



The Importance of Seed Health – a global perspective

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this presentation will provide:

- some introductory remarks
- views about the importance of seed health and global initiatives
- presentation of case stories
- DSHC initiatives in the improvement of seed health research and training

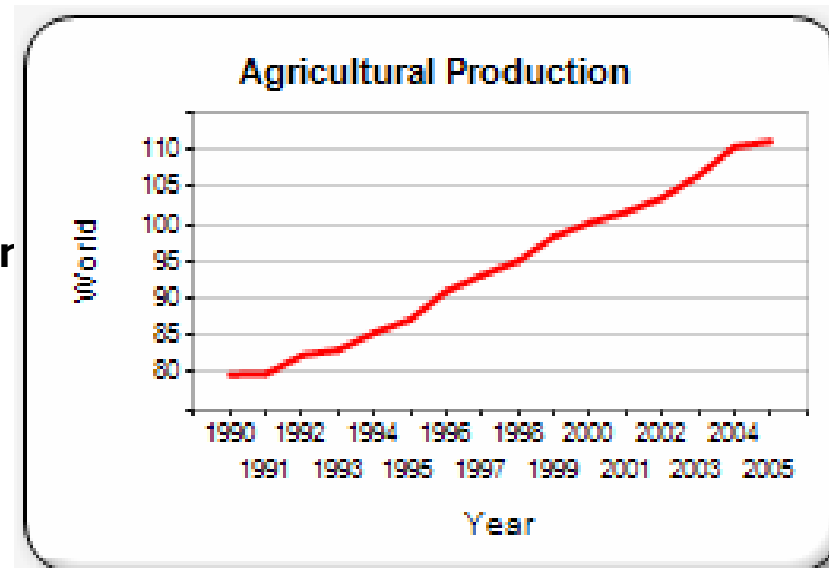
- with special emphasis on developing countries





World agricultural production

- In the past decade and a half, agricultural net production increased annually by 2.2%
- In the developing world increased output by almost 3.4%/year
- In the developed countries by just over 0.2% per year
- Food crops gross production went up 2%, but the most important of them, cereals, just 1%. Oil-bearing crops increased by 4%, fruit and vegetables by 3.8%
- However, the world's population increases also by 1.1% annually:
pressure on natural resources

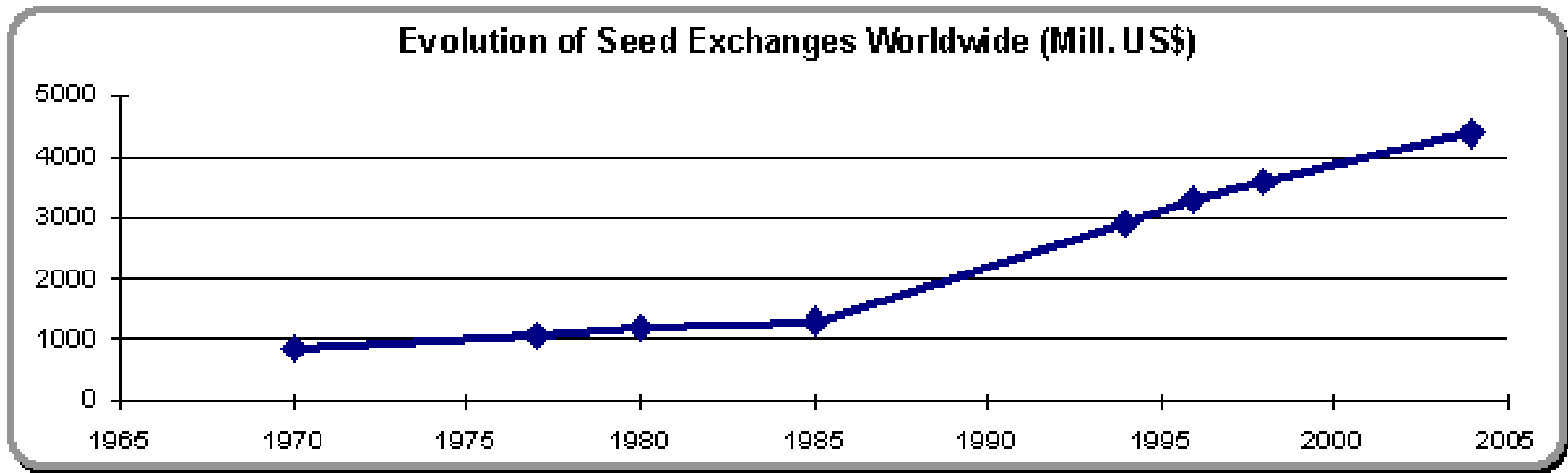


FAOSTAT 2007





Evolution in international seed trade, 1970 - 2004



www.worldseed.org/statistics.htm



Seed Exports of Selected Countries, 2005 (in USD million)

