



BES-Net Caribbean Regional Trialogue on Pollinators, Food Security & Climate Resilience

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Santo Domingo, Dominican Republic



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Organization of the
United Nations



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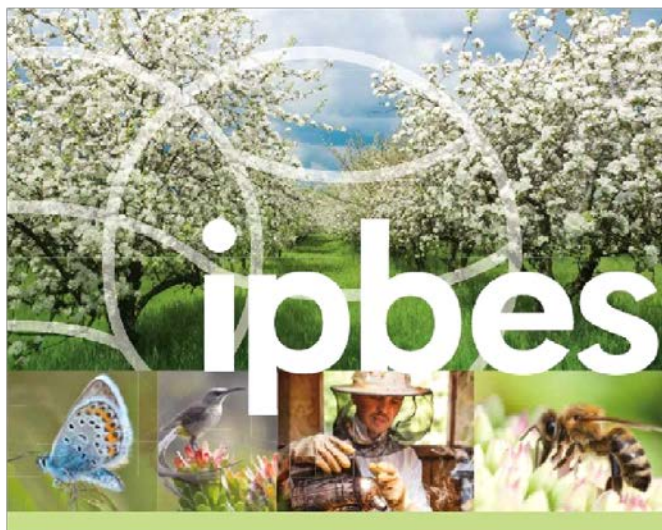
Pollination Assessment Report & Process

- **2 year process (2014-2016)**
- First output of IPBES
- 2 Co-chairs (Drs Simon Potts & Vera Imperatriz-Fonseca)
- 19 Coordinating Lead Authors
- 41 Lead Authors
- 14 Review Editors
- 35 Contributing Authors
- **TOTAL: 76 experts**



Output

- Scientific literature review and Indigenous and local knowledge
- 550 pages



The assessment report on
**POLLINATORS,
POLLINATION AND
FOOD PRODUCTION**

SUMMARY FOR POLICYMAKERS



The assessment report on
**POLLINATORS,
POLLINATION AND
FOOD PRODUCTION**



Multiple Value of Pollinators

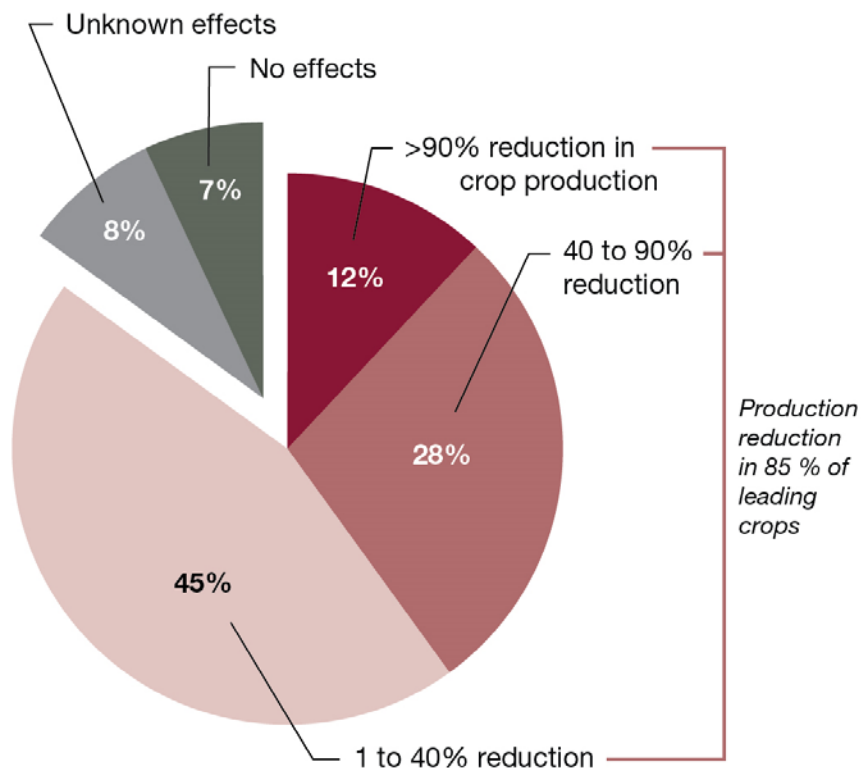
- Pollination of world's **wild flowering plant species** – avg. almost 90% depend on pollinators (94% in tropical communities)
- **Global food crops** (production, yield and quality) (3/4 of the world's leading food types and 30% by volume) + regional crop economies rely (to varying degrees) on animal pollinators = **<\$577 bn (USD/yr)!**
- **Healthy human diets and nutrition** depend on pollinator dependent crops
- **Livelihoods** – beekeeping and honey hunting & pollination services and food production
- **medicines, biofuels** (e.g. canola and palm oil), **fibres** (e.g., cotton and linen) **construction materials (timbers), musical instruments, arts and crafts, recreational activities** and as sources of inspiration for art, music, literature, religion, traditions, technology and education
- globally significant heritage, as **symbols of identity**, as aesthetically significant landscapes and animals, in social relations, for education and recreation and in governance interactions.

