The facilities are near the airport, so near in fact that for many delegates it will just be a matter of walking out of the airport and following the signs to get to the hotel.

And the congress venue is an amazing place to behold, it is much like visiting an art museum or a gallery. Make plans to come and see it for yourself.

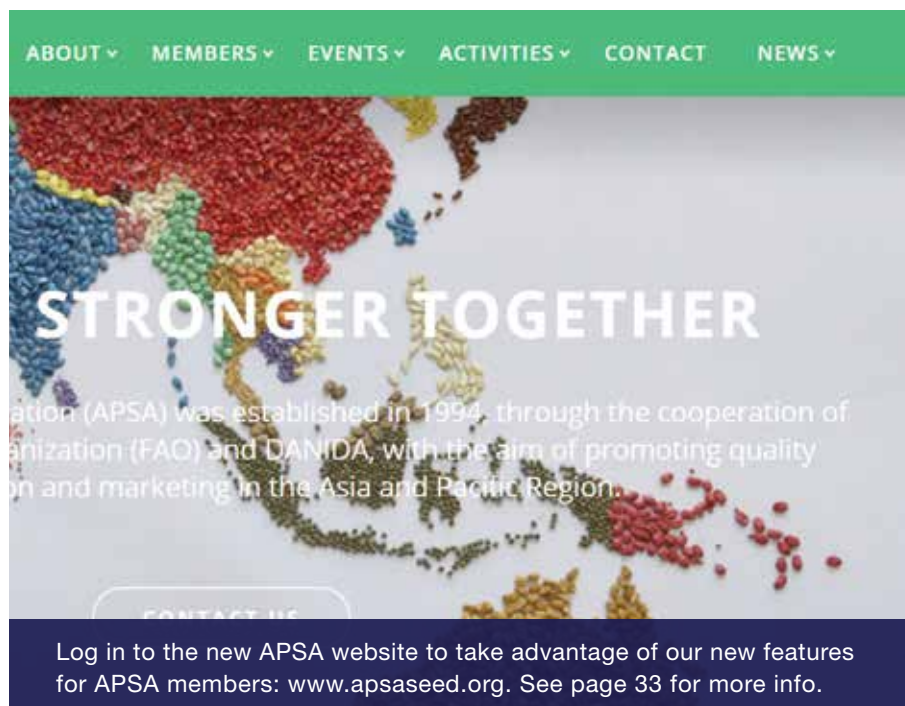


And while you are there, perhaps use your new year resolve to partake in a few of the sessions at the Asian Seed Congress. The Standing Committees and Special Interest Groups are all there for you to partake in.

Also, you can even come in a bit early or stay a bit longer at the ASC Manila. The Pre-Congress topic is going to be on Climate Change and there is a Post Congress tour being planned for you to see a bit of agriculture in the Philippines.


Between now and November, when we have the congress in Manila, there are other APSA events and study tours for you to partake in or follow up on. The Asia Solanaceous Round Table II is scheduled for 23-25 February in Bangkok this year.

We are also planning to have two Phytosanitary Expert Consultations in 2017, there is planning for a Study Tour in conjunction with the SIG on vegetables to be held



in France in June 2017, SIG Hybrid Rice is looking at planning a trip to Vietnam before Congress, and there is even talk about a possible Study Tour to Australia for field crops along with forage and amenity turf.


Again, all the best to you in the new year and please join me in making the most of your APSA membership. We hope to see more of you both online and at Congress. 🌱




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# 2017: Looking Ahead to Progress & Prosperity

**APSA saw 2016 close with continued activity. The long awaited membership database and directory is now up and running and I hope you are all enjoying the new features.**

Guangzhou held the Guangdong Seed Expo 2016 in mid-December. I was invited to speak about the seed industry in the Asia Pacific Region and was very grateful to have had the opportunity to promote APSA membership for Chinese seed industry players interested in international activities. I was also delighted to have my husband accompany me on this trip, at our own cost of course, but we did



Jintawee Thaingam (left) of Thailand's Dept of Agriculture.

use him extensively as a photographer! Xiaofeng, our China Liaison Officer, travelled from Beijing to join me for the conference, and our first event was to attend the dinner celebrating the 20 year anniversary of the Guangzhou Seed Association. APSA EC members Zhiping Wang and Dr. Dehua Ma, as well as Past President Anthony Tse, were kind enough to greet us.

On 12 Dec 2016, I conducted my presentation to the attendees of a pre-congress workshop, with Xiaofeng offering guests the Chinese translation of my speech simultaneously. The following day we attended the opening ceremony booth exhibits, visiting and taking pictures with many of our APSA members and their prized varieties of vegetables (see pp. 26-27).

Late in December, our Events Officer Jim and I scouted congress venues for Asian Seed Congress 2018, considering both Bangkok and Phuket for the event. This time of year also means membership renewals are ongoing. If you have not received your invoice, please contact our office at your earliest opportunity as contact details may differ on our database (see page 33).



Heidi Gallant, APSA Director

Early January saw Jim and I in the Philippines for ASC 2017 preparation. Meeting with the Philippines Seed Industry Association, many details for our collaboration on this year's event were settled. Sponsorship opportunities will be offered early this year, so watch for announcements in order to secure a coveted skybox or premium booth for your company.

Preparations are also in full swing for the Asia Solanaceous Round Table II to be convened in partnership with Kasetsart University here in Bangkok, Thailand, 23-25 Feb (see page 10).

Myanmar's National Seed Association held its first meeting in January, as founding members were identified and met informally to discuss the way forward following APSA's consultative advice. APSA has been attending meetings of the Vegetable Sector Acceleration Task Force with the aim to assist Myanmar in setting up this association.

The APSA Secretariat also received a very welcome visit from the Department of Agriculture, delivering a lovely New Year gift of specialty rice. We look forward to a great year of co-operation with this department.

Office Bearers of APSA met in Bangkok, 16-18 January, discussing many of the great membership programmes we have in store for 2017. Visit our website often for news affecting our industry and APSA happenings. Also be sure to update your membership profile as other companies may be trying to find just what your organisation has to offer.

I would like to take this opportunity to wish you all a healthy, happy and wealthy 2017 and year of the Rooster. As always, we are here to help, please call us if there's any way we can serve you better. 🌱





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Creating Tomorrow Today



# Best to Protect Yourself, Get Tested and Deny Charges, Advises Thai Seed Law Expert



**A Thai agricultural official-cum-lawyer has advised seed traders in the kingdom on how to best protect themselves against prosecution.**

Addressing members of the Thailand Seed Trade Association (ThaSTA) on 18 November 2016, at KU's Institute of Food Research and Product Development Building, Dr. Prasert Soodmai reviewed relevant seed-business clauses of The Plant Act of 1975, which was last amended in 2007.

Dr. Prasert, an alumni of Kasetsart University who has a Ph.D. in Soil Sciences, obtained his Administrative Law Certificate from the Thai Bar Association after formally retiring from a government career as a fertiliser certification and analysis scientist with the Department of Agriculture.

The lecture was organised in response to a recent spur in cases being pressed by prosecutors against seed producers, distributors and retailers, after inspections had reportedly revealed sub-standard germination rates. The law requires packaged seeds being sold in the kingdom to have germination rates of no less than 80%.

"The burden of proof is a key element in Thai law, which utilises adversarial legal system principles. Therefore it is prudent for members of seed enterprises to maintain comprehensive and thorough records, bookkeeping and invoicing practices", he said.

Addressing producers, distributors and agents, he said "A copy of the Statement

of Certification, with clear guidelines for storage, should always be provided with the invoice when delivering seeds. A certification statement printed on the seed label is not sufficient by itself".

Dr. Prasert urged seed traders to actively pursue training and monitor updates about seed industry regulations and requirements.

"If you can, take night courses and pursue a law degree part time. Attend training seminars and workshops regularly. The fact that you took a course 10 years ago is not sufficient. The training needs to be regular, because technology, law and regulations are changing constantly".

In addition to high standards for storage and distribution, seed testing should also not be overlooked, stressed Dr. Prasert.

"Companies that can afford to do so need to invest in maintaining and upgrading their labs and testing facilities to be in compliance with standards and rules of the International Seed Testing Association and other similar international organisations".

He suggested the sector, as a whole, pool its resources and network to provide leasing and licensing solutions to enable smaller companies access to labs.

In closing, Dr. Prasert stressed that the best protection was prevention through education and compliance with all prescriptive regulations and laws. (The full version of this story can be found on [apsaseed.org](http://apsaseed.org)) 🌱

## ThaSTA Issues Retail Shelf-Life Recommendations for 34 Types of Seeds

The Executive Committee of the Thai Seed Trade Association (ThaSTA) has issued standard recommendations for the retail shelf-life of 34 types of vegetable and field crop seeds.

The recommendations, published in a document signed 23 November by ThaSTA President Dr. Chairerg Sagwansupyakorn, were drafted with the input of seed testing officials and seed enterprise representatives who have held a series of meetings recently with the aim of improving seed quality standards in the kingdom.

The meetings were initiated by ThaSTA in response to an increase in cases being pressed by the Department of Agriculture (DoA) after inspections of "unexpired" seeds collected at numerous points of retail revealed substandard germination rates.

Thailand's Plants Act requires commercial-standard seeds (unexpired) to have germination rates of no less than 80 per cent.

APSA has translated the recommendations for the maximum retail shelf life, measured by months, as seen in the table. ThaSTA affirmed that it would distribute the recommendations to all of its members and associates.

The DoA, in close cooperation with ThaSTA, the Seed Association of Thailand and APSA, are working to develop Thailand into a global seed production hub. 🌱

	Crop Seed	Hybrid	OP
Green okra	24	24	12
Garlic (leaf)			6
Cabbage, Cauliflower, Chinese kale, Broccoli	18	18	18
Paddy	24	24	24
Corn feed	18	18	
Waxy corn	18	18	12
Baby corn	18	18	
Sweet corn	6	6	6
Sorghum	18	18	
Cantaloupe, Muskmelon, Melon	18	18	
Cucumber	24	24	18
Watermelon	18	18	12
Yardlong bean			18
Pea			12
Mung bean			12
Black gram			12
Soya			6
Sunflower	12	12	
Luffa / ridge gourd	24	24	12
Bok choy, Napa cabbage	18	18	18
Mustard greens	18	18	18
Lettuce			12
Chinese radish	18	18	18
Coriander			12
Water spinach			18
Chilli	24	24	12
Sweet pepper	18	18	
Pumpkin	24	24	12
Wax gourd	24	24	12
Bitter gourd	18	18	18
Eggplant, Thai eggplant	24	24	12
Tomato	24	24	18
Onion	12	12	
Papaya	12	12	12



## Climate Change to be Focus of Manila Congress



**Preparations are well underway for the 24th edition of the Asian Seed Congress, which is set to be held in the Philippines' capital city from 14-17 November, 2017.**

APSA's Executive Director, Heidi Gallant, and Events Organiser Duangchai Pancom visited Manila last week to inspect the venue site and meet with representatives from the Philippines Seed Industry Association (PSIA), led by President Mary Ann Sayoc.

First held in Chiang Mai, Thailand, in 1994, The Asian Seed Congress, or ASC, is APSA's annual flagship event which is hosted in a different city within the Asia Pacific region every year.

Culminating with APSA's 23rd General Assembly Meeting on 16 November, #ASC2017 will be held at the Marriott Manila Hotel's convention centre, which boasts 43 event rooms and more than 95,000 square feet of event space, including its expansive Grand Ballroom, which can accommodate up to 4,000 persons in a single gathering.

"We are very honored to be the hosts of Congress for the third time", said Mary Ann, who herself is a former APSA President and Executive Committee member.

"The Philippines seed industry has come a long way since the last time the event was held here in 2007 and we are looking forward to putting on another memorable and fruitful event", she added.

At the recent inspection meeting, APSA and PSIA agreed on a theme for the next Pre-Congress Workshop.

Mrs. Gallant explained, "The Pre-Congress Workshop is the first technical session, which sets the tone for the rest of Congress. In Incheon, last year, our session was on Plant Variety Protection, and this year it will be on Climate Change".

"Breeders, seedsmen and seedswomen in every country in the Asia Pacific region, and throughout the world for that matter, have been affected by climate change and extreme weather-related events. In particular: drought, floods, unseasonable heat waves, cold spells, cyclones, storms and so forth".

"We will plan to invite several expert speakers who will be able to shed more light on the situation and how best to adapt and thrive through the increasingly volatile times ahead".

The ASC was held in Manila for the first time in 1998 and has previously been hosted in Thailand (five times), India (four times), Japan (twice), South Korea (twice), Indonesia (twice), as well as once in China, Chinese Taipei, Macau, Vietnam, Australia and Malaysia.

The Philippines has particularly been impacted by extreme weather events with back-to-back Category 4 and 5 cyclones in November and December 2016, devastating the country's agriculture sector.

Next year, APSA is looking to host the 25th ASC for its sixth time in Thailand. 🌱

## Kyrgyz Group Learn About Quality Seed Production in Japan and Thailand



On 28 November, a group of seed entrepreneurs from Kyrgyzstan visited the APSA Secretariat office as part of an international field trip to study quality vegetable seed production in two key regional production hubs: Japan and Thailand.

