A global surveillance system (GSS) for crop diseases

Global preparedness minimizes the risk to food supplies

plant health
The American Phytopathological Society Annual Meeting

M. Carvajal-Yepes, K. Cardwell, A. Nelson, K. A. Garrett, B. Giovani, D. G. O. Saunders, S. Kamoun, J. P. Legg, V. Verdier, J. Lessel, R. A. Neher, R. Day, P. Pardey, M. L. Gullino, A. R. Records, B. Bextine, J. E. Leach, S. Staiger, J. Tohme.

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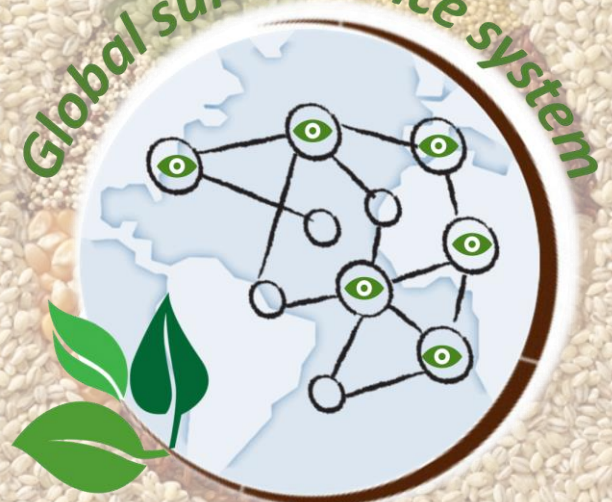


Recent trans-global disasters

- Maize Lethal Necrosis – Maize, East Africa, 2011
- *Xylella fastidiosa* - Olives, Italy, 2013
- Cassava Mosaic Disease – Cambodia, 2015
- Wheat Blast - Bangladesh, 2016
- Fall Army Worm -Africa to China, 2018
- Mal de Panama *F. oxysporum*-TR4 - Colombia, 2019
- Citrus greening disease – U.S.

Slide: Kitty Cardwell, *Oklahoma State University, USA.*

Surveillance (ISPM 6, 2018)

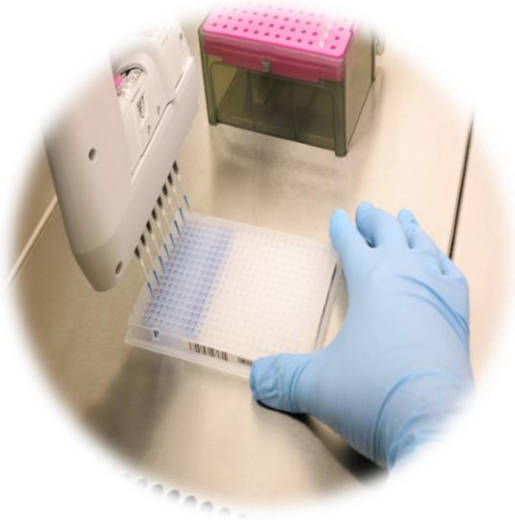
Commission on Phytosanitary Measures (CPM), which oversees the implementation of the **International Plant Protection Convention** (**IPPC**)

Specific	General
Information gathered by National Plant Protection Organizations (NPPOs)	**Information gathered** from various sources not only by NPPO
• Labs at entry and trade points, • Customs and border patrol, • Seed inspection, • Phytosanitary services • Surveys of specific P&D	• Citizens, scientists and trained agronomists • University plant pathology labs; • Fee-for-service clinics supporting grower industries • CGIAR plant pathology labs • National networked labs (NPDN) • National extension service personnel • Private crop consultants • Pesticide sales people and applicators
Detects and diagnoses pests of concern (regulated). Establishes an area as “free from” a given P&D. Trade and quarantine purposes.	Detects and diagnoses all pests, not just those that are regulated.

Only an estimated 2 to 6% of all cargo entering a country can be effectively screened (Work et al., 2005)

In the general surveillance protocols are lacking or weakly established in most regions.