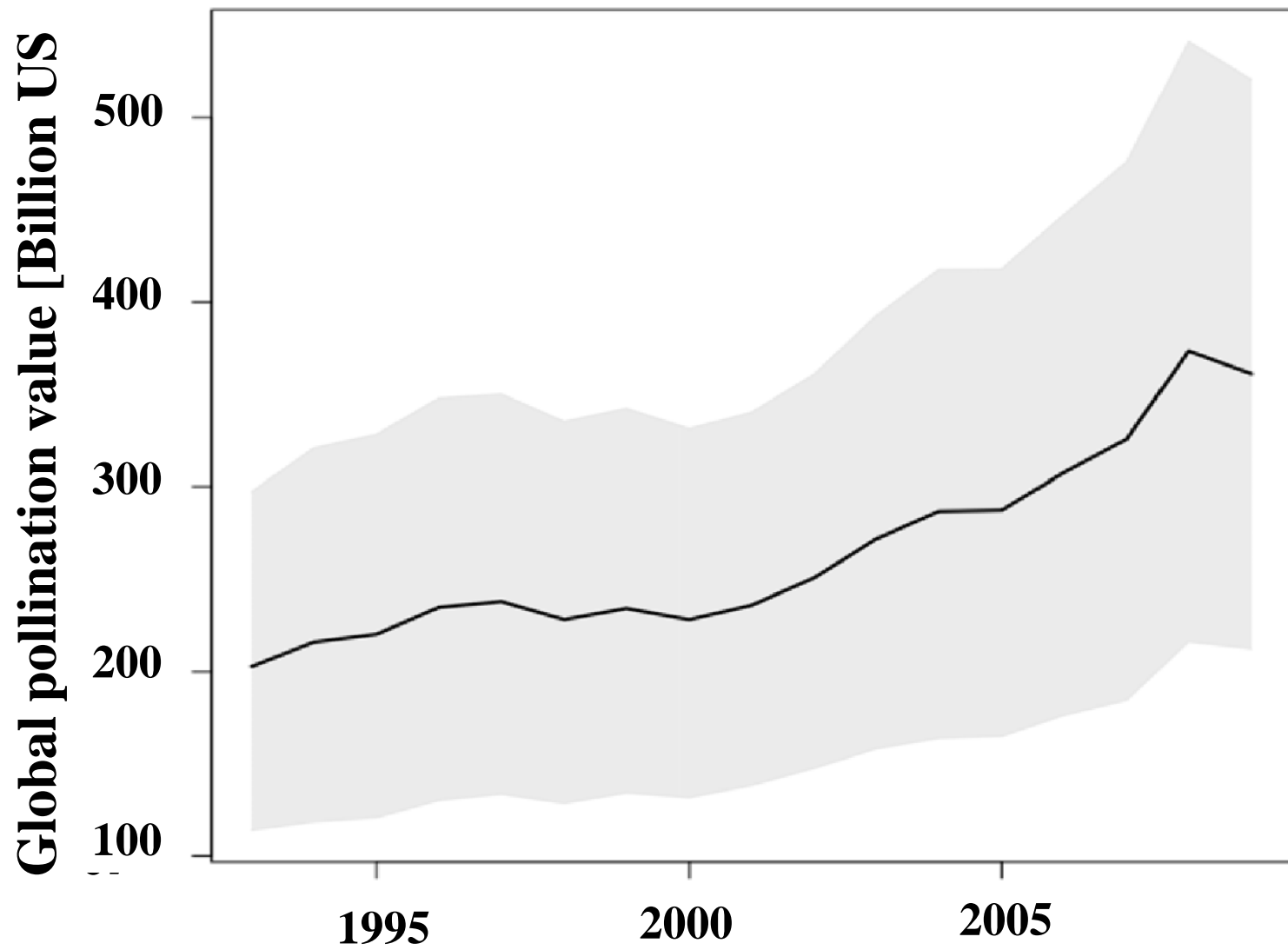


Man of Bicorp
Valencia,
Spain, 6000 BC

The importance of pollinators

Percentage of production loss due to pollinator loss in leading global crops





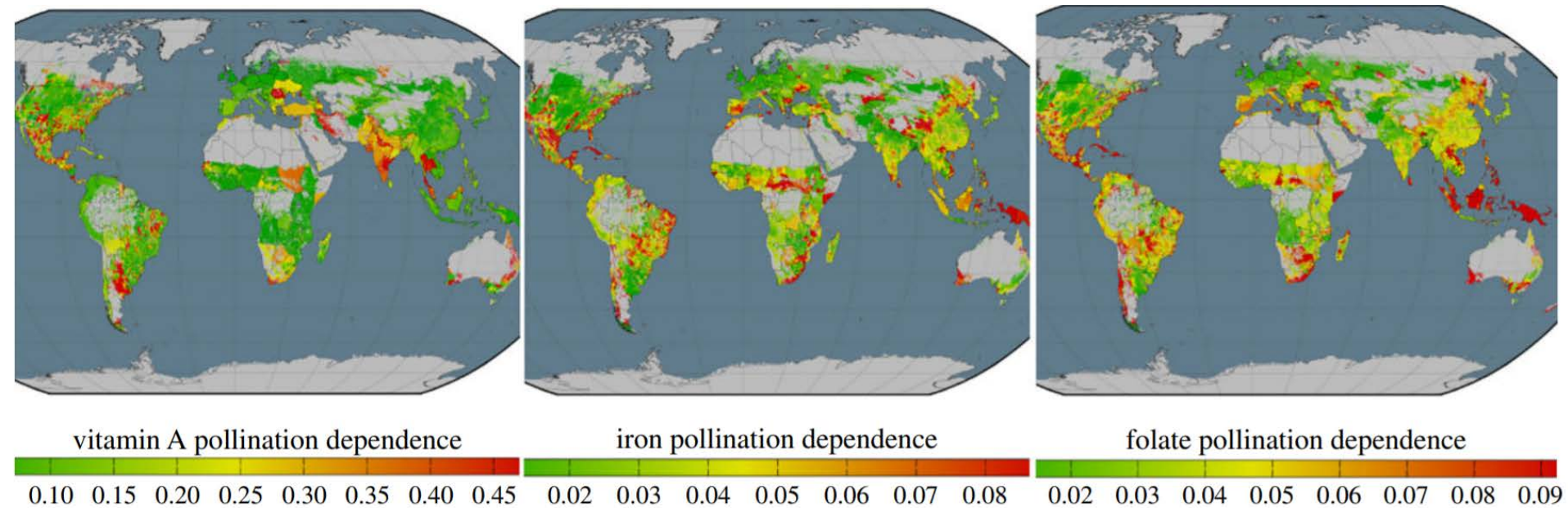
Pollinator-Mediated Crops & Nutrients in the Human Food Supply

- Staple crop production (e.g. cassava, corn, potato, rice, wheat, yam) = wind-pollinated, self-pollinated, or vegetatively propagated crops, they provide the **majority of calories** in the human diet = **poor sources of micronutrients**.
- Crop plants that depend fully or partially on animal pollinators contain >90% of **vitamin C**, the whole quantity of **Lycopene** and almost the full quantity of the antioxidants b-cryptoxanthin and b-tocopherol, the **majority of the lipid, vitamin A (>70%)** and related **carotenoids** (98%), **calcium and fluoride**, and a large portion of **folic acid** (55%)
- **58% of calcium** and **62% of fluoride** are derived from plants with marginally yield increase due to animal pollination, such as beans, but also strongly pollinator dependent plants such as fruits and nuts (including almonds) – these minerals are crucial for development of teeth and bones and prevention of osteoporotic fracture risk
- 29% of iron is derived from pollinator-dependent crops, with 6% yield increase due to animal pollination – plant sources of iron crucial to human health

Animal-pollinated crops contain the majority of the available dietary lipid, vitamin A, C and E, and a large portion of the minerals calcium, fluoride, and iron worldwide

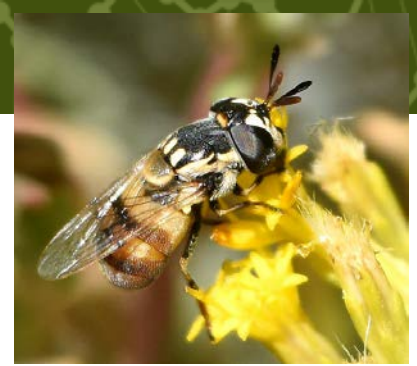
Ongoing pollinator decline may thus exacerbate current difficulties of providing a nutritionally adequate diet for the global human population.

