

## Save and Grow: Pesticide Risk Reduction for Sustainable Intensification of Rice Production

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## **Outline Presentation**

- Background: Agricultural Scenario (2010-2050) & Crop Intensification Risks =>indiscriminate use of agrochemicals in rice paddy systems
- 2. Overview FAO Intervention: Integrated Approach for Pesticide Risk Reduction
- 3. Farmer Ecosystem-Literacy Education: Farmers Field School
- 4. Case Study: *Philippines:* Sustainable Intensification of Rice Production
- 5. Concluding Notes, with particular relevance to sustainable intensification of rice production in Malaysia.

### **Global Context and FAO Intervention**

> Sustainable Intensification of Agricultural **Production**, Food Safety and Trade **Facilitation** are major driving forces for government commitment towards pesticide risk reduction and IPM promotion.



The Challenge: <u>Agricultural Scenario</u> (2010-50)
➤ Global Population (2050): 9.2 billion people and twice as much food needed

- Declining water & land per caput (4.3 ha (1961) to 1.6 ha (2050))
- Lower productivity growth & production stress from climate change
- Rapid urbanization & change in consumption patterns
- Need to Intensify Crop Production and challenge to do so <u>sustainably!</u>

## Global rice production increases needed to meet demand by 2035 (Source: IRRI)

#### **Million tons milled rice**



📕 Asia 🗖 Africa 📃 Americas 🔎 Rest of world

## The Way to Go: Save and Grow

### >In Asia:

- Land is moving out of rice
- Labor is moving out of rice
- Water is moving out of rice



- Major changes in production practices and increases in efficiency needed!
- In order for rice production to grow, farmers will need to learn how to save!

## **Crop Intensification Risks**

- Globalization and rapidly growing human traffic and plant trade => high risks of trans-boundary movement of pests and diseases;
- Increased use of agro-chemicals (fertilizers and pesticides) => environmental pollution & food safety concerns;
- Agricultural intensification risks can compromise ecosystem resilience, resulting into pest outbreaks, often made worse with the insecticides used to control them (e.g. rice Brown Plant Hoppers).



Irrigated Rice Food Web & compromised Ecosystem Resilience as a result of early season pesticide sprays



Source: Gallagher et al, 2005 In: J. Pretty, The Pesticide Detox

#### Unsprayed (A)

#### Sprayed (B)



Cambodia-Tonle Sap Wetlands Study on Aquatic Biodiversity in Rice-based Farming Systems & Importance for local Food and Nutrition Security (Source: Hallwart, 2004)

- Over 70% protein intake Cambodians derived from aquatic biodiversity (fishes, reptiles, crustaceans, amphibians, mollusks, insects and plants)
- Harvested species provide more than protein: fatty acids for vitamin absorption
- Wetland ecosystem services vital for food and nutrition security... yet compromised by agro-chemical use!









Carbamate Conazole Organophosphate Chitin synthesis inhibitor Nereistoxin Molluscicide Triazine Neonicotinoid Antibiotic fungicide Other Minority Groups Anilide Dicarboximide Organochlorin Pyrazole fungicide Strobilurin Oxadiazine Aromatic acid Phenoxy compound Safener Pyrethroid Sulfonylure Avermectin Ъ Amide herbicide 500 1000 15002000 2500 3000 0 Gram ha-1

Conflict in Mekong Delta between agriculture and aquaculture (Source: Kim Pham, East Anglia Univ., UK)

## Pesticide Risk Reduction FAO's integrated approach



Farmer education: **Promotion of Integrated Pest** Management (IPM) to: - eliminate pesticide overuse, - reduce reliance on pesticides, - end use of WHO Class I pesticides

**Regulatory control:** International Conventions & capacity building for strengthened regulatory control of the importation, distribution and use of pesticides



## **Regulatory Control**

- International Plant Protection Convention (IPPC & APPPC + SC-IPM, PQ & Pesticides)
- Code of Conduct on Distribution and Use of Pesticides
- Rotterdam Convention (PIC)
- Stockholm Convention (POPs)
- Basel Convention (Industrial chemicals)
- Montreal Protocol (Ozon depletors e.g. MB)

# International Wetlands Convention (Ramsar, 1971)

> COP-XI adopted Resolution XI-15 on rice paddy and pest control calling on governments to strengthen pesticide regulation for conservation of biodiversity and sustainable use of wetland ecosystem services.