Diagnosis capacity



information sharing

communications protocols

Many countries, particularly low-income countries (LICs), do not efficiently exchange information, delaying coordinated responses to prevent disease establishment and spread.

Global surveillance system

Develop a strategic plan and a novel framework to facilitate crops epidemics readiness globally.

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Global surveillance system

The general surveillance infrastructure has the most in-field monitoring and trained eyes, but the least coordination from local to global level.

Global surveillance system

POLICY FORUM | FOOD SECURITY

A global surveillance system for crop diseases

M. Carvajal-Yepes[1], K. Cardwell[2], A. Nelson[3], K. A. Garrett[4], B. Giovani[5], D. G. O. Saunders[6], S. Kamoun[7], J. P. Legg[8], V. Verdier[9], J. Lessel[10], R. A. Neher[11], R. Day[12], P. Pardey[13], M. L. Gullino[14], A. R. Records[15], B. Bextine[16], J. E. Leach[17], S. Staiger[1], J. Tohme[1]

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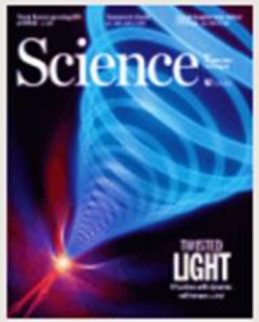

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Global surveillance system (GSS)

Existing surveillance systems worldwide

Deliberate coordination of people

Increase coordination in high-consequence disease detection

Compilation and analysis of disease diagnostic data patterns

Create linkages between general and specific surveillance entities across countries

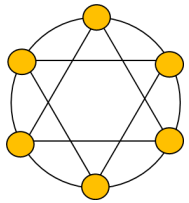
Forward-looking goal of improved risk management at a global scale

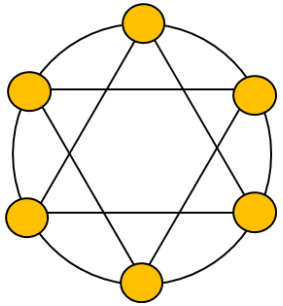
Extend and adapt established biosecurity practices and networking facilities into LICs.

Enabling countries and regions to quickly respond to emerging disease outbreaks to stabilize plant health and food supplies.