Country	Agricultural Seeds	Horticultural Seeds	Total
USA	618	304	922
Netherlands	127	557	784
France	510	178	688
Germany	313	27	340
Canada	186	29	215
Denmark	141	37	178
Italy	115	56	171





SEED IS:

- **The key input for all crop cultivation**, determining the maximum yield potential and being decisive for proper utilisation of all other inputs
- the primary **vehicle for technical innovation** created by plant breeding
- a **primary source of inoculum** for disease epidemics
- the key **vehicle for transboundary spread of plant diseases**





Importance of plant diseases

- Plant pests are still ***major constraints to food and agricultural production*** in parts of all regions of developing countries
- **Crop losses** significantly reduce food available for human and animal consumption: ***food insecurity and poverty***
- **Negative effects** in the internal and external **marketing/trade** in agricultural products, reduce farmers' income, and **block poverty alleviation**
- Control of plant pests still requires ***substantial use of pesticides*** (side effects on human health and the environment)



IMPACT OF SEED BORNE DISEASES:

- direct yield losses
- perpetuation of epidemics
- spread of diseases
- food safety/ toxins
- storability

Empty panicles of rice to
to seed-borne fungal and
bacterial pathogens





Quality healthy-seeds

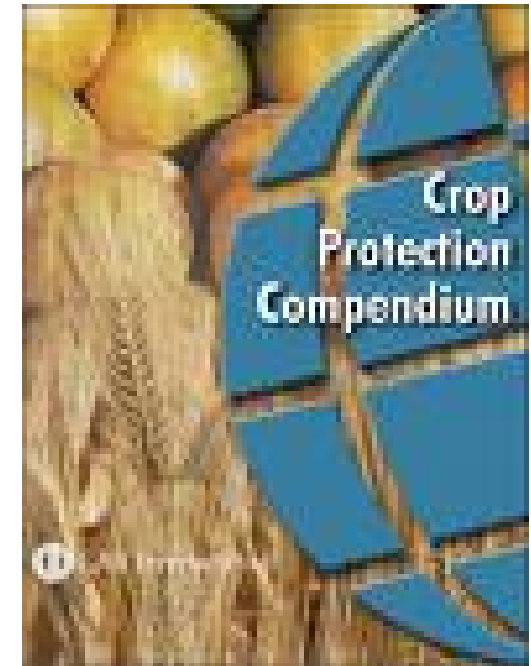
- Particularly important in developing countries is the supply of high-quality seed to small farmers
- Responsible in some countries for >90% of domestic food production.
- Plant diseases remain one of the major checks on crop production.
- The availability of resistant crop plants is not always possible and ***quality disease-free seed is one of the options.***





Global & Regional Initiatives:

- **Secretariat of the IPPC, FAO/EPPO:**
Working in the harmonization of phytosanitary measures, better information exchange, and improved approaches for early warning and rapid response to potential quarantine pests.
- The **Crop Protection Compendium** incorporated the Database **on Seed Borne Diseases**: *Monitoring of seed-borne pathogens through the global crop*





Seed trade obstacles

Phytosanitary barriers?

Phytosanitary requirements from many countries/regions are still considered to be main obstacles to international seed trade

Eggplants with bacterial wilt symptoms (*Ralstonia solanacearum*), Mysore, India





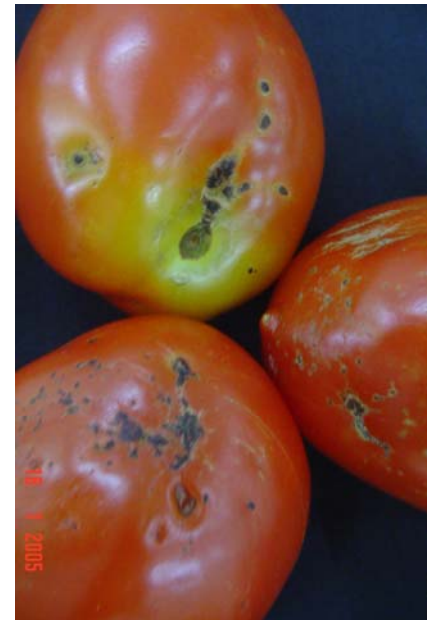
Why seed health?