Source: <u>http://www.ramsar.org/cda/en/ramsar-documents-cops-cop11-cop11-drs/main/ramsar/1-31-58-500%5E25607\_4000\_0</u>



## Capacity building for Regulatory Control

Harmonization & updating pesticide legislation, including list of banned/restricted pesticides

Advice on pest & pesticide management policy reform

Development of licensing & inspection systems for the retail sector



#### Community Regulatory Action and Education for Pesticide Risk Reduction

- Community Surveys to assess location-specific risk for curriculum development
- Community/farmer training on pesticide risk reduction (IPM-Farmers Field Schools)
- Community Mobilization & Formulation/implementation of Action Plans
- Inspection & enforcement of pesticide regulations
- Local Commune Policy Development with policy spin-offs at national level



## Pesticide Risk

## Risk = Hazard x Exposure

Probability to cause harm as determined by hazard (chemical property) and exposure (environmental conditions and preventive action) equation

No Hazard = No Risk

No Exposure = No Risk

## Hazard Reduction

Elimination of use of WHO Class I pesticides and adoption of novel options for pest management





## **Exposure Reduction:**

**≻**Limiting exposure through better handling, use, storage, disposal of pesticides



## Integrated Pest Management (IPM)

**Knowledge-intensive** process of decision making that combines various strategies (biological, cultural, physical and chemical) for sustainable management of pests and diseases.

Pesticides used as a <u>last</u> resort!



## What is a Farmers Field School ?



School without walls", farmers learn about crop ecology and pest management in the field;

Season-long, from seed to harvest, 25-30 farmers;

Aim to help farmers adopt IPM, grow healthy crops and produce more & safer food with less inputs of agro-chemicals



## China National IPM Program

- Intensive production for domestic and increasingly export markets
- High use of pesticides cause pest outbreaks, crop loss and food safety concerns
- Strengthened pesticide management in recent years
- Training of extension workers & farmers in Integrated Pest Management and pesticide risk reduction
- China government investment in IPM-Farmers Field Schools: RMB 800 million (2012)



## Farmer Field Schools & Sustainable Intensification of Crop Production

FFS are particularly suited for learning complex management skills, like IPM and Natural Resource Management (*Swanson & Rajalahti, 2010*).

- Observation skills
- Analytical skills
- Decision-making skills

These skills can be extended to:

- Agro-biodiversity: Genetic resource management & species conservation/sustainable use of wetlands ecosystem services
- Managing Soils & fertility, crop nutrition, reduced N-inputs
- Rice-fish farming systems
- System of Rice Intensification (SRI)





Apply high N dose

Apply baseline N dose

Apply little or no N

New variety (Ciherang) with fertilizer & agrochemical protection – no yield

Traditional variety (Sintanur) with organic SRI management – 8 t/ha yield

Paddy fields in East Java, hit by both <u>brown planthopper</u> (BPH) and <u>tropical storm damage</u> in June 2011



#### KASAKALIKASAN The Philippine National IPM Programme

### **Ecosystem Services for Sustainable** Intensification of Crop Production (SICP)



(Source: J. Binamira based on Rola & Pingali, 1993; Mataia, Jamora, Maya & Dawe, 2009; Warburton, Palis & Pingali, 1995; Dawe, 2006; IRRI,2007)



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#### **Conservation and Utilization of Ecosystem Services for Sustainable Intensification of Rice Production (1994-2007)**

- Spray frequency & insecticide a.i./ha < 70%</p>
- Increase Yield/ha >12%

Reduction Yield <u>variability</u> across seasons <15%</p>

National Increase National Rice production: >60% 10.5 MMT (1994) to 16.8 MMT (2007)

(Source: Rola & Pingali, 1993; Mataia, Jamora, Maya & Dawe, 2009; Warburton, Palis & Pingali, 1995; Dawe, 2006; IRRI, 2007)

## **Concluding Notes & Recommendations**

- Global Food Security: <u>Sustainable</u> Intensification of agricultural Production
- Conservation & Sustainable Utilization of Essential Ecosystem Services
- In tandem with better pesticide policy and regulatory action, investments in Ecosystem-Literacy Education for Smallholder Farmers of vital importance
- Today's rural youth will be the farmers of tomorrow: Include discovery-based field training on ecology and exploring wetland agro-biodiversity in formal school curriculum!



## More Information:

- ➤ "Save and Grow: A Policymaker's Guide to the Sustainable Intensification of Smallholder Crop Production", published by the FAO Plant **Production & Protection** Division, FAO-HQ, Rome, Italy, June 2011 www.fao.org/ag/save-andgrow/
- FAO and IPM/Pesticide Risk Reduction training in Asia <u>www.vegetableipmasia.org</u>