The GSS **would function though five interconnected networks**

(i) Diagnostic labs network





GSS Diagnostic labs network

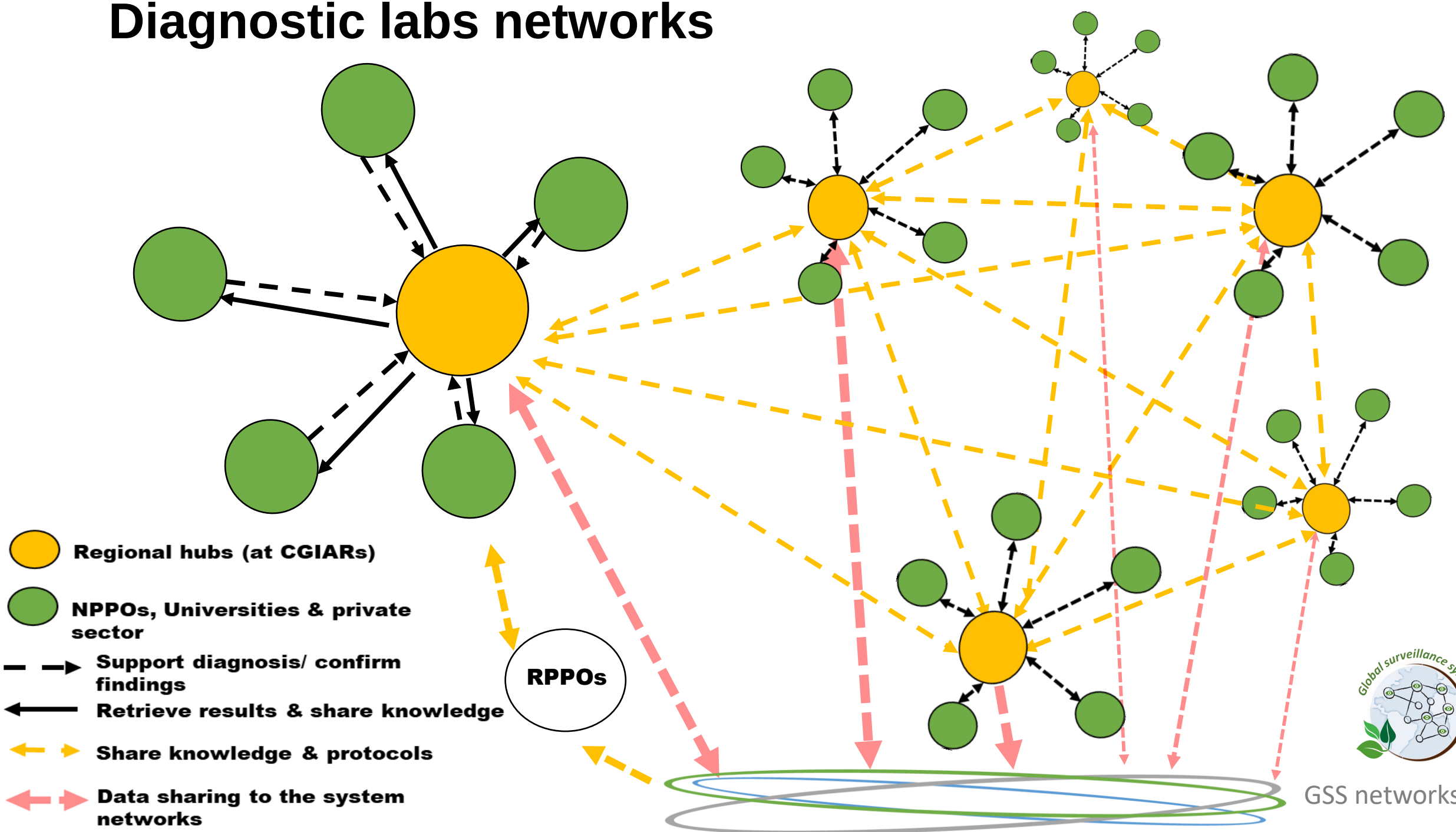
- Promote and extend standardized diagnostic protocols already used by the regulatory sector (IPPC),
- Network diagnosticians with regional experts to promote faster and more accurate results and standardized information management and reporting.
- **Coordinated by “regional hubs” that support the “spoke” diagnostic labs in a region, focusing specifically on diagnostic labs and extension services in LICs.**
- Contribute to update and coordinate existing standard operating procedures for diagnostics, sampling methods, and surveillance approaches.
- Regional hubs located at six CGIAR Centers in collaboration with RPPOs and the IPPC, to facilitate consensus with regional partners.

Germplasm Health Units located at 11 CGIAR centers across the globe

- GHUs are components of the Genebank Platform and ensure safe germplasm exchange
- Provide phytosanitary services to the 35 germplasm collections held by the 11 CGIAR centres (cassava, maize, wheat, potato, rice, beans…)
- Standardize procedures for handling plant health to cope with diverse quarantine systems in different countries
- Comply with IPPC and NPPO procedures

Slide: Maritza Cuervo, *Alliance Bioversity Int. & CIAT, Cali, Colombia*

Diagnostic labs networks



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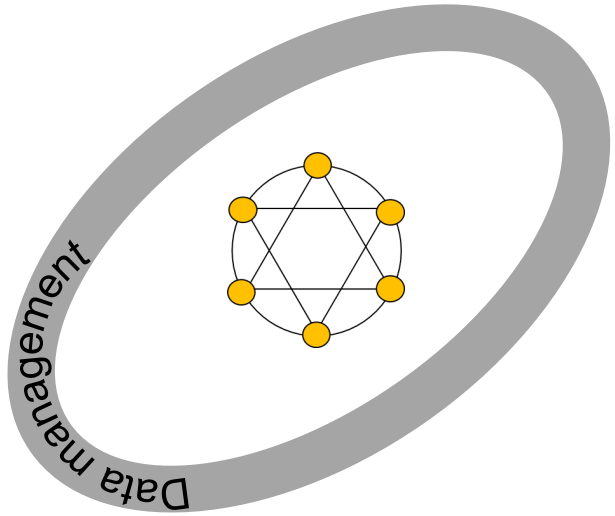
(ii) data management network,



Data management network

- Develop consensus on data collection standards and access protocols
- Support the collection, curation, storage, analysis, and management of plant disease and pest data.