As part of their first official stop in Thailand, the group spoke with APSA's Executive Director, Heidi Gallant, and Communications Officer Steven Layne about their goals and ambitions to improve their capacity to produce quality vegetable seeds for the export market.

The Kyrgyz agriculturalists, comprising of representatives from several crop and seed cooperatives in the landlocked Central Asian country, expressed interest in expanding their knowledge in seed technology, organic horticulture and high-yielding hybrid varieties.

Kyrgyzstan's seed and agriculture industry had previously depended heavily on cereals and livestock, but many farmers and seed producers have begun shifting to more lucrative horticulture crops and vegetable seed production in recent years.

The study tour, organised as part of a Japan International Cooperation Agency (JICA) project, initially visited various seed production and horticulture sites in Japan before flying to Bangkok on Saturday. After a visit to the Thailand Ministry of Agriculture and Cooperatives on Tuesday, the tour continued in Thailand's North and Northeast regions, covering various seed production field sites.

On their itinerary was Thai Seed & Agriculture Co. Ltd. in Udon Thani; Kaneko Seeds Thailand Co., Ltd. in Nan; as well as the Ta Wang Pa Village and OTOP exhibition, also in Nan. The group returned to Bishkek via Almaty on 4 December. 🌱

# Solanaceous Expert Speakers Confirmed for ASRT 2 in Bangkok



**A host of impressive vegetable crop breeders and scientists from around the world will lead discussions at the second edition of the Asian Solanaceous Round Table 2017 (ASRT 2), set to convene on 23-25 February in Bangkok.**

ASRT1 proved to be a productive event, enabling valuable public-private deliberations on vegetable crop research, and breeding challenges and solutions, with a focus on the solanaceous family of vegetables, primarily tomato, pepper and eggplant.



The inaugural event in India proved an ideal foundation to build public-private partnerships for advanced vegetable crop production.

Hosted in co-operation with Kasetsart University, under the direction of a steering committee of APSA's members, the ASRT 2 will focus its deliberations on the theme 'Challenges and Future Trends in Solanaceous Crops R&D in Asia'.

The inaugural event, held in 2014 in Bangalore, India, drew nearly 300 participants who represented both the public and private sectors, including scientists, plant breeders, plant variety protection specialists, seed industry experts, and students.

This important dialogue, which encompasses strategies and methods for reducing incidences of diseases and pests, and improving crop productivity and profitability, will continue with an impressive line-up of speakers (see table for highlights).

At time of press, limited spaces are still available. Registration, which costs \$150/delegate for seed industry professionals and \$100 for government officials, can be initiated by emailing APSA [apsa@apsaseed.org](mailto:apsa@apsaseed.org), or through our online events calendar ([apsaseed.org/events](http://apsaseed.org/events)). 🌱

## Asian Solanaceous Round Table 2017 (ASRT 2)

APSA THE ASIA & PACIFIC  
SEED ASSOCIATION



NAME	COUNTRY	PRESENTATION TITLE
CHEE HARK HARN	KOREA	Recent Breeding Technologies for developing new germplasms.
GERARD VAN WEERDEN	NETHERLANDS	Focus on Solanaceous crop wild relatives.
MARIE C. DAUNEY & J. DINTINGER	FRANCE	Eggplant resistance to Bacterial Wilt and to Fusarium Wilt: Is there a link OR Bacterial problems caused by the strong interaction between Bacterial Wilt resistance and bacterial diversity in Solanaceous crops.
DAVID FRANCIS	USA	Tomato breeding: Challenges & trends, with special focus on Bacterial Spot resistance in tomato.
IVO RIEU	NETHERLANDS	Tomato heat tolerance: Dissecting the genetic basis of pollen thermos tolerance in tomato.
BEN VOSMAN	NETHERLANDS	Host plant resistance against insect pests in pepper and tomato.
MOHAMED RAKHA	TAIWAN	Whitefly resistance in tomato.
LONG HONGJIN	CHINA	Research on chilli distant three way crossing breeding technology OR An overview of pepper breeding at Horticultural Research Institute, Yunnan, China.
JUNDAE LEE	KOREA	Development & utilization of molecular markers linked to the useful traits for chilli pepper breeding.
J.B. YOON	KOREA	Breeding anthracnose resistance in chilli: From genetic resources to commercialization.
ORARAT MONGKOPORN	THAILAND	Genetics & molecular markers for anthracnose resistance in chilli.
PAUL TAYLOR	AUSTRALIA	Lifestyles of Colletotrichum spp. and implications for anthracnose integrated disease management.
SUCHILA TECHAWONGSTIEN	THAILAND	Mechanism and inheritance of anthracnose resistance in chilli.
LAWRENCE KENYON	TAIWAN	Diversity of Chilli Leaf Curl virus and recent developments in Asia & its control measures.
BIKASH MANDAL	INDIA	Transmission, diagnosis & characterization of begomo viruses associated with chilli leaf curl in India.
SURINDER K. TIKOO	INDIA	TOSPO Virus: The challenges and developments made by Tierra Seeds – An opportunity for Private – Private Partnership.

\*\*Full Programme, List of Speakers available on [apsaseed.org](http://apsaseed.org)\*\*





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Vegetable Seed Production - Italy

## 2017

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of the world

January

M	T	W	T	F	S	S
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25	26	27	28	29	30	31



- Late bolting
- Heat Tolerance
- Multicut
- Best aroma
- Large leaf



April

M	T	W	T	F	S	S
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25	26	27	28	29	30	



# China Mandates Unique QR Codes for All Seed Labels



An APSA delegation of Chinese seed traders on a recent study tour in India examine seed label printing at VNR Seeds' factory in Raipur. The cost of production in Raipur is already drastically lower than in China, where production base costs are set to rise even more.

**Production costs for crop seed companies dealing in the Chinese market are poised to rise significantly as a result of a new regulation mandating that unique QR codes be added to labels on every single packet.**

Published by the Ministry of Agriculture on 18 September, last year, and enforced as of 1 January 2017, the “QR Code Rules for Crop Seed Labels” (In Mandarin, “*Nong zuo wu zhong zi biao qian er wei ma bian ma gui ze*”) is part of an administrative measure by the Chinese Government to improve traceability of all crop seeds and eradicate their illegal trade in accordance with the Seed Act.

APSA Immediate Past President and GM of Celestial Seeds, Wang Zhiping, who is part of a working committee advising and assisting companies in the implementation of the new regulation, summarised the requirements.

“The QR codes for crop seed labels should be unique. One QR code should correspond to one minimum

sale unit or packet”, he said. “Once a QR code is used for one seed packet, it can’t be used again”.

While the MoA has not specified any grace period or penalties for companies who fail to comply, according to Section 9 of the Seed Act, violating label requirements may incur fines of between RMB2,000 (\$289) and 20,000 (\$2,894) per instance.

Moreover, goods deemed as “fake” or “illegal” may be subject to seizure and confiscation.

Ms. Wu Xiaoling, Deputy Director of the Department of Seed Management, MOA, explained that the onus of generating, printing and managing the QR codes is entirely on seed companies.

“Companies must design and generate the QR codes and corresponding tracking URLs in accordance with the guidelines (see right). Government agricultural departments and seed management institutes won’t designate or entrust any person or company to design

software, QR codes or tracking URLs”, she affirmed.

Ms. Wu went on to explain that QR codes can be printed and produced in various ways using existing software and services, whether paid or free, and can be done by a packet printing company or by seed producers themselves, who are permitted to affix the printed code to a seed label after the label is printed.

However, she was adamant that companies need to ensure that each QR code can be scanned by both PC and smartphone scanners, and that they won’t fall off the label if they are printed separately.

While creating unique QR codes is a fairly simple procedure, the requirement to generate one for every single seed packet may prove to be tedious and costly, requiring more advanced production techniques, including the utilisation of jet ink printers, which may require a substantial investment from companies.





Staff of Hybreq Seed hold up packets of seeds with the newly required QR Codes. The new requirement will increase production costs by as much as RMB1 per packet, however it will address fake seed trading.



A staffer from Jiangsu Zhongjiang Seed Co., Ltd. shows his regulation-compliant seed packages.

The head of one seed company, who asked not to be named, told *Asian Seed* that in order to comply with the new rules, his company needed to invest in 16 high-calibre jet ink printers, requiring an initial investment of RMB800 thousand (US\$116,000), which doesn't factor in maintenance costs of the equipment.

Companies not ready or unable to invest in new and sufficient printing equipment may consider outsourcing.

Mr. He Zhili, General Manager of Shenzhen Sangye, an APSA member who specialises in seed packaging production in China, confirmed that production costs will increase significantly in order to meet the new requirements.

"Our company has conducted some test runs with an RMB40,000 (\$5,800), multi-nozzle inkjet printer, and we found that we had to clean the nozzles every five days. Then there are the costs of the cleaning chemicals and replacement of the nozzles, which can add up quickly depending on the capacity required".

According to his estimation, the cost will increase by no less than RMB0.05 (1 US cent) per packet.

Calculations by Mr. Wang Huasheng, General Manager of Hainan Haikou Yongfeng Huasheng Seeds, also underline reduced profit margins.

"For conventional vegetable seed varieties, packaging costs range from 0.3 to 1RMB (4-14 cents) per packet, and the profit margin is around 0.05-0.3RMB per packet (1-4 cents). To add unique QR codes to each packet, we estimate our costs to increase by, on average, 0.04RMB (1 cent) per packet".

On the plus side, unique QR codes will enable companies to have better inventory management and increased quality control over their products.

Since this regulation will drastically improve the traceability of all seeds on the market, it may prove to be an effective measure to help eradicate fake seeds and illegitimate traders, who negatively impact the bottom line of legitimate companies. 🍌

## Crop Seed Label QR Code Guidelines



This is what a QR code looks like. The new requirement in China stipulates that the code on seed packet labels has to use black ink. Using a QR Code scanner app, scan this code to view a list of the full guidelines.

- One single-use QR code is required for every packet sold. Once used, it can never be used again.
- The QR code must embed the following four items: 1) Name of the variety; 2) Name of the production company or the import company; 3) Unit Identification code; and 4) a trace URL.
- The tracking URL must list the four points in sequence on separate lines and these points must be consistent with information printed on the label, and consistent with information in the seed variety's administrative license and registration.
- The Unit Identification code is a unique code differentiating each minimum sales unit (packet). It must be limited to 20 characters, can be a combination of numbers and characters, or purely be numbers. It can be the same as the original product code or can be a new code, but it must be generated and managed by the seed companies themselves.
- Seed companies are responsible for generating, managing and guaranteeing the tracking URL and its effectiveness. Customers can use this URL to trace the seeds processing lots and logistics, or sales information. The URL should be accessible by PCs and smartphones.
- The QR code information must not have misleading and promotional information.
- The design of the two dimension code should comply with all other existing parameters for QR codes.
- The size of the QR code can be determined according to the size of the packet, but should not be smaller than two square centimeters.
- The printing of the QR code should be clear and complete, and should be legible for scanners.
- The QR code should be black with a white background. The background area should be at least 2 mm larger than the code area.

Published by the MoA on 18 Sept 2016 and enforced as of 1 Jan 2017.



# The Order of Climate Disorder: **Climate Change** **2017**

Something is going on with the weather and the greater climate of our planet. More than just a trendy talking point, Climate Change is something that will increasingly impact everyone – mentally, physically and financially.

**E**ven as world leaders continue to debate on the causes and implications of Climate Change, with many governments and private organisations scrambling to react and devise effective strategies to minimise future economic losses, numerous actions and reactions are well underway to directly intervene with the course of the planet's climate, as we shall examine in the following pages.