Seed health activities/seed industry (FIS-ISHI's)

- **The increased expectation of farmers and growers:** they ask for quality seeds using modern technologies (GMO varieties, precision seed, pelleted or coated seed..)
- This request is associated, obviously, **to the need of healthy seed** (free from seed-borne diseases)

International Seed Trade Federation (FIS) established in collaboration with ISTA (International Seed Testing Association), the international seed health initiatives (ISHIs) on vegetable, herbage and field crops:

the recognition of seed health testing methods developed as global standards



Importance of seed health in developing countries:





Mozambique 2004: Fungal occurrence in maize (A.M. Mondjana, UEM)



Detected fungi	Fungi incidence (%)	
	Matica ¹	Marsal-Chinaka ¹
<i>Fusarium moniliforme</i>	42.2 a	44.3 a
<i>Fusarium spp</i>	21.8 b	25.0 b
<i>Penicillium spp</i>	16.0 c	11.1 c
<i>Acremonium spp</i>	8.0 d	8.8 c
<i>Aspergillus flavus</i>	7.9 d	7.1 c
<i>Aspergillus niger</i>	2.7 e	0.2 d
<i>Alternaria spp</i>	2.4 e	1.9 d
<i>Nigrospora spp</i>	0.9 e	1.1 d
<i>Alternaria tenuis</i>	0.3 e	0.2 d





Mycotoxins in food crops

	Biological Factor	Locality	Correlation factor	Significance
Fumonisin concentration	<i>Fusarium moniliforme</i>	Matica	.660	*
		Marsal-Chinaka	.500	*
	<i>Fusarium spp</i>	Matica	.690	*
		Marsal-Chinaka	.580	*
	Weevil attack	Matica	.674	*
		Marsal-Chinaka	.180	NS