Incentivize data sharing:

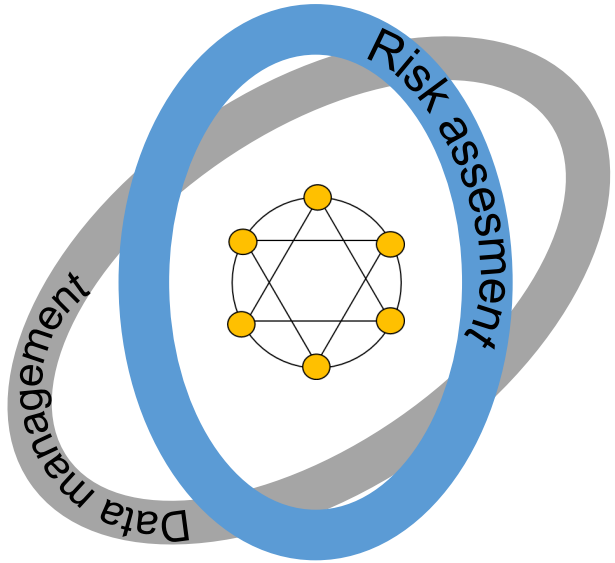
- Deploy FAIR (findable, accessible, interoperable, and reusable) data principles,
- Create trusted and standardized information for communications protocols
- Data access for risk analysis purposes would benefit decision making processes and preparedness of Ministries and National Plant Protection officials

The GSS **would function though five interconnected networks**

(i) diagnostic labs network

(ii) data management network

(iii) risk assessment modeling network,

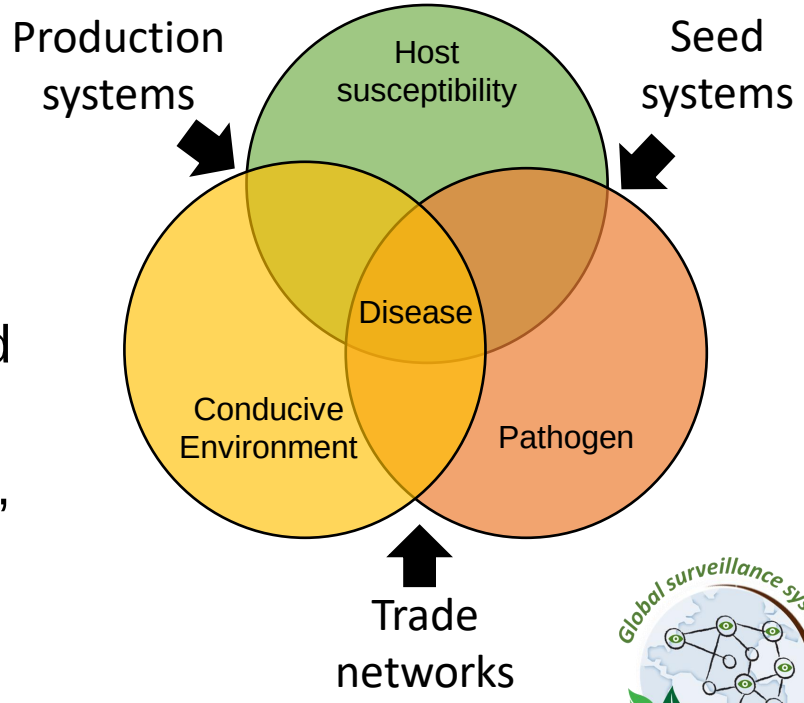


Risk assessment network

- Pest risk analysis for quarantine pests were established by the IPPC in 2001.
- It would support the collection, integration, and management of risk-related data
- Develop **analytical modeling and visualization tools** for interpreting and **communicating** to key stakeholders through standardized communication protocols.