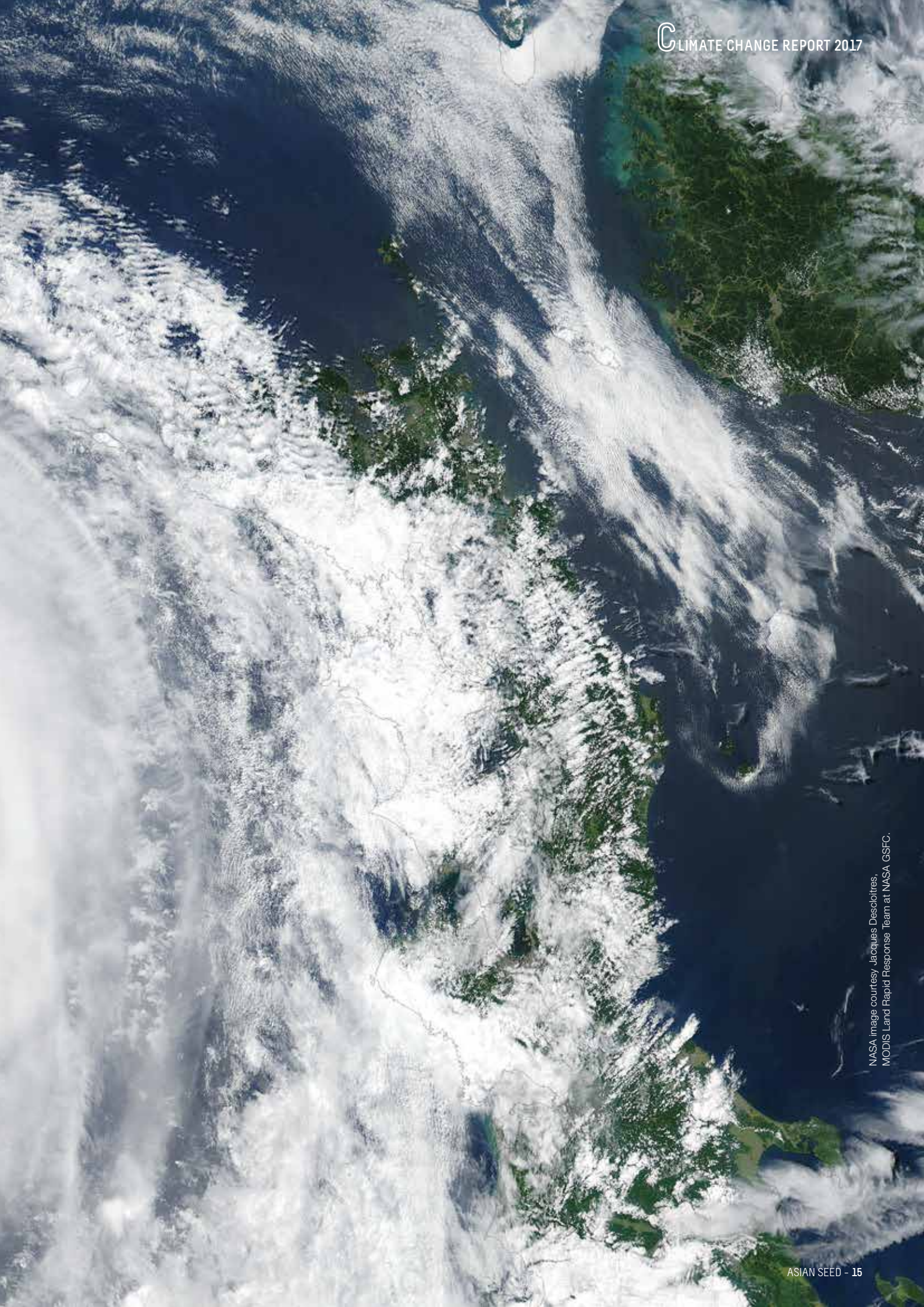
Seedsmen and seedswomen need little convincing of the situation's magnitude. We are dependent on and vulnerable to weather and seasons, which dictate harvests and markets. And while the weather by definition is concerned with short-term seasonal

and unseasonal events, the climate encompasses fluctuating weather patterns over longer periods of time, be it years, decades, centuries, epochs, or even ages.

Nowhere are said changes more apparent and damning than here in the Asia and Pacific region, where it's either been hotter and drier than usual (drought), wetter than usual (flooding), colder than usual, or a combination of the extremes.

Here, *Asian Seed* offers a comprehensive overview of the prominent theories and scientific factors influencing our complicated climate – in the past and present – so as to underline implications for what the future may have in store.





NASA image courtesy Jacques Desloires,  
MODIS Land Rapid Response Team at NASA GSFC.



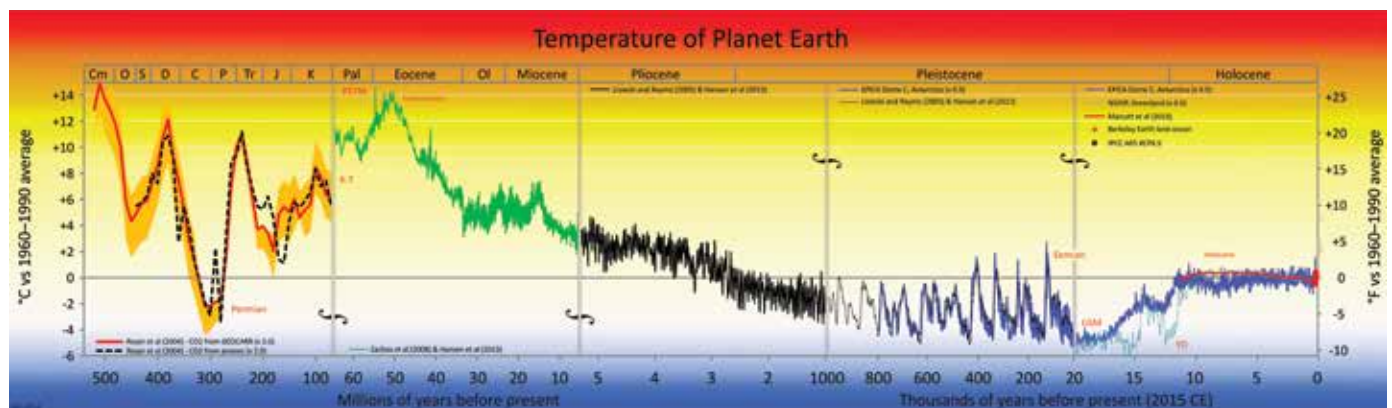
# Epoch Anthropocene

It's difficult to refute human kind's negative impact on the environment, especially since the dawn of the industrial age. Over centuries, and particularly since the last half of the 20th century, human-made pollutants have reached unprecedented levels in the atmosphere and the implications are dire.

So much is the impact that it has prompted some scientists to now classify the last few centuries as an entirely new geological period in time – Epoch Anthropocene – inferring that humans have artificially altered the course of our planet's natural destiny.



ABOVE: From left: Shanghai smog, photo by Peter Dowley; Beijing smog, photo by Jeffery Beggerly; Rice field flooded from Typhoon Ketsana, photo by Chris Quintana; BELOW: Global temperature estimates, data by Glen Fergus



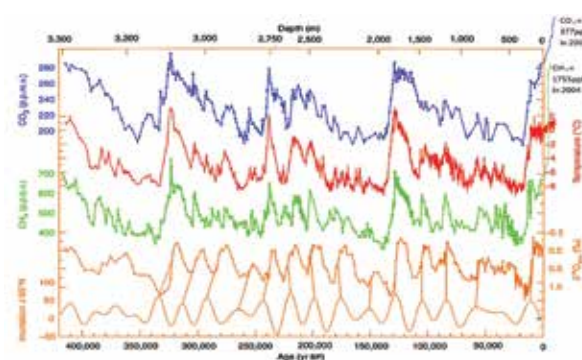
The destructive effects of the human footprint are plain for any keen observer to see. Through our cities, streets, beaches, oceans, rivers, sewers, landfills, industrial parks, fracking pits, nuclear test sites, toxic waste dumps, the list goes on...

Proponents of anthropogenic climate theory argue that the current level of greenhouse gasses in the atmosphere are “off the charts”. While we can’t directly measure climate in the past, we can indirectly extrapolate conditions using proxy measurements.

One such way scientists have determined atmospheric greenhouse gasses in the ancient past is by examining air trapped inside ancient ice cores.

By looking at Antarctic ice air bubbles from the past 800,000 years, scientists have determined that the maximum atmospheric level of carbon dioxide has never exceeded 300 ppm (in Antarctica) [EPICA Lüthi, D., et al. 2008]. That is until now, with the present level having breached 400 ppm and rising. [NOAA, 2016]

The detrimental effects from the accumulation of these greenhouse gasses in the atmosphere are underlined by alarming headlines such as the 21st century having the “10 hottest years on record since 1880” [GISTEMP, 2016], linked to occurrences such as thermal expansion and acidification of the oceans; an increase in intensity and frequency of coastal storms, and melting polar ice; and to rising sea levels and an imminent threat of complete coastal inundation, with some forecasts pointing upwards of a 2-metre rise by 2100. [Gregory, 2013]



LEFT: Greenhouse gas levels in 400,000 years indicated by measurements from Vostok Station; RIGHT: An atmospheric carbon dioxide levels chart by NASA/NOAA.



# Mixed Signals



Greenland ice sheets, photo by Christine Zenino

One might be tempted to link rising sea levels with melting arctic sea ice, which has consistently disappeared since 1979 when satellites began tracking it. While indicative of a warming trend, the melting of arctic sea ice could not be contributing to rising sea levels, just as melting ice cubes in a glass of water would not cause the water level in the glass to rise.



LEFT: Melting arctic ice, photo by NOAA; RIGHT: Greenland on the globe, photo by Connormah

Therefore, any sea level rise attributed to glacial eustasy would have to be linked to land-based ice sheets, the majority of which are in Antarctica and Greenland. In the worst case scenario, if all of the remaining ice on Antarctica (26.5 million cubic kilometres) and Greenland (2,850,000 cubic kilometres) melted, the sea could potentially rise 66 metres – about 7.2 m from Greenland, 58 m from Antarctica, and the rest from other glaciers on the planet.

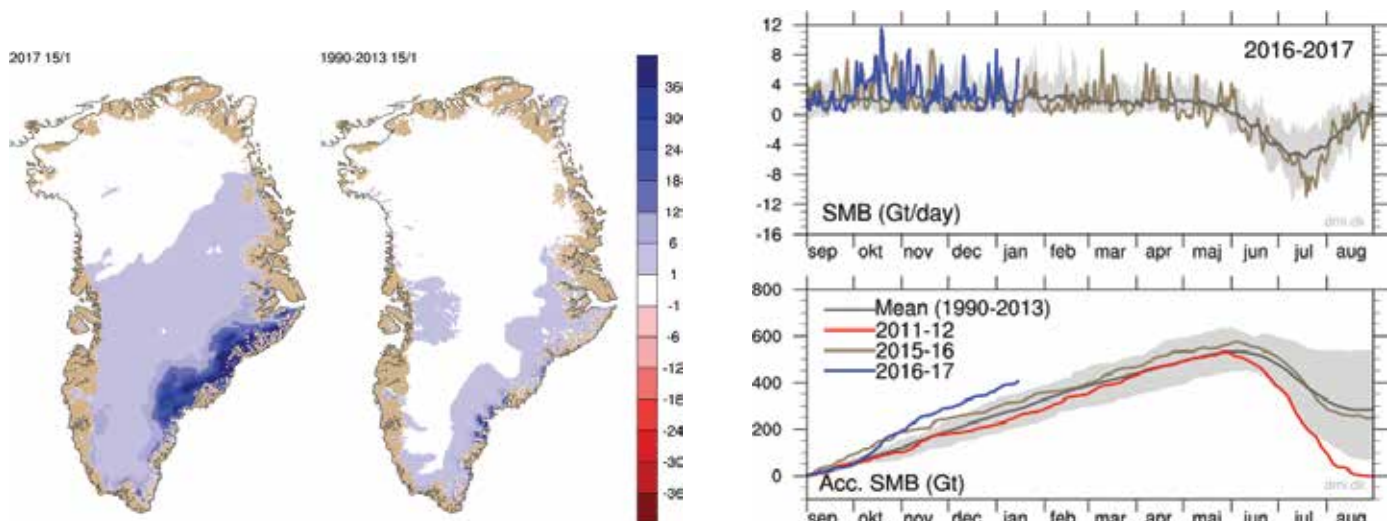
However, Antarctica's ice sheets have actually been growing more than they've been melting, accumulating a net gain of ice every year, tracked from 1991 to 2008. So therefore the southernmost continent's contribution to the world's sea level would have been a net decrease, not an increase. [Zwally, et al., 2015]

And although Greenland has reportedly been losing ice at a rate of 200 gigatons per year over the last decade, which might explain some of the sea rise, Danish researchers this winter (2016-2017) are closely monitoring an unexpected anomaly, noting that the "surface mass budget" gain of ice in Greenland has so far been statistically higher than the mean of the previous 24-years of satellite observation (1990-2014). [Langen, Peter L., 2017]

The winter of 2016-2017 has been particularly cold elsewhere in the northern hemisphere – from Siberia to Sweden, Japan to North America, and the UK to Greece, where record amounts of snowfall and low temperatures have been recorded.

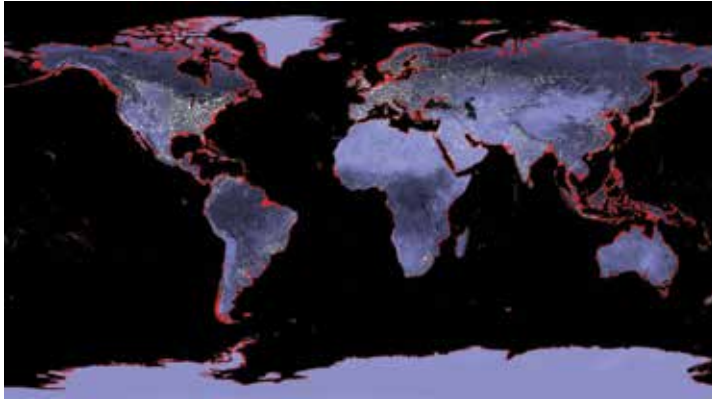
Is it just a pause in global warming or could it be something else?