Fractional dependency of micronutrient production on pollination



The diversity of pollinators

- flies, butterflies, moths, wasps, beetles, thrips, birds, bats and other vertebrates.
- **BEES!** 20,100 species of bees; most are wild



Global Trends

- **Wild pollinators have declined in occurrence and diversity** (and abundance for certain species) at local and regional scales in North West Europe and North America.
- Wild insects are extremely important pollinators and can pollinate many crops more effectively than managed bees (Garibaldi et al. 2013)
- Although a **lack of wild pollinator data** (species identity, distribution and abundance) for Latin America, Africa, Asia and Oceania preclude any general statement on their regional status, local declines have been recorded.
- The IUCN Red List assessments indicate that 16.5 per cent of **vertebrate pollinators are threatened with global extinction** (increasing to 30 per cent for island species). ****There are no global Red List assessments specifically for insect pollinators.**
- Regional and national assessments indicate high levels of threat for some bees and butterflies.

Trends in managed pollinators

- Global: The number of managed western honey bee hives has **increased** over the last five decades, even though declines have been recorded in some European countries and North America
- Regional: Latin America plays a major role in the global honey supply (Seven Latin American countries are within the 20 leading countries of the world honey market)
- **Latin American trends in honey production and beehive numbers are drifting from the global pattern**, and several high colony loss rates were registered in this region.
- **These results reveal the presence of beekeeping difficulties in Latin America** (variability in methods of colony loss survey across initiatives prevent proper conclusion on loss rates)
- Beekeeping productivity and livestock in Latin American countries are growing slower than the global trend, suggesting potential professional difficulties for beekeepers in such developing economies.
- Information about trends in beekeeping activities and honey production are lacking.



HONEYBEE TRENDS

(1960s-2010)

Globally managed hives increased ~ 50%

The volume of production of pollinator dependent crops increased by 300%

**Global agricultural is now twice as
pollinator-dependent**





DRIVERS OF POLLINATOR AND POLLINATION CHANGE

- The abundance, diversity and health of pollinators and the provision of pollination are threatened by direct drivers that generate risks to societies and ecosystems.

Threats include:

- land-use change
- intensive agricultural management and pesticide use
- environmental pollution
- invasive alien species
- Pathogens
- Climate change





PESTICIDES

-  Reduced impacts in non-agricultural settings
-  Sulfoximine pesticides
-  Nanoparticle pesticides
-  Increasing fungicide use



HABITAT LOSS AND HOMOGENISATION

-   Corporate control of global agriculture
-  Destruction of bat roosts

PARASITES AND PATHOGENS

-  New RNA viruses
-  Reduced pollinator richness drives epidemics
-   Pollinators as disease vectors






CLIMATE CHANGE

-  Extreme weather events
-  Altered pathogen epidemiology

INVASIVE SPECIES

-  Invasive bees in Asia

NOVEL INDIRECT DRIVERS

-   Increased diversity of managed pollinators
-   Cutting pollinators out of food production
-  Impacts of IPBES pollinators assessment



LAND-USE CHANGE

- Habitat destruction
- fragmentation and degradation
- conventional intensive land management practices:
 - high use of agrochemicals
 - intensively performed tillage, grazing or mowing
- By 2030, the area of agricultural land is expected to increase a further 10%, mainly in the developing world (Haines-Young 2009)