Sorting farm saved seed by hand in Ghana 2004



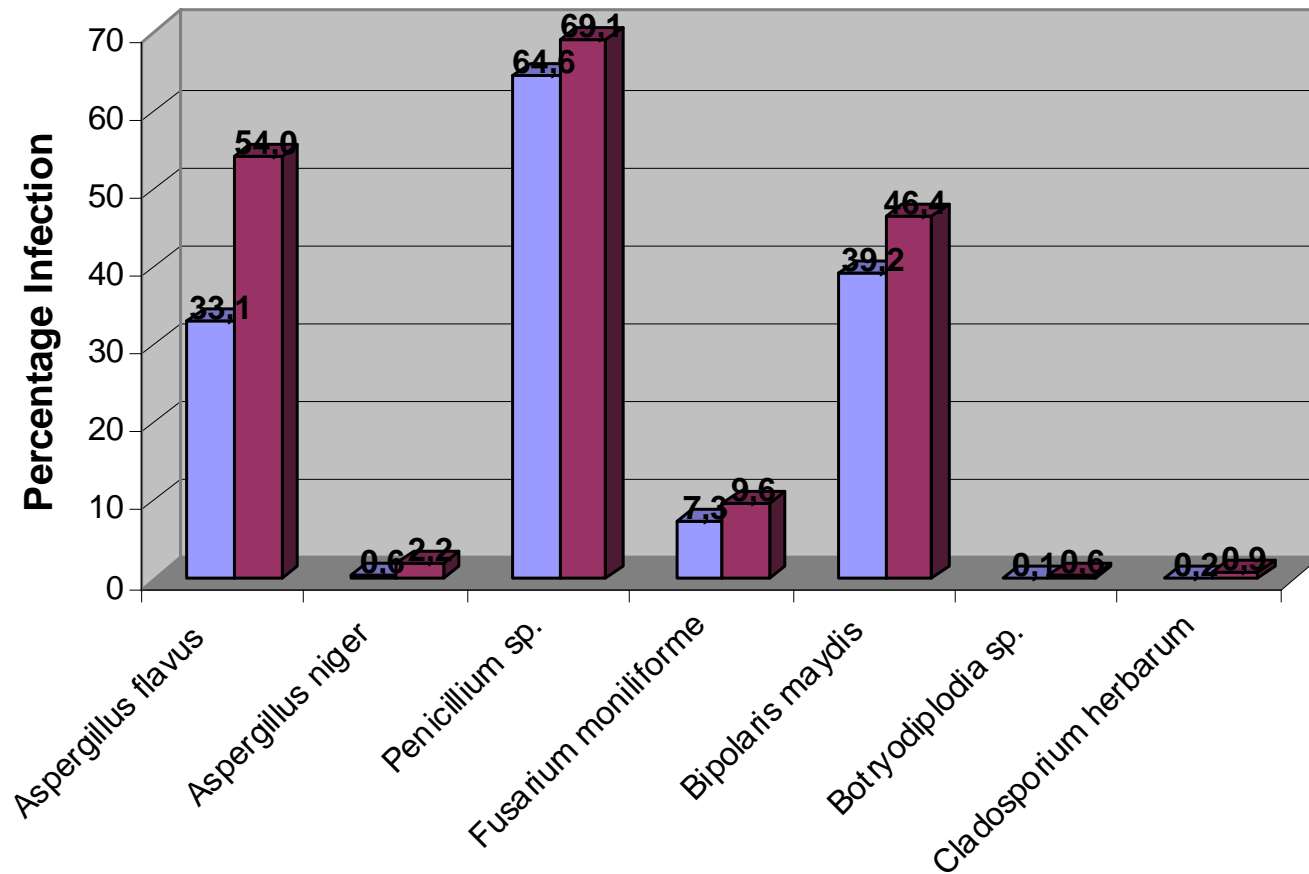


Ghana 2004: Seed Health evaluation of farmers' maize seeds

2 x 12 farmers in two districts

(Data by Dr O.A. Danquah et.al. 2006)

■ Clean seed' ■ Original' seed





Yield and some yield parameters of sorted and non-sorted farm saved seed of maize in the major season of 2004

(Data by O.A. Danquah et al 2006)

Parameter	Original Seed		Sorted Seed	
	Mean \pm SE	Range	Mean \pm SE	Range
Emergence	78.1 \pm 5.1	55-97	88.6 \pm 3.2	70-99
Vigour	54.2 \pm 2.3	44-68	65.8 \pm 1.3	60-72
Leafblight incidence	87.5 \pm 2.2	77-100	84.1 \pm 0.1	72-100
Leafblight severity	2.1 \pm 0.1	2.0-2.4	1.9 \pm 0.1	1.7-2.4
Eyespot incidence	99.5 \pm 0.5	94-100	98.0 \pm 1.3	85-100
Eyespot severity	2.3 \pm 0.1	2.0-2.6	2.2 \pm 0.1	1.7-2.4
Cob wt. (kg)	3.427 \pm 0.5	1.0-7.5	4.68 \pm 0.5	1.6-7.6
Shelled wt. (kg)	2.836 \pm 0.4	0.7-0.9	3.909 \pm 0.5	1.3-7.0





Testing infected rice seed in Vietnam 2005





Vietnam 2005: Testing farm saved seed at different infection levels (Data by Dr N.V. Tuat, NIPP)