As for rising sea levels, whether from melting land-based ice sheets or thermal expansion, research is ongoing. We know that in the 20th century the global mean sea level (MSL) rose by as much as 17 cm [Thompson, P.R., et al., 2016], which would equate to an annual mean increase of 1.7 mm, while satellite data from the last 23 years shows a global mean sea level rise rate, from 1993 to 2016, to be 3.4 mm [Colorado University, 2016]. All things considered, the current rate of sea rise is not "unprecedented" – not even close. Nor can current temperatures be argued to be the warmest ever, let alone the warmest in human history.



Greenland observations by the Danish Climate Centre show surface mass ice accumulation this winter as being statistically higher than the previous two decades.

# Global Warming 1.0



This map by NASA shows which coastlines would be inundated if the sea were to rise six metres. In fact, the sea has risen this high at least twice in human history.

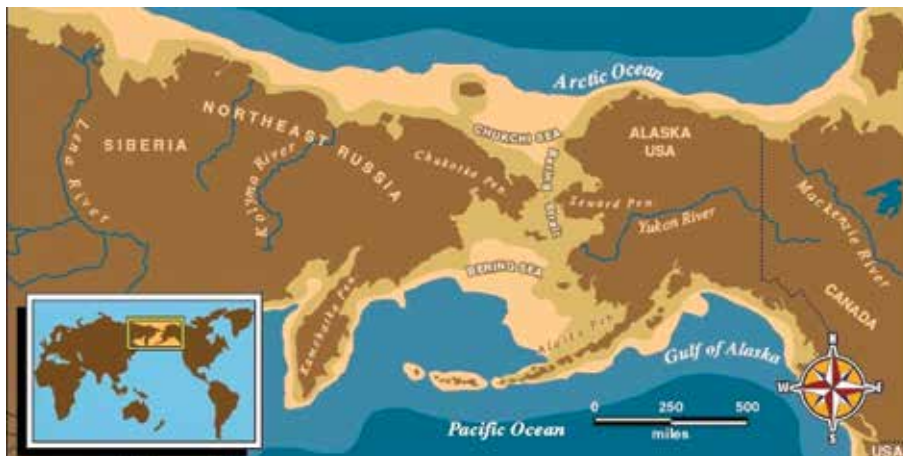
Ancient homo sapiens who lived during the Eemian Interglacial period (Circa 130,000-115,000 years before present) would have been the first of our kind to experience climate change in the form of rapid global warming. During that Eemian episode, a long-forgotten speck in human history, the climate oscillated between hot, wet and arid conditions that corresponded with rapidly rising seas. Humans who lived during this epoch would have experienced a climate as much as eight degrees warmer (at least in Greenland), and a sea level highstand of up to eight metres higher than today [Copenhagen University, 2013]. Scientists tend to agree that the warming “was the result of the Eemian distribution of summer radiation between latitudes and seasons as determined by the Earth’s orbit”. [Ganopolski and Robinson 2011]

## Continental Connectivity



The warming and rising seas of the Eemian period peaked by about 120,000 BP, when suddenly the planet’s climate went into reverse, entering a new period of glaciation, a cooling phase that would last 100,000 years, the bulk of homo sapiens’ known existence. The glaciation of the poles correlated with a dramatic decline in seas levels, reaching a trough by about 20,000-18,000 years ago during the height of the last great ice age, when sea levels were more than 100-150 metres below present levels. [Lambeck, 1990]

During that time, a map of the present day Asia and Pacific region would have been dramatically different, and it is on this basis that anthropologists theorise that humans were able to migrate across continents (without modern boats or planes). With much of the seas tied up in polar ice, a huge continental land bridge known as “Beringia” connected Eurasia to North America, thus enabling the migration of Native Americans’ ancient East Asian ancestors sometime between 25,000 and 13,000 years ago [Elias, 2014]. Similarly, further south in Asia, lower sea levels enabled migration between the Australasia region through two great landmasses known as Sunda and Sahul.



Sunda and Sahul, map by Maximilian Dörrbecker; Beringia map by US National Park Service.

Indeed, for a bulk of human kind’s time on this planet, the climate had been cool and the sea levels relatively low. But just as some of the earliest humans had experienced extreme climate shifts leading up to and after the Eemian, another generation of humans would get to experience yet another sharp shift in the climate after the last glacial period finally ended, signalling the beginning of the last and current interglacial period (Holocene), which began about 11,000 years ago.

## Holocene Highs

Numerous geomorphological, glacial, sedimentary and radiocarbon proxy indicators give us a pretty accurate picture of the climate, ecology, weather, coastlines and sea levels during the many millennia since the last great ice age.

And just like during the Eemian, rapid warming during the “holocene

climatic optima” or “holocene maxima” is believed to have been caused by “astronomical” factors, with corresponding rising seas reaching their maximum levels (sea level highstand) between 7,000 and 6,000 years BP.

In the Malaccan Strait, near present-day Singapore, from 8,900 to

8,100 years BP, during what is known as the “mid-early holocene epoch”, the sea rose by an average of 1.8 metres per century – which equates to 18 mm/year over 800 years (compared to the rate of 3.4 mm/year for the last 23 years). Sea levels there plateaued in the following 700 years before rising again by an additional five metres from 7,400



to 6,500 years before present, or about 4.4 mm/year over 900 years. [Bird, et al, 2010]

The highstand, or peak sea level, during the holocene maxima varies around the Asia-Pacific region. While studies in Indonesia and Malaysia indicate a sea level rise of 5-6 m above Mean Sea Level (MSL) [Woodroffe and Horton, 2005], in the Gulf of Thailand, the highstand may have only reached 4 m above the present MSL [Nimnate P, et al., 2014]. Meanwhile, data from the South Australian coast indicates a

highstand of 2.4 m above MSL [Bryant, 1992]; while the highstand at modern day Hong Kong harbor was 2 m, and possibly as much as 5 m above MSL [Yim and Huang, 2003]. It is interesting to fathom that cities like Shanghai, Hanoi, Manila and Bangkok, where APSA's Secretariat is currently located, would have been at the bottom of the sea as recently as 6,000 years ago, and could very well be in the future should the seas continue to rise.

While the evidence overwhelmingly suggests that our generation is not

the first of our species to experience climate change in the form of extreme global warming, and that our planet's climate is constantly subject to extreme shifts and reversals, as evidenced in data from the past hundreds, thousands or even millions of years, it does not negate the fact that humans at present are altering the "natural" course of our planet's climatic destiny. This change is not only an accidental byproduct of the industrial age, but arguably an intentional effort of the technological age.

## Weather Warfare

From 1967 to 1972, during the Vietnam and American conflict, the US' 54th Weather Reconnaissance Squadron carried out a covert cloud-seeding operation code-named Operation Popeye. Through the disbursement of substances such as lead iodide and silver iodide into clouds, the operation's aim was to generate rainfall over strategic targets along the Ho-Chi-Minh trail in Laos, Vietnam and Cambodia. [US Office of the Historian, 1967]

Interestingly, the Southeast Asia wartime cloud seeding experiments complement "hurricane seeding" research conducted throughout the 1960s by the US Department of Defense's Department of Commerce and National Science Foundation, through Project STORMFURY, which reportedly focused on manipulating a cyclone's intensity.

Among the striking revelations from the experiments was that "... the augmented heating associated with the simulated seeding resulted in an increase in the total kinetic energy of the hurricane's winds by about 20 per cent. Since this could result in a significant increase in the A-2 storm surge, we caution against conclusions that seeding does not make the storm 'worse'. Furthermore, 'simulated seeding' inside the original radius of maximum winds results in a slight increase of strongest winds" [US DTIC, 1971]. In other words, proven storm manipulation techniques have been within the military's arsenal for at least four decades.

Inevitably, the public got wind of military weather experiments, and resulting media outcries ultimately led to the ratification of the Environmental

Modification Convention (ENMOD) in 1978. Eventually signed by 77 countries, ENMOD formally bans the practice of modifying weather for warfare, but as time would tell, it had little impact in dampening the military's ambitions for controlling the weather.

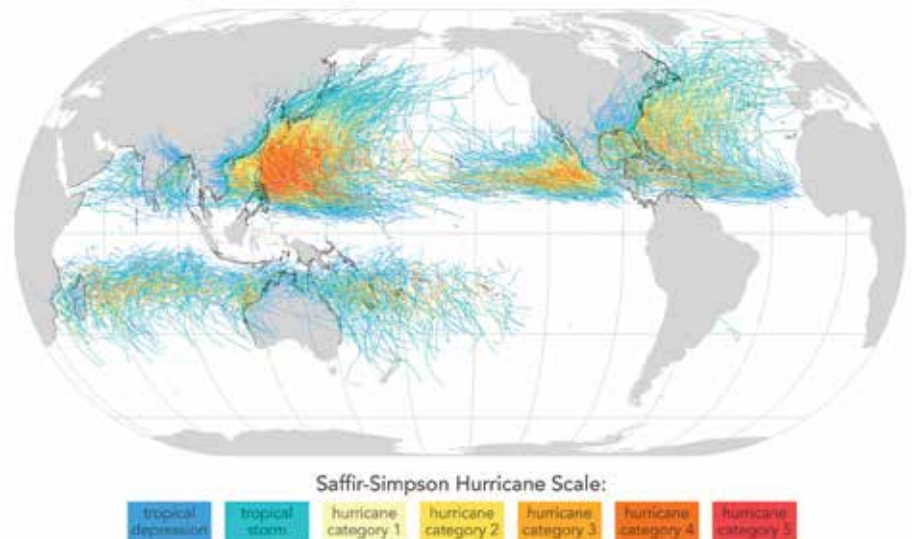
From 1993 to 2015, the US Department of Defense funded the controversial High Frequency Active Auroral Research Program (HAARP), an ionospheric research programme that a science and engineering US Air Force officer, David Walker, had admitted on public record was designed for the purpose of "managing the ionosphere ... to inject energy into the ionosphere to be able to actually control it". [Murkowski, 2014]

The military's ambition to "own the weather" is no secret, nor is it some

elaborate conspiracy. It is perhaps best underlined by a 1996 research project commissioned by former US Air Force Chief of Staff, General Ronald Fogleman, entitled "Weather as a Force Multiplier: Owning the Weather in 2025". [Smith, 2006]

Dubbed "Air Force 2025" for short, the 44-page executive summary, which cites previous Air Force studies about the importance of the ionosphere in understanding and controlling space weather, concluded that "... efforts are already underway to create more comprehensive weather models primarily to improve forecasts, but researchers are also trying to influence the results of these models by adding small amounts of energy at just the right time and space". [Col. House, et al., 1996]

## Tropical Cyclones, 1945–2006



This map by Citynoise shows which areas on our planet are most prone to cyclones.

# 2016 Extreme Weather: Asia & Pacific Snapshot

## 1 Australia & New Zealand

Last year was reportedly the warmest on record in New Zealand and the 4th warmest in Australia, in large part due to a warm and dry year's start. In January, wildfires burnt more than 115,000 Ha of land in northeast Tasmania. The rest of the year saw record rainfall across much of Australia, and later in New Zealand, threatening fruit crops. In September, flooding swept through New South Wales, reducing the volume of some pulse crops by as much as 80%, with overall crop losses in the state valued at A\$500 million. Likewise, floods were blamed for record high potato prices in North Queensland, and wet weather resulted in 25-50% crop losses in South Australia. Also in September, many farmers in West Australia were caught off guard by an unseasonable cold spell, contributing to A\$140 million in crop damages, largely affecting wheat and barley, which had also suffered from water logging and isolated dry conditions. Parts of New Zealand were hit by rare summer snows late in the year.