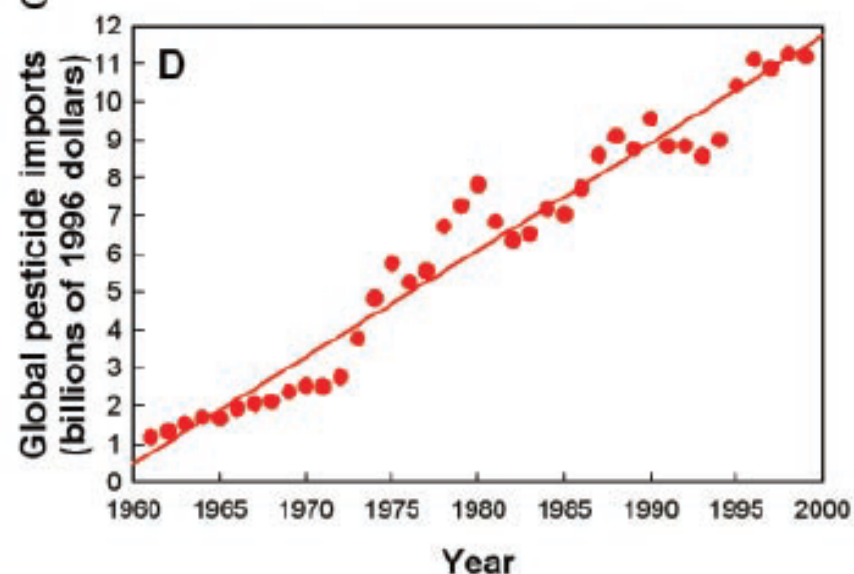
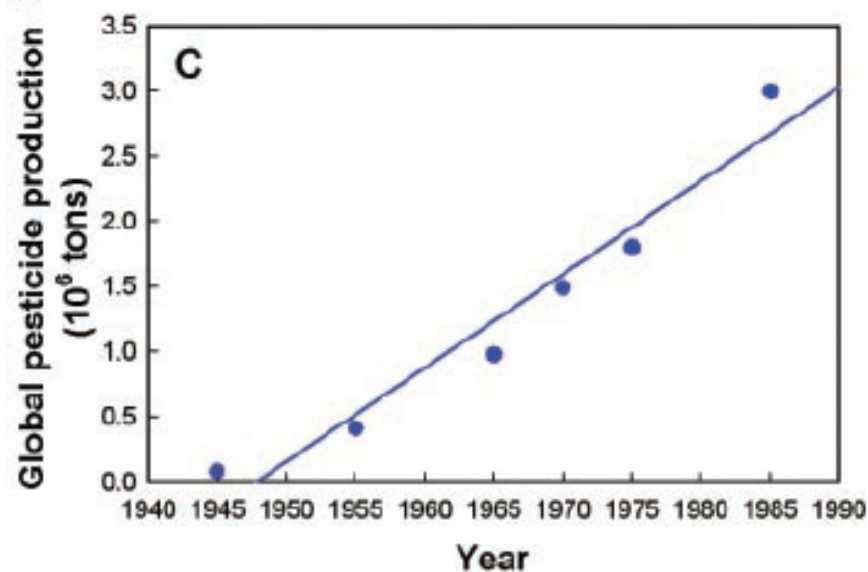
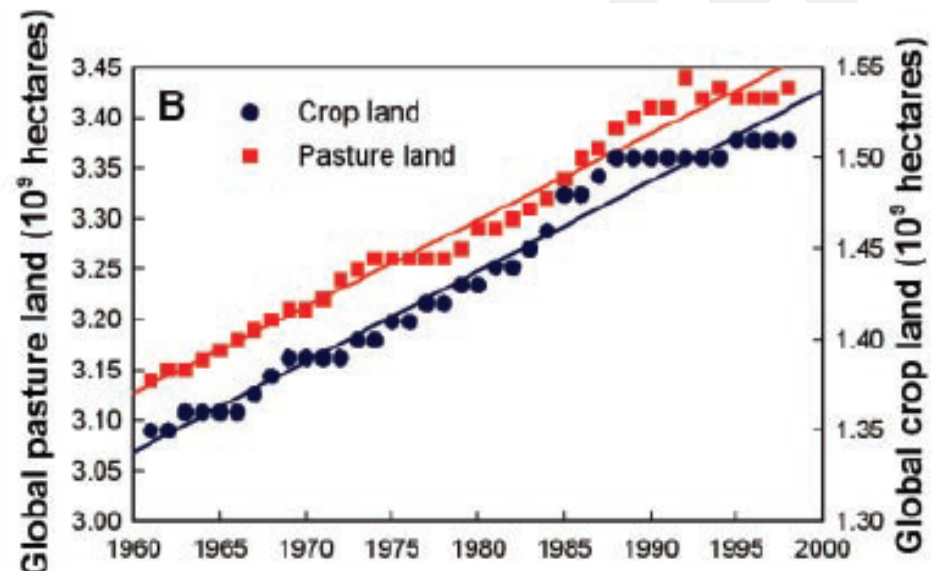
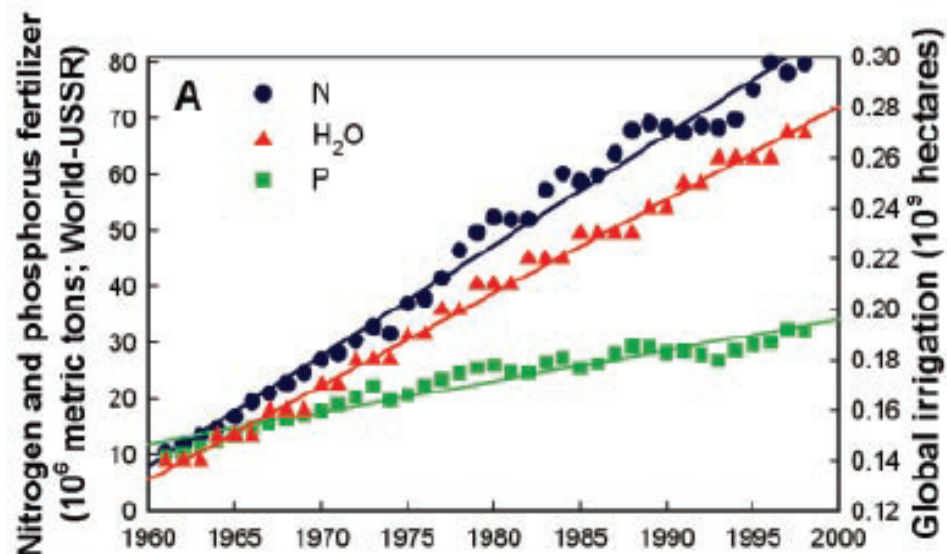
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FERTILISER, PESTICIDE USE