YIELD

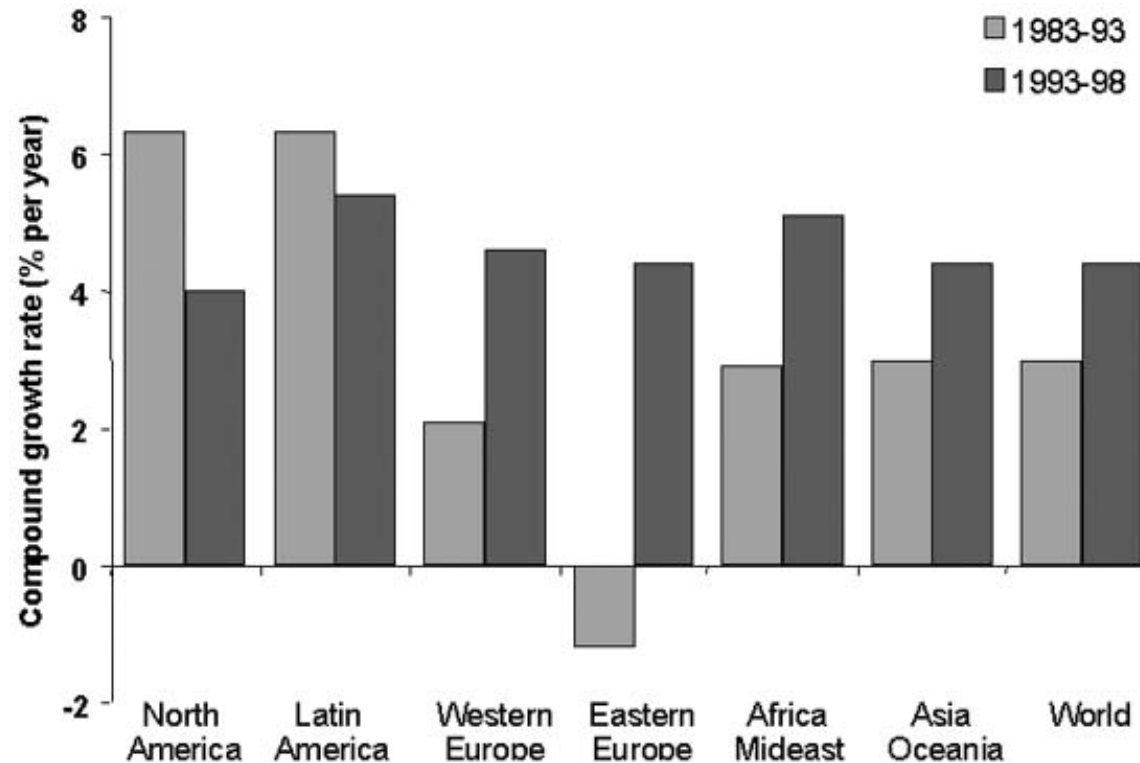
Seed infection	Fungicide		Nam Dinh			Nghe An – S			Nghe An – A		
	Seed	Foliar	Hkg	rel.		hkg	rel		hkg	rel	
<10%	-	-	7.10	a	100	6.20	ab	100	5.48	a	100
	+	-	7.20	a	101	6.35	ab	98	5.60	a	102
	-	+	7.15	a	101	6.30	ab	102	5.57	a	102
	+	+	7.22	a	102	6.40	a	103	5.64	a	103
10-30%	-	-	6.45	b	91	5.50	ab	89	5.13	ab	94
	+	-	6.90	a	97	5.85	ab	94	5.45	a	99
	-	+	6.80	ab	96	5.75	ab	92	5.40	a	99
	+	+	6.95	a	98	6.05	ab	98	5.52	a	100
>30%	-	-	5.88	b	83	4.95	b	80	4.82	b	88
	+	-	6.10	a	86	5.20	b	83	4.92	b	90
	-	+	6.05	b	85	5.05	b	81	4.86	b	89
	+	+	6.10	b	86	5.25	b	85	4.83	b	88





Rice crop production & increased use of pesticides

- The increase in crop loss was accompanied by a growth in the rate of pesticides use
- The average rate of increase in pesticide consumption world-wide during the period of 1993 to 1998 was in the order of 5% per year exceeding the earlier period
- In Latin America and Africa the growth rate of pesticides was above world average: close to 6% per year



Source: after Wood *et al.* 2000.



Danish Seed Health Centre
for Developing Countries



HISTORY IN BRIEF:

- Danish Government Institute for Seed Pathology for Developing Countries (DGISP) established in 1967
- Key activities: capacity building for seed pathology work through HRD, research and support to infrastructure in developing countries
- DGISP associated with KVL in 2001
- Danish Seed Health Centre (DSHC) established in January 2004 by merging the Centre with the Section for Plant Pathology, Department of Plant Biology, KVL
- Performance Contract with Danida effective from 2004





The Seed Health Centres

DSHC
Copenhagen



ASHC
Mysore, India



AfSHC
Morogoro, Tanzania





Danish Seed Health Centre
for Developing Countries



- Seed Health Centre
- CEP/SHIP
- New partner country



RESEARCH PROJECTS AT PARTNER INSTITUTIONS			Diagnosics	Importance	Epidemiology	Seed sanitation	Control strategies	Others
India	4	Serological and molecular diagnostics						
		Seed health assessments						
		Biocontrol of seed-borne diseases						
		Detection and quantification of mycotoxins						
Tanzania	5	New diseases on sunflower						
		Disease incidence in vegetable crops						
		Effect of natural compounds						
		Screening of pasture seed						
		Seed treatment studies						
Burkina Faso	3	Plant extracts for seed treatments						
Cameroon	1	Plant extracts for seed treatments						
Ghana	1	Impact of using healthy seed						
Nepal	3	Bakanae disease of rice						
		Effect of different methods for seed cleaning						
		Management of diseases in maize, wheat and rapeseed						
Uganda	4	Assessment of diseases in cowpea, chillies and rice						
		Screening for seed borne vira						
		Examination of seed borne bacteria						
Vietnam	5	Analysis of diseases in Solanum ethiopicum						
		Impact of seed borne diseases in rice						
		Cultivation practices for seed production						
		Loss estimates in rice						
		Management of grain rot in rice						
		Impact of seed borne diseases in groundnut						



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