## 2 Japan

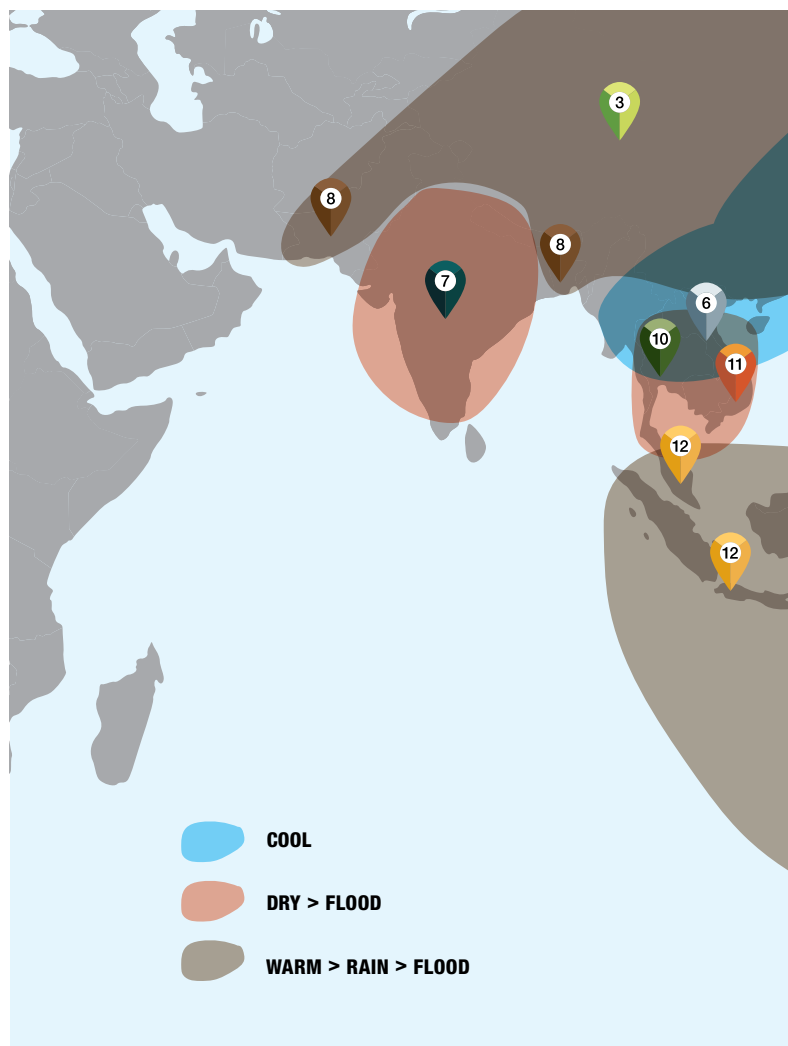
Unseasonal cold spells have brought record snowfall and low temperatures to Japan and neighbouring islands over the last few winters. In January 2016, the first recorded snowfall in 115 years was observed on the sub-tropical island of Amami-Oshima, while subtropical Okinawa Island in February, 2016, also got hit with its first recorded snowfall since 1966. Then, in November 2016, Tokyo received its first November snowfall since 1962, the first in 54 years. A number of typhoons brought the usual havoc to the Japanese archipelago, especially in August with Typhoon Lionrock and in September with Typhoon Malakas.

## 3 China

The infamous cold spell of January 2016 registered record-low temperatures at 24 weather stations across the country, including minus 46.8 degrees C in Inner Mongolia, while residents in Guangzhou City saw sleet for the first time in 60 years. The country also reportedly received its highest amount of rainfall on record in 2016. In June-July 2016, swaths of Northern and Southern China were devastated by the country's second costliest flood disaster, in which more than 400 were killed, while an estimated 280,000 hectares in cropland were destroyed, amounting to nearly US\$6 billion in losses on top of \$22 bn in property damage. The floods ultimately affected 32 million people across 26 provinces.

## 4 Korean Peninsula

In January 2016, more than 90,000 passengers were left stranded on South Korea's Jeju island when 1,200 flights were cancelled and record low temperatures were recorded throughout the country, including minus 18 degrees C in Seoul. During 2016, the country's agriculture sector had been suffering from the worst drought in 42 years when Typhoon Chaba suddenly struck in October, killing seven, inundating 500 homes and damaging crops across 7,500 hectares. Likewise, North Korean residents had reportedly been suffering from drought-induced food shortages when a historical deluge in August prompted a rare appeal by the government for international aid after flooding permanently swept away hundreds, leaving some 70,000 people homeless and another 600,000 in need of humanitarian assistance.



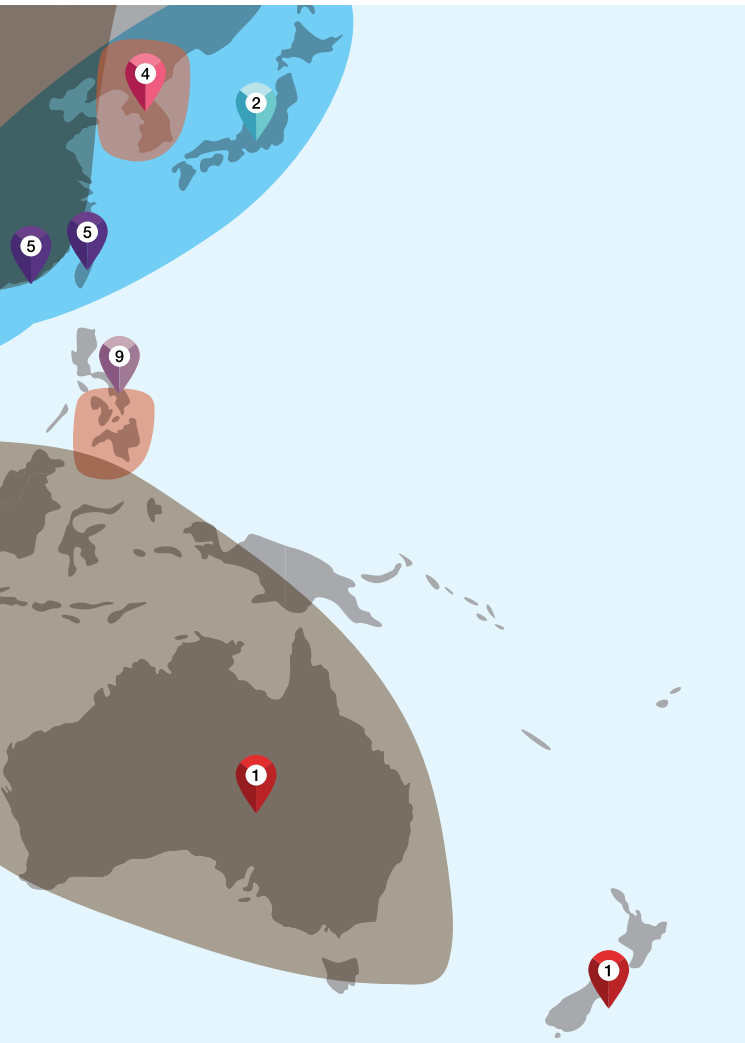
## 5 Chinese Taipei & Hong Kong

More than 80 weather-related deaths were reported throughout Chinese Taipei when the temperature plummeted to near-freezing temperatures during the cold-spell of January 2016, which brought temperatures in the negatives and rare snowfall to much of the island. Millions in losses were reported from damages to oranges, Indian jujubes, wax apples, pineapples, dragon fruit, papayas, pears, strawberries, tomatoes, rice seedlings and mountain-grown cabbages. Meanwhile in Hong Kong, schools were closed and people trapped on frozen high ground were rescued and treated for hypothermia as a new record low of minus five degrees C was recorded on the city's highest peak, Tai Mo Shan.

## 6 Laos

Flights were cancelled and delayed while some government officers were granted three days of leave to avoid unnecessary travel as January 2016's cold snap brought rare sleet and snowfall to the northern uplands of the country, namely in Et-Phou Louey National Park. Additionally, an untold number of crops and livestock were destroyed from the frosty weather.





## 7 India

The year 2016 started off dry, with some 330 million affected by the worst drought conditions in decades reported by May. The rains would return however. From June through August, millions were displaced as some 500 fatalities across 11 Indian States were reported from monsoon-induced flooding. Rhinos and elephants were killed while bridges and vehicles were swept away as major rivers such as the Savitri, Brahmaputra, Mahananda and Ganges reached record levels. More flood devastation came to the states of Andhra Pradesh and Telengana in September, with dozens more fatalities and damages to more than 50,000 hectares reported.

## 8 Pakistan & Bangladesh

Heavy rain and flash floods in April caused no less than 71 deaths in north and northwest regions, while at least 26 more were killed by deadly floods in Pakistan's Sindh and Balochistan provinces in August. In Bangladesh, the warm summer weather was cited as the main reason why more than 261 people succumbed to fatal lightning strikes by June, while no less than 42 were killed by flooding across 16 districts in August.

## 9 The Philippines

Like much of the region, the Philippines started 2016 with an extended El-Niño induced drought, which affected up to 85% of the country and tens of thousands of farmers by April. By year's end, three powerful typhoons had devastated the Philippines. In October, two back-to-back superstorm systems, Typhoon Sarika and Typhoon Haima, resulted in crop damages across 456,232 hectares of paddy, maize, mangoes, bananas, papayas, cassavas and vegetables, with damage estimated to be upwards of US\$212 million. Then, Typhoon Nina in December resulted in a further \$80 million in agriculture damages to 65,247 Ha of farmland, resulting in an estimated 268,355 tonnes of lost produce, including rice, corn and fisheries, with 70,000 farmers impacted.

## 10 Thailand

The East Asia cold spell of January 2016 brought temperatures in tropical Bangkok down to 16 degrees celsius, with 14 weather related deaths reported across the country. El Niño would then go on to bring one of the worst droughts in decades, with 30 of Thailand's 77 provinces adversely affected by June. But the first big rains of the year flooded the streets of Bangkok later that same June, setting the tone for the rest of the year with episodes of rain-induced flooding affecting Northern and Central Thailand in August and October. Southern Thai provinces along the Thailand-Malaysia peninsula got their turn for flooding, in November and then again in December and January, with more than a million affected by the latest floods and agriculture damage estimations estimated at B15 bn (\$419 mn).

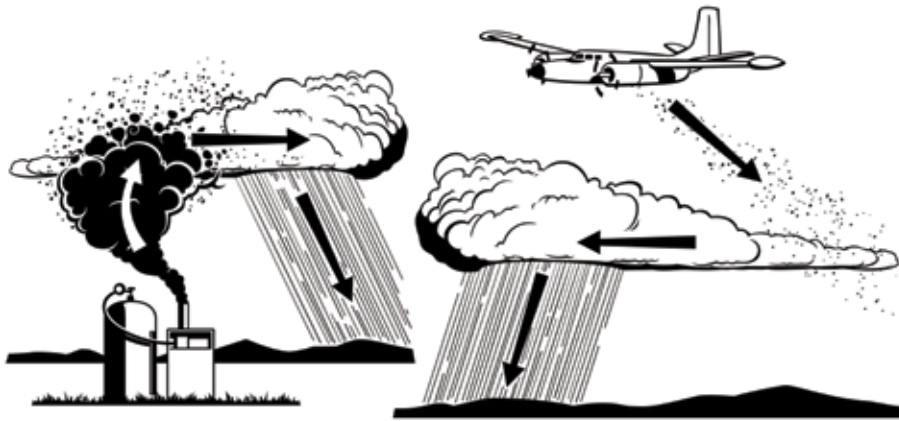
## 11 Vietnam

The country has experienced climate-induced agriculture hardship on multiple fronts. Frost, snow and record-low temperatures that struck in January 2016 did not spare crops and cattle in Northern Vietnam, and even central parts of the country, where some districts witnessed snow for their first time ever. By May 2016, the country's agriculture sector took another hard hit from what was described as the country's worst drought in a century, causing the level of the Mekong River to drop dramatically, which in turn resulted in sea water intrusion, devastating paddy production in the Mekong delta. But the rains would return by year's end, and in full fury, where dozens of fatalities and millions more in crop and livestock damages were reported in three deadly floods that struck the northern and central parts of the country in an eight-week window from 17 October to 5 December.

## 12 Malaysia & Indonesia

Through early 2016, drought conditions caused adverse affects on agriculture production, especially on palm oil and rubber. For these two Southeast Asian countries, most of the year was highlighted by heavy rains and devastating floods. Starting in February, Malaysia's Sarawak State and Indonesia's Jambi provinces were hit hard by flooding, which would prove to be fairly regular for the rest of the year as numerous floods from March through to the end of the year killed dozens and displaced hundreds of thousands throughout Indonesia's Sumatra Sulawesi, East Java, Central Java and West Java provinces, and likewise in Malaysia's Penang, Kedah, Terengganu and Kelantan states.

# Climate Engineering



Scientists have developed technology to not only create weather, but also modify the climate.

It's not only the US military who has been experimenting with weather and climate modification. For time immemorial, humans have been conducting rain-making experiments. Cloud seeding was invented in 1946 by self-taught American chemist Vincent J. Schaefer, who seeded a cloud with an airplane and dry ice (carbon dioxide) to make it snow over Massachusetts. The rest is history.

By the 1970s, news of advanced cloud seeding techniques had emerged and governments quickly jumped on board. Though ENMOD banned the use of weather modification for warfare, it didn't say anything about agriculture. According to the World Meteorological Organization, more than 50 countries around the world have active Weather Modification programmes, which include cloud seeding operations to enhance

precipitation, as well as hail suppression programmes. [WMO, 2014]

It goes without saying that over the last fifty years, an untold quantity of silver iodide, potassium iodide, solid carbon dioxide (dry ice), liquid propane and other substances have been dispersed into the atmosphere. Other than triggering and suppressing precipitation, scientists eventually discovered another application for cloud seeding.