- Risk to pollinator depends on the combination of toxicity and the level of exposure, which varies geographically with the compounds used and the scale of land management and habitat in the landscape.
- Pesticides (sp. Insecticides) have a broad range of lethal and sublethal effects on pollinators under **controlled experimental conditions**.
- It is currently unresolved how sublethal effects of pesticide exposure recorded for individual insects affect colonies and populations of managed bees and wild pollinators, especially over the longer term.
- There is evidence from a recent study that shows impacts of neonicotinoids on **wild pollinator survival and reproduction at actual field exposure**. Evidence, from this and other studies, of effects on managed honey bee colonies is conflicting





Genetically Modified Organisms (GMOs)

- Are herbicide tolerance (HT) or insect resistance (IR) (traits); reduced weed populations accompany HT crops which decrease food resources for pollinators. Insect resistant (IR) crops can result in the reduction of insecticide use - the reduction in insecticide use **could** reduce pressure on non-target insects.
- Risk assessments required for the approval of genetically modified organism (GMO) crops in most countries do not adequately address the direct sublethal effects due to **lack of data**

Invasives

- can disrupt native pollinator communities by outcompeting indigenous insects for resources or by spreading pests and disease - **there is little available evidence that alien plants are detrimental to pollinator diversity**

Diseases and pests

- Bees suffer from a broad range of parasites, including *Varroa* mites in western and eastern honey bees.
- Emerging and re-emerging diseases are a significant threat to the health of bees, especially when they are managed commercially.

Climate change

- Climate change is anticipated to bring about changes in rainfall distribution, wind patterns, temperature, air pollution and occurrence of extreme weather events, among other environmental changes
- The effects of climate change on plant-pollinator interactions are still mostly **unknown** and the **indirect effects** upon interacting species and networks of species are poorly represented in the literature
- Plant and pollinator ranges are **shifting/moved their ranges**, altered their abundances and shifted their seasonal activities in response to observed climate change over recent decades – **A recent analysis: bumble bees appear to be undergoing range contractions as climate changes across Europe and North America**
- Differential migration rates of co-occurring plants and insects as a result of changing climatic conditions (Schweiger et al. 2008) may lead to a spatial dislocation of processes like pollination.
- climate change may alter the synchrony between plant flowering and pollinator flight periods = **PHENOLOGICAL MISMATCHES** = probably contribute to pollinator losses that subsequently disrupt pollination of plants



Climate Change scenarios

- Under all climate change scenarios for the second half of the 21st century
 - (i) **pollinator community composition is expected to change** as a result of **decreases in the abundance** of some species and increases in others
 - (ii) the **seasonal activity of many species is predicted to change** differentially, potentially disrupting life cycles and species interactions between plants and pollinators

Impacts of ongoing climate change on pollinators and pollination services to agriculture may not be fully apparent for **several decades, owing to a delayed response in ecological systems.**

Adaptive responses to climate change include **increasing crop diversity and regional farm diversity and targeted habitat conservation, management or restoration.**

The effectiveness of adaptation efforts at securing pollination under climate change is untested



Convention on Biological Diversity (CBD)

- The Thirteenth meeting of the Conference of the Parties (COP 13) (Cancun, Mexico, December 2016) adopted decision XIII/15 on the **Implications of the IPBES assessment on pollinators, pollination and food production** for the work of the Convention, in which the Conference of the Parties welcomed the IPBES summary for policymakers of the thematic assessment on pollinators, pollination and food production and endorsed its key messages.