GSS Risk assessment network can:

- Recommend biosecurity, sampling and mitigation strategies.
- Supply updated risk estimates to the participant countries and diagnostic laboratory network for enhanced surveillance.
- Contribute to capacity development along with NPPOs, universities, government personnel, and private groups.



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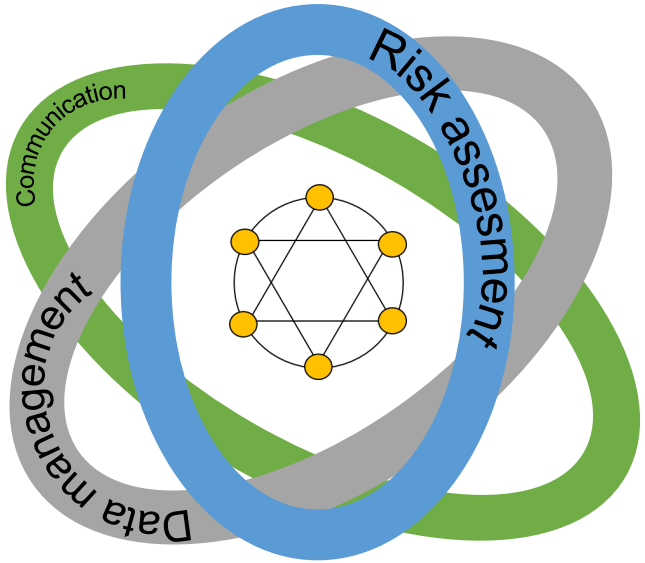


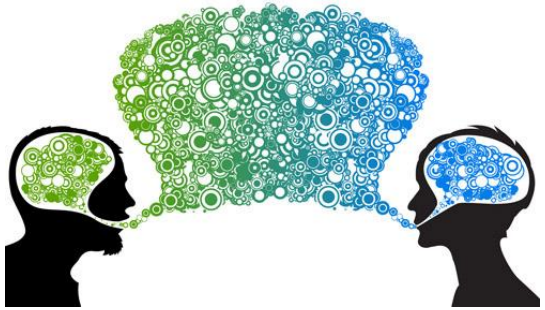
Global surveillance system

Communications network

- **Facilitate dialogue across all networks**
- Raise awareness and coordinate timely responses to disease outbreaks

    - Internally to the system
    - Externally to participating host governments through the NPPOs

- Expedite transfer of knowledge derived from the ***diagnostic*** and ***risk assessment networks*** by identifying the most appropriate source and ensuring the timely, responsible and secure transfer of knowledge.