In 1991, inventors David B. Chang and I-Fu Shih were granted a patent for "Stratospheric Welsbach seeding for reduction of global warming" [US Patent No. US5003186 A 1991]. The invention, which devises a means for reversing the greenhouse effect by dispersing metallic dust particles into clouds, would in theory allow heat trapping greenhouse gasses to escape the atmosphere while

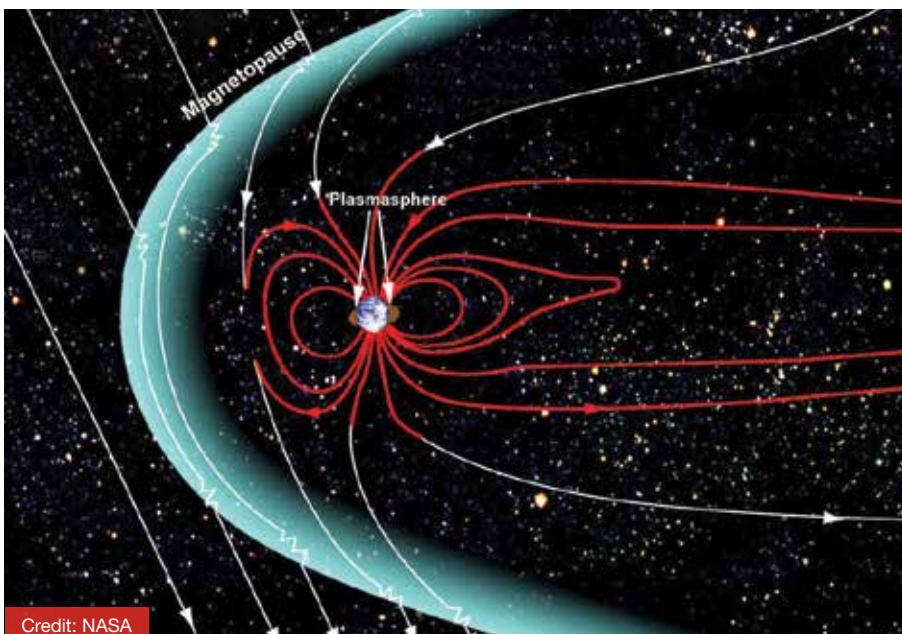
disallowing solar radiation to enter the atmosphere. With this development we officially graduated from Weather Modification to Climate Engineering, a term which is used interchangeably with Geoengineering.

Leading global efforts are a number of political and academic bodies, including the US Global Change Research Program, Intergovernmental Panel on Climate Change (IPCC), the Institute for Advanced Sustainability Studies (IASS), as well as Oxford University's Geoengineering Programme, which defines geoengineering as "the deliberate large-scale intervention in the Earth's natural systems to counteract climate change". [University of Oxford, 2017]

In 2014, the IASS organised the first International Climate Engineering Conference, with the next edition scheduled to take place in Berlin this October, where authorities will continue to discuss and coordinate transnational climate intervention strategies.

Among these include the disbursement of aerosols into the stratosphere with the aim of reflecting solar radiation back into space (Solar Radiation Management), as well as the dispersing of nutrients and other compounds into oceans as a mechanism to absorb carbon dioxide and counteract ocean acidification (Ocean Fertilisation and Alkalinity Enhancement).

## Cosmic Clouds



The Obama Administration, on 13 October 2016, issued an Executive Order entitled "Coordinating Efforts to Prepare the Nation for Space Weather Events", defining space weather events as "solar flares, solar energetic particles and geomagnetic disturbances". [US Federal Register, 2016]

The White House is certainly not the first to take heed of space weather. As we established, the US military has been studying space weather effects in the ionosphere and its implications for earth since at least 1993. Europe too has also turned to the cosmos for more answers.

Ongoing research conducted at CERN – the European Laboratory for Particle Physics in Geneva, Switzerland – has, since 2009 at least, been examining





a link between galactic cosmic rays (GCR) and cloud formation. By injecting GCRs into a Proton Synchrotron (PS) acceleration chamber, the Cosmics Leaving Outdoor Droplets (CLOUD) experiment has demonstrated a strong influence of GCRs on the formation of aerosols, tiny particles suspended in the air that can grow to form seeds for cloud droplets. It is hypothesised that since GCRs can greatly enhance cloud formation, their dispersion into the atmosphere would increase cloud

coverage and thus have a cooling effect on the planet, since clouds reflect solar radiation back into space. [CERN, 2017]

But since GCRs are essentially highly-charged radioactive particles of energy, direct exposure can be lethal to humans and disruptive to electrical grids and electronic systems. Travel in space thus requires strong physical or magnetic shielding from GCRs, so as to protect astronauts and their

expensive equipment. Likewise, our planet's magnetic field provides a protective shield from deadly GCRs, thus allowing life on the planet to thrive.

While scientists are still determining the influence of GCRs in the polluted, warm atmosphere of the present age, there is strong evidence for their cloud influence during cooler episodes of our planet's past, when cosmic radiation levels were higher.

## Solar Cycle Significance

One way to determine past levels of GCRs on Earth is to examine isotopes in terrestrial archives. By measuring concentrations of the cosmogenic isotopes Carbon-14 and Beryllium-10 found in tree rings and ice cores, scientists have not only reconstructed a timeline of past radiation levels, but have also used these as proxies to verify solar activity over multiple millennia.

Subsequently, we now know two main phases of our sun, this being "strong" and "weak", or maxima and minima, which correlate with warm and cool climate periods on our planet. [Ilya G. Usoskin, 2010]

The exact mechanisms of solar cycles are a bit complex, but the basic reasoning is that during solar minimum cycles, the earth's magnetic field is

weaker in relation to a less dense plasmasphere, which allows more GCRs to penetrate the earth's atmosphere. This in turn leads to more extensive cloud coverage blanketing the planet. Not only is less solar radiation being emitted from the sun during its weak phase, but more of that diminished radiation is reflected back into space through cloud albedo, thus coinciding with the cooling of our planet.

## Chilling Indicators

The evidence is overwhelming: our sun is getting weaker and so is the Earth's protective magnetic field. Complementing isotope dating methods, scientists can also determine solar activity, or lack thereof, by counting sunspots, which increase and decrease with the intensity of solar radiation. While there is evidence that Ancient Koreans and Chinese may have used sunspot observations more than a millennia ago to predict the future, modern astronomical sunspot

observations began in the early 17th century, with daily logs kept since 1849.

When the number of sunspots peak, we are considered to be in a solar maximum period, which correlates with stronger magnetic shielding of earth from cloud-forming GCRs. Conversely, when the number of sunspots fall, we enter a solar minimum, associated with increased GCR penetration and cloud coverage over earth.

Since 1755, there have been 24 Solar Cycles, and we are rapidly approaching the end of the the 24th cycle, marked by a minimum period of low solar activity. Solar minimums occur on average every 11 years, while "grand solar minimums", which last longer and have much more intense effects on the climate, tend to occur every few hundred years. These grand solar minimums have been directly correlated with a number of infamously cool periods in recent history. The last one was the Dalton Minimum,



which occurred between 1790 and 1830. The one before that was the Maunder Minimum, which occurred roughly between 1645 to 1715, a period which is often associated with the “Little Ice Age”. During these periods, winters were

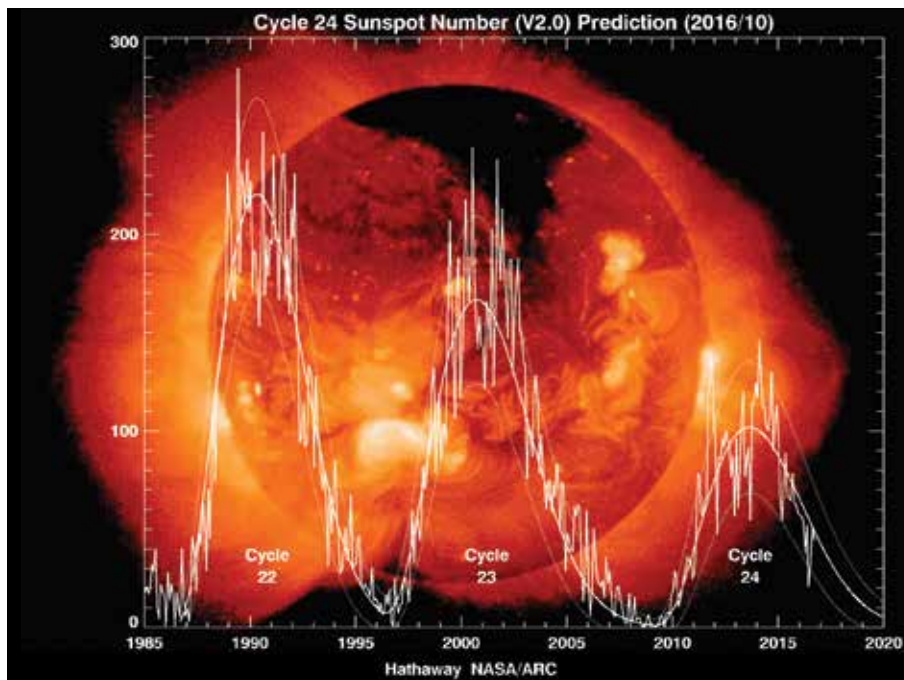
particularly harsh, crops failed regularly and food-related famines were commonplace.

As we approach the end of Solar Cycle 24, there are several signs suggesting that the next solar minimum, expected

to fully begin by about 2020, could be a grand solar minimum. In addition to isotopes and sunspot indications, the weakening sun trend has also been verified by solar wind measurements taken from outer space.

Launched in 1990, the spacecraft Ulysses orbited our sun three times before it was finally decommissioned in 2009. One of the key revelations Ulysses found was that the intensity of solar winds has weakened significantly. Between its first orbit in 1994/1995 (which was timed with the solar minimum between Solar Cycle 22 and 23) and its third and final orbit in 2007/2008 (during the solar minimum between Solar Cycle 23 and 24), Ulysses recorded a 25% reduction in solar wind intensity, down to the “lowest levels since accurate readings have become available”, or about 50 years before that point. [Geophysical Research Letters, 2008]

As for our planet’s protective shield, the European Space Agency estimates that the Earth’s magnetic field has lost 15% of its strength in the past 150 years. [ESA, 2017]



## Sulphuric Sun Shield



The eruption of Mount Pinatubo in 1991 had a cooling effect on the earth’s climate, with effects observed for several years. Photos by USGS

Numerous studies have linked volcanism with solar minimums and climate cooling. One study of 11 major volcanic eruptions in Japan over the previous three centuries found a statistically significant correlation between violent eruptions and the increase in GCRs during solar minima, when a majority of the examined eruptions took place. The increase in GCRs are postulated

to have triggered the eruptions. [Ebisuzaki T, 2011]

When a large volcano full of sulphur-rich magma erupts, there are cooling implications on global weather. As a result of the eruption of Mount Pinatubo in the Philippines in June 1991, an estimated 20 megatons of sulphur dioxide was emitted into the atmosphere. This caused global mean

surface temperatures to cool 0.5 degrees the following year, with further climate effects observed for up to three years after the eruption [Robock, 2002]. Likewise, the eruption of Mount Tambora, Indonesia, in 1815 (which occurred during the Dalton Minimum), is believed to have been directly responsible for the infamous “Year without a summer” in 1816. [USGS, 2016]





## Conclusion

If anything is clear, it is that climate change is real, serious and deserves our attention. Keeping true to the scientific method, there needs to be more critical inquiry, research and debate about what our past, present and future holds – be it warming, cooling or a combination and cyclical balance of both.

It cannot be denied that humans are responsible for some of the changes in the weather, and arguably the climate, through modifications, intentional or otherwise, in the troposphere, stratosphere and ionosphere.

And all of it begs serious questions about the erratic weather and evolving climate. What is natural and what is artificial? What is alarming and what is real? What is cause, what is effect,

who suffers, who benefits, who gains, who loses? At the same time, we must not be complacent and ignore the bigger picture, for to think that our will is more significant than ancient geological, solar and cosmic forces is arrogant at best.

Even if the climate engineers of Oxford University, the White House, IPCC and CERN are correct in their presumptions and prove to be successful in “reverse warming”, through the large-scale dispersion of more substances into our atmosphere and oceans, or perhaps through more ionosphere manipulation experiments, then what does that imply for the future – of the climate, Earth, society, agriculture and seed?

As the relationship between solar physics, volcanism and climatology

clearly underlines, global cooling has serious implications for life on this planet. Increased levels of GCRs in our atmosphere associated with the upcoming solar minimum have strong potential to accelerate cloud albedo. If history repeats itself, and the increase in GCRs also triggers more large-scale, violent volcanic eruptions, the effect of a cooling planet would be further exacerbated, even without the assistance of airplanes and artificial aerosols.

Global cooling, in its extreme, would prove much more devastating to the seed industry and world food production than global warming, but given a choice, neither is preferable. Either way, the next few years will prove both critical and interesting as our true climatic destiny unfolds, for better or for worse. 🌱

## Climate Change Vocabulary

Aerosol	Eemian Interglacial	Holocene Interglacial	Radioactive
Albedo	Galactic Cosmic Rays	Ionosphere	Radiocarbon Dating
Anthropocene	Glacial Eustasy	Isotopes	Solar Minimum
Anthropogenic	Glaciation / Glacial	Maunder Minimum	Solar Maximum
Atlantic Multidecadal	Global Cooling	Magnetic Field	Solar Radiation
Oscillation (AMO)	Global Warming	North Atlantic Oscillation (NAO)	Solar Wind
Biosphere	Geoengineering	Nitrous Oxide	Stratosphere
Carbon Dioxide	Geomorphology	Ocean Acidification	Sulphur Dioxide
Methane	Glaciation	Plasmasphere	Sun Spots
Climatic Oscillation	Grand Solar Minimum	Pleistocene Epoch	Thermal Expansion
El Niño–Southern	Greenhouse Gases	Proxy Measurements	Troposphere
Oscillation (ENSO)	Highstand (sea level)		Volcanism

Scan QR code to see bibliography of this article online







# Guangdong China Seed Hub 2025

**The Government of Guangzhou City has announced plans to develop Southern China's most populous metropolis into an "International Seed Centre" by 2025.**

The project was announced at the 15th Guangdong Seed Expo by Mr. Liao Chongbin, Vice Director of the Agriculture Department of Guangzhou City.