Convention on Biological Diversity (CBD)

- PROMOTING POLLINATOR-FRIENDLY HABITATS
- IMPROVING THE MANAGEMENT OF POLLINATORS, AND REDUCING RISK FROM PESTS, PATHOGENS AND INVASIVE SPECIES
- REDUCING RISK FROM PESTICIDES, INCLUDING INSECTICIDES, HERBICIDES FUNGICIDES
- ENABLING POLICIES AND ACTIVITIES
- RESEARCH, MONITORING AND ASSESSMENT



UN **BIODIVERSITY**
CONFERENCE
COP13-COPMOP8-COPMOP2
CANCUN, MEXICO 2016
MAINSTREAMING BIODIVERSITY FOR WELL-BEING
UNEP   

Declaration - Coalition of the Willing on Pollinators

The Netherlands announced at the high level segment of COP-13, the launch of a new initiative, called the **Coalition of the Willing on Pollinators**.

Signatories include:

France, Germany,
the United Kingdom,
Belgium, Austria,
Denmark,
Luxembourg, Finland,
Spain, the Netherlands,
Uruguay, Peru and
Slovenia (n=13)

***Ethiopia** signed the Declaration on the Coalition of the Willing on Pollinators (2017)



At IPBES-6 (Medellin, Colombia)
FIVE new signatories: Colombia,
Mexico, the Dominican Republic,
Bosnia-Herzegovina and the
Republic of Ireland joined the
Coalition of the Willing on
Pollinators

Sweden (July 2018)