The GSS **would function though five interconnected networks**

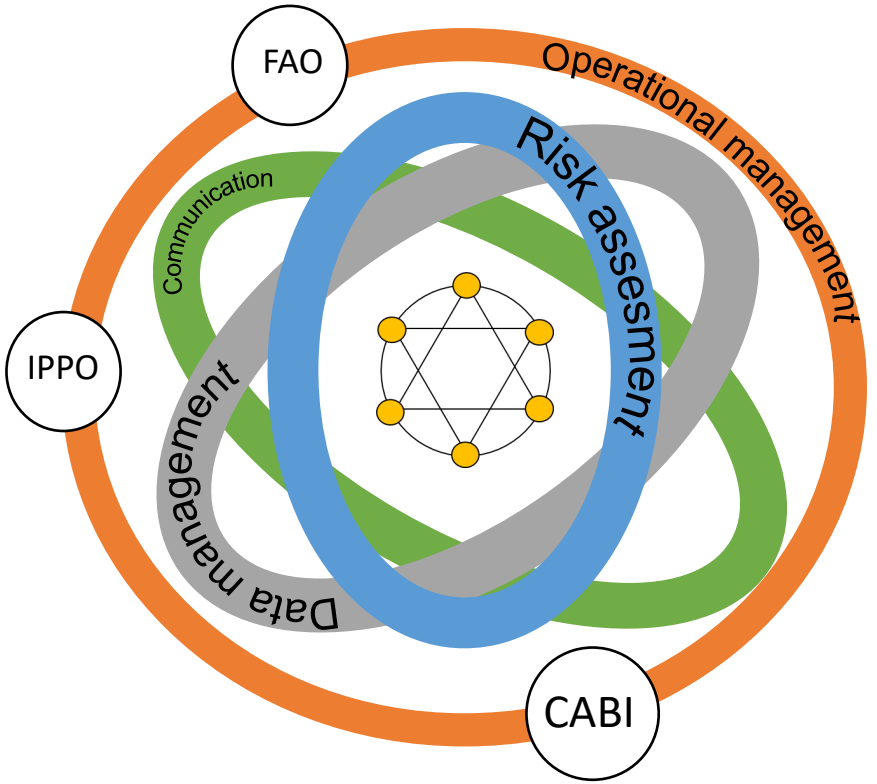
(i) diagnostic labs network

(ii) data management network

(iii) risk assessment modeling network,

(iv) communication network, and

(v) operations management network



Operations management network

- Would provide governance for an integrated surveillance system

  Operationalize the networks,
  Coordinate partners,
  Administering budgets,
  Fundraising,
  Establish policies and guidelines (together with an expert advisory committee)