Addressing the expo's "Kemulang Forum" on 11 December 2016, at the Hotel Nikko Guangzhou, Mr. Liao said that the project would indeed be supported by the city government, but would ultimately be funded and operated by private seed enterprises.

He said the project would generate RMB450 billion (US\$64.9 bn) in revenue in the coming decade from the trade of seeds and complementary inputs.

As the administrative seat of Guangdong Province, Guangzhou City has a population of about 12 million, while the greater metropolis, which includes Shenzhen, Dongguan, Macao and parts of Foshan, Jiangmen, Zhongshan,

Zhuhai, and Huizhou, is home to some 44 million residents.

Mr. Liao explained that the project would be financed through social capital and estimated the need for about RMB30-60 bn (\$4.3-8.6 bn).

## BLOSSOMING BUSINESS

More than 30,000 visitors, including representatives from some 1,000 Chinese and international seed companies, attended the 15th Guangdong Seed Expo from 10-14 December 2016.

Hosted at Tianhong Hotel and at the Guangdong Agricultural Technology Extension Station in Guangzhou's Tianhe District, the leading Chinese seed trade event this year was organised under the theme, "Integration, Innovation, Development and Sharing".

The event featured more than 382 hotel-room exhibitions, 110 regular and 60 premium trade booths, and a field demonstration area spanning more than 200,000 square metres.

The opening ceremony at Kemulang (Guangdong Agriculture Technology Extension Station) on the morning of 12 Dec was attended by 200 guests, including officials from the Agricultural Department of Guangdong Province, and representatives from international and national seed associations and seed companies.

Addressing the assembly, APSA Executive Committee member, Dr. Dehua Ma, who is also Vice President of Longping Hi-tech, encouraged seedsmen and seedswomen to be more integrative, innovative and competitive, stressing the need to "work together to develop the seed industry with a global view".

Also attending the expo on behalf of APSA were Immediate Past President Zhiping Wang, Executive Director Heidi Gallant and China Liaison Officer Li Xiaofeng.

Speaking at the event's Grand Banquet on 12 Dec at Hotel Nikko Guangzhou, Director of Guangdong Agricultural Technology Extension Station, Mr. Lin Iv,





revealed that in addition to more than 6,000 vegetable varieties showcased this year, there were also teas, flowers, Chinese herbal medicine products, as well as more than 30 supporting technologies on display at the expo.

“This year our focus is on the integration of the whole agriculture industry, building on our efforts since last year to integrate [companies dealing in] varieties, agronomics and agricultural machinery. As a result of improved facilities, the demonstrated varieties are greatly enriched”, he said.

Among the popular varieties on display included Syngenta’s seedless watermelon and hybrid sweet corn, ready to eat raw after picking; and thick, fresh bitter gourd from Helinong company, which is preferred for its superior ability for lengthy storage and transport.

The bitter melon from Helinong had a good response, so much so that it was served with soup during the grand banquet.

Several APSA members had displays, including Derit Seeds, a cucumber company which was recently acquired by Longping Hi-tech, and Hunan Xiangyan, which commands a dominant share of the Chinese pepper market.

The expo’s organisers, Guangdong Seed Trade Association and Nanfang Rural Newspaper, estimate that more than 77,000 agriculture varieties from throughout the world have been demonstrated at the expo since its inception in 2002, directly driving the growth of farmers’ annual income by an estimated RMB3 billion (US\$432.6 mn).

Ms. Zhang Kaisui, from the Secretariat of Guangdong Seed Trade Association, noted that the popularity of, and turnout to, the event has steadily grown with each passing year.

“The hotel-room exhibitions were very popular and were fully booked not long after registration opened”, she said.

“The number of visitors is increasing every year and we see a growing interest from international seed companies and foreign visitors attending the event”, she added, noting that this year also coincided with the 20-year anniversary of the founding of Guangdong Seed Trade Association, which was marked with a celebratory gala dinner on 10 Dec at Tianhong Hotel.

While Guangdong Seed Association oversaw the hotel-room exhibitions, Nanfang Rural Newspaper was responsible for the main demonstration area and field exhibitions, as well as organising the Kemulang Forum.

More than 300 delegates attended the Kemulang Forum at the Hotel Nikko Guangzhou, which was held under the theme “Being Together, Becoming Rich”, and was divided into three segments, including marketing, financing and crossover.

The forum featured a presentation by APSA Director Heidi Gallant, who updated a captive audience of seed and agriculture entrepreneurs on the “Status of the Asia and Pacific Seed Industry”. The presentation will be available on [apsaseed.org](http://apsaseed.org).







# 2nd Pakistan Seed Congress

By Dr. Irfan Afzal

**The second Pakistan Seed Congress was held recently in Faisalabad, the country's third most populous city, and proved to be a very successful event, enabling a wide spectrum of seed industry stakeholders to strengthen competitiveness, sustainability and private-public collaboration.**

The Congress was organised on 21-22 November 2016 at the University of Agriculture, Faisalabad (UAF), under the auspices of the Pakistan Seed Promotion Alliance (PSPA) as a joint initiative by UAF, the Federal Seed Certification & Registration Department, the Seed Association of Pakistan (SAP), and Crop Life Pakistan. The United States Pakistan Center for Advanced Studies in Agriculture and Food Security (USPCAS-AFS) supported the event and facilitated the participation of technical experts from abroad.

Building on the momentum and enthusiasm of the first Congress held in December 2015 at the same venue, there were some 300 participants in this latest event, which included a seed expo, plenary meetings, technical sessions and workshops. Delegates and technical experts came from several countries, including China, Europe, Pakistan, Singapore, Thailand, Turkey and the USA.

Presiding over the inauguration ceremony was Mr. Rana Sana

Ullah, the Provincial Law Minister, together with Prof. Dr. Iqbal Ahmed Khan, Vice Chancellor of UAF, who welcomed representatives from key international development partners, as well as representatives from local farmer organisations and many seed companies. Other key participating stakeholders deserving mention include Prof. Dr. Asif Ali, Vice Chancellor of MUNSA; Dr. Shakeel Ahmed Khan, President of the Pakistan Seed Promotion Alliance; Mr. Ch. Asif Ali, Chairman of the Seed Association of Pakistan; Mr. Muhammad Asim of Crop Life Pakistan; and Prof. Dr. Hafeez Ahmed Sadaqat, UAF.

The Seed Expo featured 40 exhibitors from national and multinational seed companies, and other allied businesses that provide services to the seed industry, who took this opportunity to showcase their products, technologies and innovations to practising agriculturalists.

The technical sessions were led by local and international keynote speakers under the theme of "Seed Security for Sustainable Agriculture". They covered a wide range of topics including seed legislation, policy, regulation, quality seed production, seed analysis and storage, biotechnology, seed treatments, trade and marketing trends, and forecasting the future of Pakistan's expanding seed industry.

International experts included Dr. Kent Bradford, a distinguished professor and director of the Seed Biotechnology Center, UC Davis, USA; Mr. Johan Van Asbrouck, President, International Seed Academy Thailand; Mr. Timothy Blank of the California Crop Improvement Association; Dr. Suleyman Karahan, General Directorate of Agricultural Research Ankara, Turkey; Dr. Chen Mao from Monsanto Singapore; and Ms. Zhu Xiaobo, Managing Director of the Wuhan Qingfa-Hesheng seed company in China.

Valuable inputs for strengthening Pakistan's seed sector were provided by Mr. Francisco Gamarro, Deputy FAO Representative, and Dr. Stephen P. Davies, IFPRI, as well as Dr. Jim Hill, Emeritus Professor of Plant Sciences, UC Davis, all offering sound advice for the benefit of academia and seed industry practitioners alike.

At the farmers' session, Dr. Muhammad Anjum Ali, DG Agricultural Extension, Mr. Faisal Shah and Mr. Muhammad Saleem Raza shared their experiences and provided insights into the farming community and their expectations from the seed industry. On the policy side, Dr. Ghazanfer Ali Khan, Additional Secretary Planning, Agriculture Department, explained the context of the new Punjab Seed Act, which is currently in preparation.



## Achievement Appreciation

At the Seed Expo, 40 exhibitors were judged in two categories. In the international seed companies' category, Monsanto Pakistan took first, while the second and third positions were awarded to Wuhan Qingfa China and Bayer Pakistan, respectively. In the national seed companies category, Jullandur Seed Corporation, Sher Ali and Sons, and Chaudhry Khair Din & Sons were awarded first, second and third positions, respectively.

A new tradition was established with the presentation of the "Lifetime Achievement Awards" to recipients for their efforts in providing leadership and contributing significantly to the betterment of the Pakistan seed sector. The inaugural recipients who were honored with this award were Prof. Dr. Iqar A Khan and Dr. Shakeel Ahmed Khan.

Prof. Iqar A Khan was recognised for his stewardship in strengthening public-private partnerships, introducing a new degree programme in seed science and establishing the Seed Centre at UAF. This centre will conduct research on topics of concern to the Pakistan Seed Industry. Dr. Shakeel Ahmed Khan was honored for his untiring contribution in the approval of the Seed (Amendment) Act that was passed in 2015 and the Plant Breeder's Rights Act that was approved by the national assembly in December 2016.



## Capacity Building in Seed Technology

To conclude the event, a training workshop was held on "Dry Chain Technology for Reducing Post Harvest Losses of Seeds and Grains", which attracted about 60 participants. The workshop was organised by Dr. Irfan Afzal of UAF, with financial support from USPCAS, and was based on a project to improve livelihoods in the maize farming sector, which provided technical training to farmers, national seed company personnel and policy makers through dry chain experiments in different provinces of Pakistan.

The workshop focused on agricultural drying and seed storage systems for humid climates, and particularly the "dry chain" technique, which involves various drying methods implemented soon after harvest, quickly followed by hermetic (airtight) packaging to maintain dryness in the value chain until the seed is used.

Dr. Kent Bradford and Mr. Johan Van Asbrouck shared their experiences on recent developments in the technologies for handling and storing seeds while Dr. Afzal discussed his project findings with the participants.

*The Second Pakistan Congress would not have been possible without sponsorship from USAID, FAO, Yuksal Seeds, Wuhan Qingfa China, Monsanto Pakistan, CKD, Bayer Pakistan and Tarnab Seeds.*



## Cash Crop Production: Pakistan



SOURCE: PAKISTAN BUREAU OF STATISTICS



## Vegetable Breeding Consortium to Trial 'Climate-Resilient' Varieties

**Attention all savvy vegetable breeders: newly-developed, multi-disease- and pest-resistant tomato, cucurbit and pepper varieties are ready for advanced, pre-market trials.**

In response to the growing demand for high quality breeding lines, APSA has partnered with the World Vegetable Centre (WorldVeg) to form a consortium that is offering a unique opportunity to take part in preliminary yield trials (PYT).

The PYT represents an advanced testing stage from which WorldVeg selects entries for its 'online seed catalog', giving participating members access to the breeding lines no less than six months before the general public.

As part of the PYT stage, consortium members will be invited to a workshop this May in Tainan, led by the lead chief breeders (see panel) and attended by other WorldVeg scientists and researchers.

Membership to the consortium, which is only offered to APSA members, costs a nominal fee and includes an array of exclusive benefits (see panel).

Signed in Bangkok on 7 December 2016 by APSA Executive Director Heidi Gallant and WorldVeg Director General Marco Wopereis, the "APSA and World Vegetable Centre Consortium" agreement is available on APSA's website.

The agreement signing dinner was attended by esteemed representatives of leading seed and plant breeding enterprises and agriculture research, including Chia Tai, Lion Seeds, Dynamic Seeds, East-West Seed and Kasetsart University.

"The signing of this consortium represents not only a significant opportunity for participating members, who will gain access to cutting-edge breeding resources developed by WorldVeg, but also stands to serve as a pro-active and effective response to regional and global food security challenges", said Mrs. Gallant.

"Every country in the world has been, and will continue to be impacted by climate change, while the demand for new, quality and versatile vegetable varieties continues to grow. With its global network of research centres and breeding scientists, WorldVeg's objectives and vision are very much in line with our own, and together we can make a lasting impact moving forward", she added.

Completing the feedback loop, breeders will participate in surveys and meetings before, during and after the trials, sharing, reviewing and analysing results, which WorldVeg will then log so as to apply towards further research and development.

Commenting on what he termed the "impact pathway" of the consortium, Mr. Wopereis said "We are often asked what our research is doing for the farmers ... The seed companies are closest to the farmers, so they know what is needed in the field. Their insights will help us establish our breeding priorities, so it's a win-win, and with such a programme there is reciprocal information flow. We provide information to the seed companies and farmers, and they provide feedback to us".