n=20



Many National Initiatives

Established or **in development**

England

Scotland

Wales

All Ireland

France

Switzerland

Netherlands

Norway

USA

Canada

Brazil

Argentina

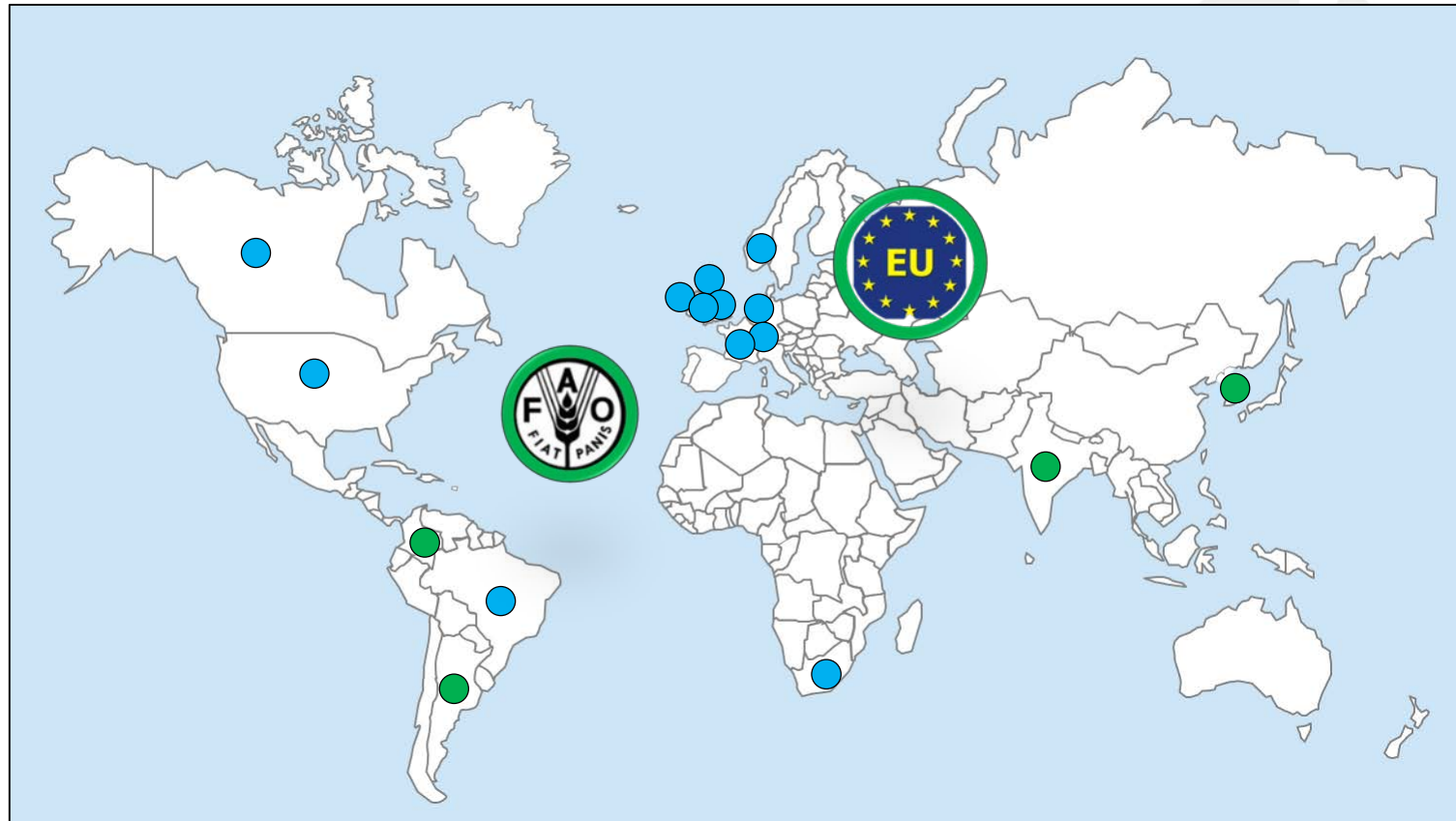
Colombia

South Africa

India

Republic of Korea

EU and global and others



Awareness and communication opportunities:

World Bee Day

<https://www.worldbeeday.org/en/bee-with-us.html>



Capacity Building & mainstreaming:

BES-Net Trialogue (Sarajevo, Bosnia and Herzegovina)

18-20 October 2017

52 stakeholders from Albania, BiH, Georgia, Moldova & Montenegro



More Initiatives

- National pollinator strategies (to be developed)
- EU Pollinators Initiative
- The International Pollinator Initiative – Plan of action 2018-2030 – based on IPBES

Recommendation adopted by SBSTTA for upcoming COP-14 - Adopts the Plan of Action 2018-2030 for the International Initiative for the Conservation and Sustainable Use of Pollinators as contained in annex I to the present decision, for implementation according to national circumstance

Conclusions

- Pollinator loss is an urgent problem
- Food Security: High policy relevance (impact on food production)
- Nutritional security: pollinators improve yields for crops that contribute nutrients to the food supply
- Global relevance (as well as regional)
- Economic, Ecological, social and cultural importance
- Impact is still limited by the lack of global policy uptake and implementation effort
- Globally we share many of the broad challenges and these will need **locally and regionally** developed solutions to enhance pollinators and pollination services
- Regional and national initiatives have a critical role to play in sharing knowledge, building capacity and supporting the development of better policies and practices





The Caribbean context

- Crop Production (by area harvested) in 2016

Antigua & Barbuda	Cuba	Dominican Republic	Trinidad & Tobago
Fruit, tropical fresh nes	Sugar cane	Coconuts	Fruit, fresh nes
Seed cotton	Maize	Coffee, green	Cocoa, beans
Mangoes, mangosteens, guavas	Rice, paddy	Sugar cane	Coconuts
Lemons and limes	Beans, dry	Rice, paddy	Rice, paddy
Melons, other (inc.cantaloupes)	Cassava	Cocoa, beans	Plantains and others

IPBES

- In four developing countries and across five nutrients, we found that 0 to 56% of populations would become newly at risk if pollinators were removed. Increases in risk were most pronounced for vitamin A in populations with moderate levels of total nutrient intake
- Moreover, recent studies have estimated that pollinators are responsible for up to 40 percent of the world's supply of nutrients
- . Sixty-nine percent or more of the vitamin A in children's diets came from fruits and vegetables, many of which depend strongly on pollinators (Fig. 2, Table 1, S2 Table). Fruits and vegetables also contributed most of the folate to children's diets, but these plants depended on pollinators to a much lesser degree (Fig. 3, Table 1, S2 Table). Children received a large portion of their calcium from dairy and vegetables, and their iron and zinc from vegetables and grains (Fig. 4, S2 Table); however, dairy and grain products do not depend on animal pollinators [8], and the vegetables providing most of these nutrients did not depend heavily on pollinators (Table 1, S2 Table)