- Key members of international plant protection organizations

NPDN National Plant Diagnostic Network

IPPC

RPPO stands for Regional Plant Protection Organization

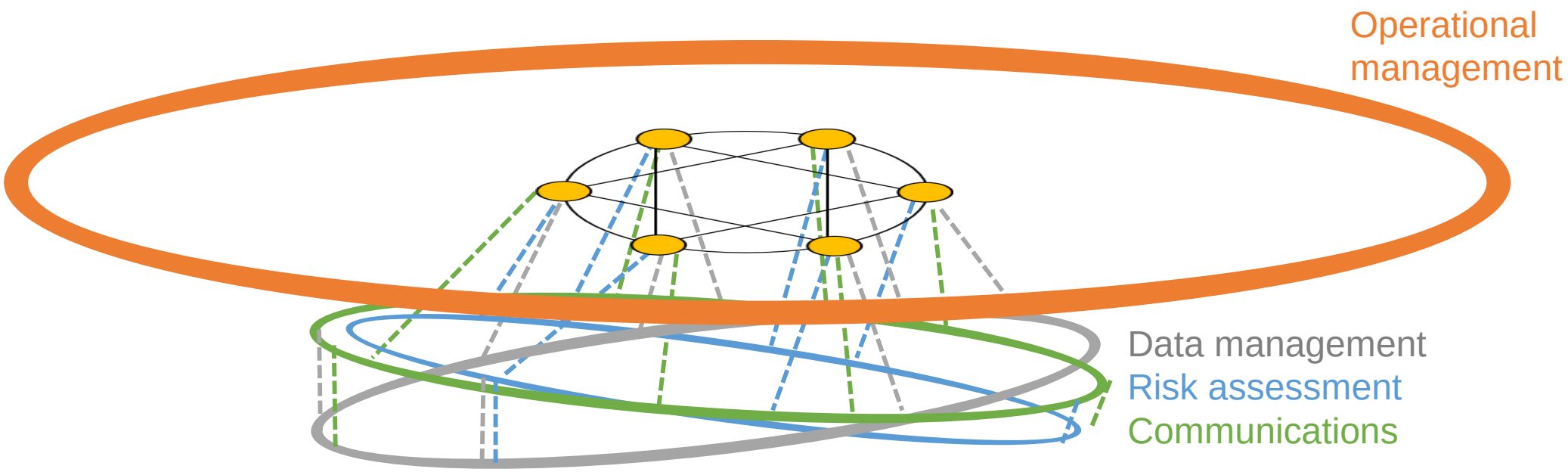
CGIAR

FAO FIAT PANIS

…..among others

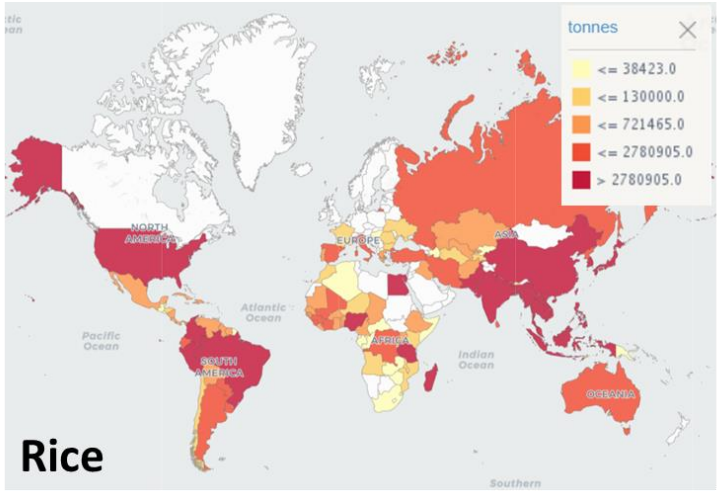
Global surveillance system

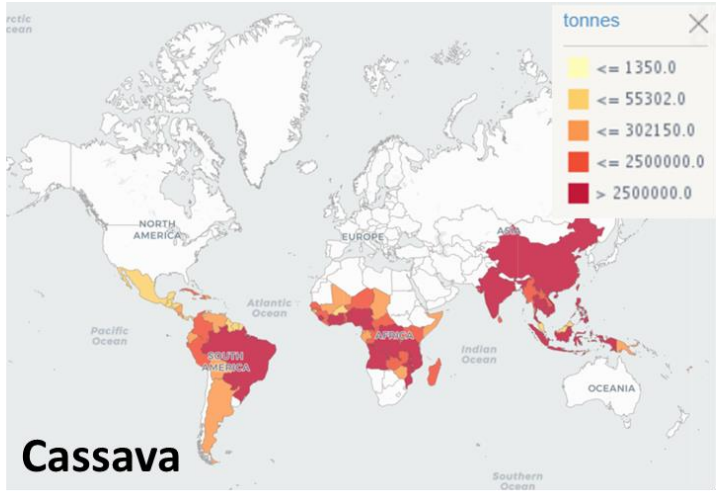
GSS structure

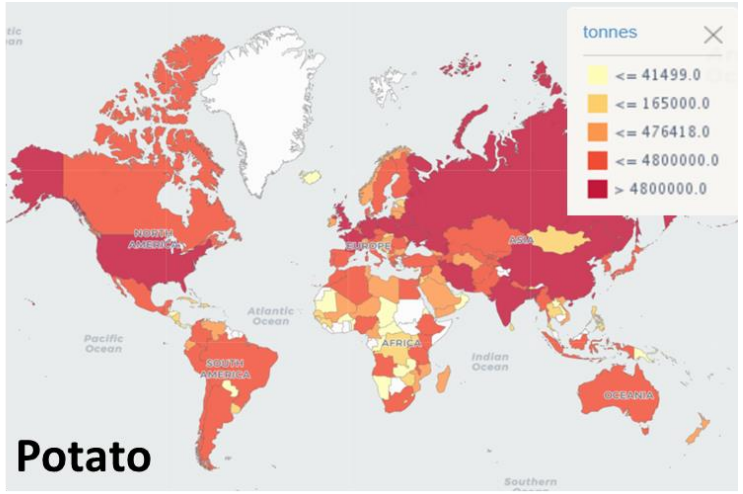


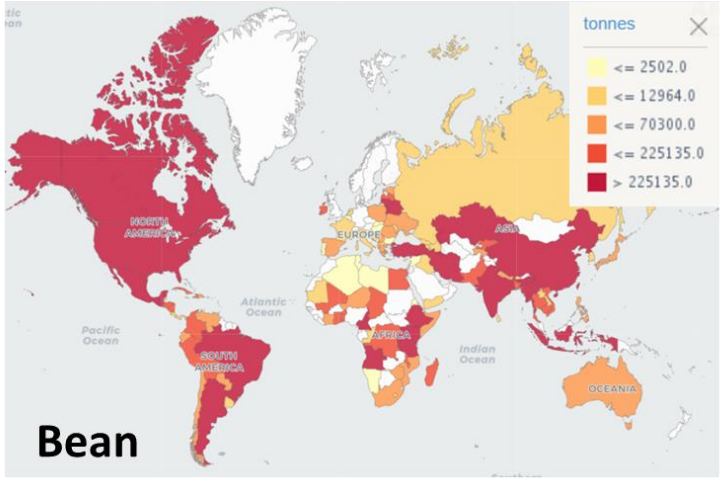
*** all sharing a crosscutting capacity-development component**

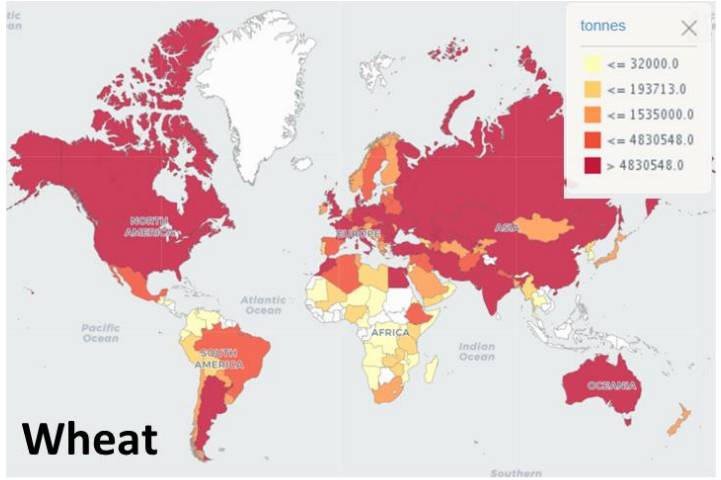
Pilot phase: focus on high-risk diseases causing high economic impact in the world's most important crops

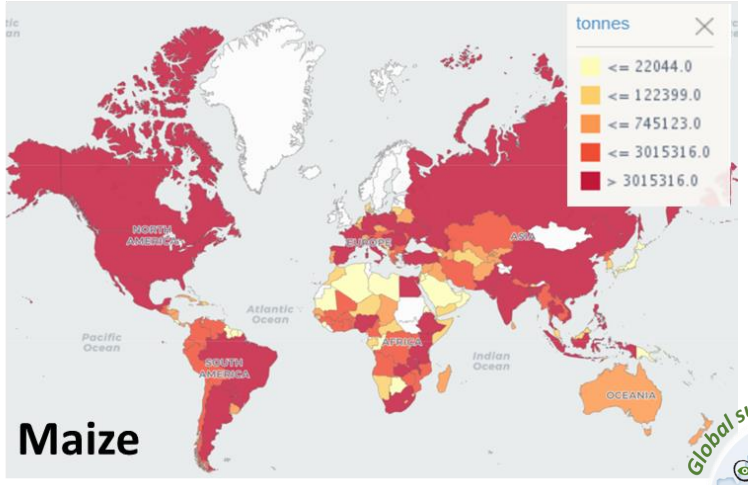












Source: FAOSTAT, 2019

Impact of implementation of the GSS

- Would **detect threats and risks to global food supplies** and **support timely responses**
- **Countries and regions will benefit** by **increasing** their **capacity** to predict, detect, communicate and effectively respond to emerging pest and crop diseases outbreaks.
- More effective biosecurity practices can be developed with regionally important agricultural industries and businesses.
- **Regional economies** will be enhanced:

  - **Managing barriers to trade** in partnerships across regions
  - **Lowering** invasive pest and diseases **mitigation costs**
  - **Avoiding** production **losses** of keys crops

Thanks for your attention!

Global surveillance system

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