Mr. Wopereis noted that for 2017, WorldVeg will provide new breeding lines specifically for tomato, sweet pepper, chilli pepper and cucurbits (gourds, squash, pumpkins and cucumbers) through its headquarters in Shanhua, outside of Tainan, as well as its research stations in Thailand.

"These lines are being developed specifically for multiple-disease resistance, especially to viruses and fungi. Important traits in the pipeline for future lines include multiple disease resistance, improved heat tolerance and insect resistance – traits important to address the problems brought on by climate change".

"We are proud to partner with APSA, the largest regional seed association in the world, essentially linking us with a wide range of seed companies across the region. I'd like to especially thank Mrs. Gallant for her dedication in ensuring this agreement could happen, and I look forward to great progress ahead", he said.

Full details on the consortium agreement can be found in the "Member's Programs" section of our website.

Headquartered in Tainan, WorldVeg is among a handful of organisations leading a €6.9 million initiative to catalog genetic 'blue prints' of the world's potatoes, tomatoes, peppers and eggplants. Dubbed G2P-SOL, the European Commission funded project will run from 2016-2021 in various countries around the world. The World Vegetable Centre is a non-profit, international agricultural research and development centre whose mission is to alleviate poverty and malnutrition in the developing world through increased production and consumption of nutritious, health-promoting vegetables. WorldVeg carries out its mission by forming research partnerships with governments, and non-governmental and private sector organisations, both in developing and developed countries, to conserve and utilise vegetable biodiversity, improve vegetable varieties, and increase production, marketing and consumption. 🌱





## Consortium Benefits

1. Early access to WorldVeg preliminary yield trials of disease-resistant, climate-resilient pepper, tomato and cucurbit breeding lines.
2. Early access to screening protocols or other kinds of select,\* scientific information developed at WorldVeg.
3. Participation in an annual workshop at a WorldVeg facility to review and discuss field trial breeding results by other consortium members.
4. Direct consultation and group/individual discussions with WorldVeg scientists and breeders before, during and after workshops.\*
5. Lodging, meals and local transport\* during workshops is included in consortium fee.
6. Inclusion on mailing list for exclusive newsletter\* covering relevant literature in the field of germplasm screening, breeding methodology and WorldVeg breeding lines.
7. Ten free seed requests from WorldVeg per year.\*
8. Exclusive access to WorldVeg's annual report.
9. Preferential access and a 20% discount on tuition for WorldVeg-offered training opportunities for all employees.
10. Opportunities to make special breeding requests to WorldVeg.



\*Subject to conditions, please see full details at <http://apsaseed.org/members-programs/>



## Breeding Lines Workshop in May

**Peter Hanson, Tomato Breeder**

> Tomato Breeding will feature two types of lines: high lycopene, dual purpose, fresh market/processing and fresh market lines with boosted bacterial wilt resistance (Bwr-6).

**Sanjeet Kumar, Pepper Breeder**

> We plan to demonstrate a new set of about 5-10 new hot and five new sweet pepper improved lines, which are resistant to multiple diseases. The names and salient features of several selected lines are attached.

**Narinder Dhillon, Cucurbit Breeder**

> 2-4 lines of Japanese type cucumber will be demonstrated.

List of hot pepper lines for APSA workshop (ICPN23) + Hybrids Checks

Line	Other designation	Parentage	Remarks/Resistance*	Fruit length (cm)	Fruit width (cm)	Fruit wt. (g)	Total Capsaicin (mg)**
AVPP1346	ICPN23-05,PP1237-7712	Tiwari sel.	CMV(MS), CVMV(R), PVY(R)	6.5	0.9	2.4	184.6
AVPP1357	ICPN23-08,PP1237-7821-1	Tiwari/CATIE11056-1-2-3-5-6	CVMV(R), PVY(R), BW(MS), Anthr(FR)	5.7	1.2	3.3	126.6
AVPP1339	ICPN23-13,PP1307-7546-2	Jin's Joy//Kulai*3/PBC932//Kulim/HDA248/4/Bangchang-selex//HDA210/Szechwan10/MC4	CMV(MR), CVMV(R), PVY(R), BW(MS)	12.1	1.2	7.1	12.6

\*CVMV=chili veinal mottle virus, PVY=potato virus Y, BW=bacterial wilt, CMV=cucumber mosaic virus, Anthr= Anthracnose (FR= field tolerant, R=resistant, MR=moderately resistant, MS=moderately susceptible)

\*\*contents in 100g fresh weight edible portion.

Sweet pepper lines for APSA workshop (ISPNI2) + Hybrid Checks

Line	Other designation	Parentage	Remarks/Resistance*	Fruit type	Fruit length (cm)	Fruit width (cm)	Fruit wt. (g)
AVPP1371	ISPNI2-05,1307-7248	White King seln/Milord // Piknik/F1 PR 300-7 sel.	CVMV(R), PC(MR)	Bell	9.5	7.9	155
AVPP1376	ISPNI2-06,1307-7257	F1 White King seln/Milord // Ja Yi Orange#1 sel.		Bell	6.7	8.1	138

\*PC1= Phytophthora race 1, CVMV=chili veinal mottle virus (R=resistant, MR=moderately resistant)





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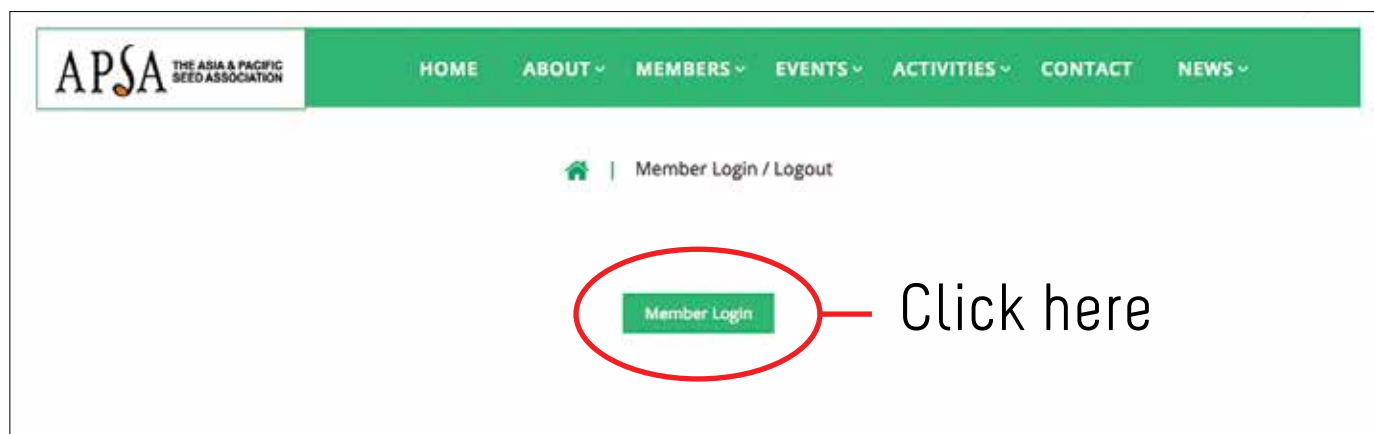
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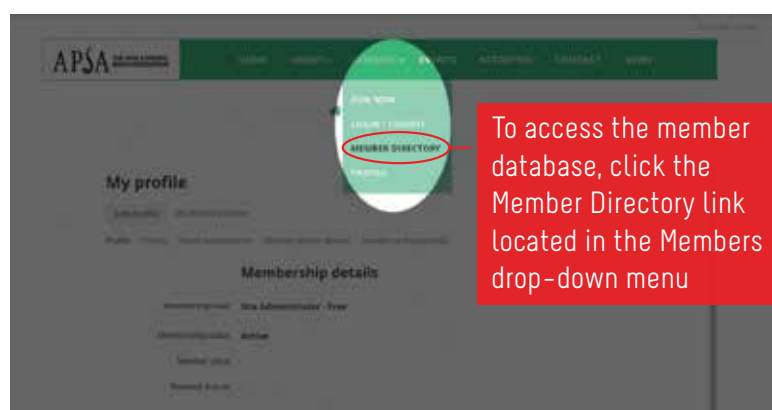


## New Membership Directory Live!

We are pleased to announce that APSA's new, fully-integrated, online membership directory, events and payment platform is ready for members to access. Within January, members' key representatives should have received an email about accessing the new directory. Below are the key points.

Once successfully logged in, you will see your Profile, which displays your organisation's category, status, name, description, contact information, type of business and products.

To change, add or edit these details, click 'Edit Profile'. We encourage members to fully complete their profile to accurately reflect their organisation. If you haven't already, log in now to check, verify and update all of



your information as soon as possible, including your contact details (for your main voting representative in addition to your second representative) and type of business, service, and products.

*Should you have any questions, comments or feedback about the system, please do not hesitate to contact APSA Secretariat.* 🌱

## Best Practice Guidelines for Seed Enterprises

APSA's Vegetables and Ornamentals Special Interest Group, in collaboration with ISF's Vegetable Seed Production Working Group, have published a "Vegetable Seed Production Good Practice Guide". Designed to assist stakeholders and seed companies who are engaged in vegetable seed production and sales, the document comprehensively underlines how to maintain the integrity of the production chain from stock seeds to commercial seeds. Guidelines include advisable good practices for two main perspectives – seed company and seed producer – covering everything from contract negotiations to handling, packaging, distribution and marketing, and includes a matrix comparing various IP protection measures. Members can download the guidelines from the Vegetables and Ornamentals SIG page on APSA's website.



Scan QR code to download report

# Solidarity for a Stronger Seed Sector

By **Anke van den Hurk**, Senior Adviser at Plantum NL and an APSA EC Member from 2010-2016



**Why are you keen to work in agriculture? This was often the first question people asked me in job interviews.**

I was born in Amsterdam, the Netherlands. My father's vegetable garden was the first trigger for my interest in agriculture. The second was the genetics lessons in biology classes during secondary school. I combined these two inspirations to go on to study plant breeding at the University of Wageningen.

During my studies, it soon became clear that I had an interest in interfacing with elements of plant breeding, people and foreign culture. I pursued this interest through agricultural development project opportunities abroad. With CIMMYT, I took a six-month trip to Mexico where I worked with Dr. S. Rajaram on a wheat breeding project, which was the first of many valuable learning experiences abroad that followed.

In Turkey and Syria I furthered my wheat breeding field study at CIMMYT Turkey and the headquarters of ICARDA, where I gained valuable insight into the importance of understanding the farming fields for which we are breeding. For example, wheat of about half-a-metre high

from the fertile soils of ICARDA only turned out to grow 15-20 centimetres in the farmers' fields, while parent-lines of about a metre high, almost valueless at the station, turned out to be an appropriate and healthy crop in the farmers' fields. In other words, what constitutes a healthy crop in a farmer's field is unique to that particular field.

Studying on plant breeding does not make one a practical breeder – this became clear in my first job at Nunhems Zaden, the Netherlands, where I really learned the daily practices of breeding, selection and seed production for several types of vegetable crops.

When the opportunity arose to become an agriculture teacher in Ethiopia, I strapped on a backpack and jumped on a plane to Mekele for a new adventure at a new university, starting from scratch with limited resources. Aside from teaching, I was actively involved in a survey on a Global 2000 project developed by Dr. Norman Borlaug (Nobel Laureate), Ryoichi Sasakawa (Nippon Foundation) and the former US President Jimmy Carter.

I learned a lot about Ethiopian culture and really enjoyed my interactions

with farmers, as well as getting to understand their experiences with the programme and their needs to improve yield and quality.

My interest in 'ownership' of genetic resources and plant varieties was raised during my work for Bioversity, an international organisation dealing with the conservation and sustainable use of biodiversity. In Rome I looked into training modules on the optimisation of conservation, while in Colombia I focused more on practical examples of optimal conservation systems for cassava.

In 2001, my path brought me to Plantum, the Dutch Seed Association, where I was able to really bring together all the elements that give me energy: plant breeding, a beautiful and very innovative sector, an international sector with a wide range of people, and the possibility to further specialise myself in biodiversity legislation. Initially focusing on the Netherlands, I would later go on to represent the Dutch breeding sector at various international forums.

Being an APSA EC member for the last six years was an interesting experience. Highlights include the well-attended annual meetings, the finalisation of the new constitution, and the improvement of technical and legal matters of the association, the latter of which I contributed to a great deal.

Though my tenure as an EC Member is through now, I will continue to work closely with APSA through Plantum, offering support to further professionalise the seed sector within the region.

In my opinion, our goals can only be reached if a reasonable set of rules and regulations are developed, allowing sufficient freedom for all types of seed companies to operate – be they national or international, small or big – while respecting and valuing the work done by others. Solidarity in the sector is therefore important. 🌱

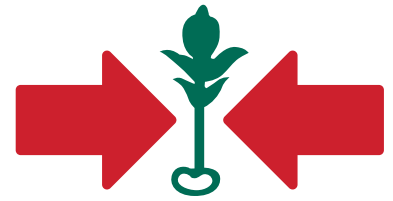




# 24th Asian Seed Congress

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