Sustainable Crop Production Intensification

Outline

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- Increasing food production
- Sustainable crop production intensification
- Policies and Technologies
- Principles
- Conclusion

Introduction

- The number of hungry and malnourished in the world stands at about 1 billion today
- There is a need for a major increase in food production to feed a population of around 9 billion people in 2050
  - on average a doubling of crop production in developing countries OR
  - 70% for the world as a whole

Constraints

At the same time there is:

- decreasing availability of and competition for land and water
- increasing urbanization and shift to peri-urban production
- changing consumption patterns
- climate change

Increasing food production

HOW

- increasing the yield of crops
- increasing cropping intensity
- expanding the area under cultivation

Many programmes exist

- key concern how to do so *sustainably,* without causing damage to vital natural resources, or to the ecosystem in general

Increasing food production

ROLE OF FARMERS

Key players in achieving increases in production

- challenge is to provide them with adaptable and relevant technologies and
- encourage them with enabling policies, infrastructure and supportive institutions

One of the most vulnerable groups - food insecurity

- almost half the worlds population live in rural areas, 2.5 billion of them are involved in farming
- approx. 75% of the worlds hungry and poor live in rural areas – small holder farms comprise about 85% of all farms

Increasing food production

THE GREEN REVOLUTION

- did increase productivity but involved a significant increase in the use of agrochemicals

Lessons learned include the need to:

- view production in the context of the overall food system
- strengthen rural institutions to avoid problems of exclusion, build resilience at the community level
- promote local technology development, adaptation and transfer

Entry points along the Food Chain

- A food chain approach helps to identify and address linkages between intensification, ecosystem health and product safety
- No matter what the entry point to this system - seeds, use of land or water resources, pest management or post harvest losses and processing *all* other aspects need to be taken into account
- It is not possible to focus on one dimension in isolation, if the goal is *sustainable* production intensification

Sustainable Crop Production Intensification (SCPI)

SCPI aims to increase crop production per unit area, taking into consideration all relevant factors affecting the productivity and sustainability in the following three dimensions:

POLICY - (national, land tenure, market and extension)

TECHNOLOGIES - (agronomic, transfers and linkages) and

FARMERS - (socio-economic status, traditions, knowledge)

SCPI in FAO

- **Strategic Objective A** – Sustainable Intensification of Crop Production
- **Second report on the State of the Worlds Plant Genetic Resources for Food and Agriculture** (SoWPGR-2)
  - released 26 October 2010
  - highlights significant achievements in the conservation and sustainable use of plant genetic diversity – critical gaps and emerging issues

SCPI Policies

National Enabling Environments

- Strengthening of agriculture as a priority for investment
- Relationship between climate change and agriculture needs to be understood and taken into consideration – changing cropping patterns
- Policies that promote soil fertility management and reduce nutrient mining
- Policies that strengthen developing country capacities to collect, preserve and sustainably use plant genetic resources for food and agriculture

SCPI Policies

National Enabling Environments

- *Small holders need special attention* - intensification may have a disproportionate negative impact on small holders who are excluded from the process or have reduced access to resources (e.g. land and water)
  - Adaptation and demonstration sites for SCPI managed by farmers and associations to promote the development of national policies and programmes **Farmer Field Schools**
  - **Local participatory research** to blend traditional knowledge with new and improved practices

SCPI - Technologies

Some key technologies include:

- Conservation Agriculture (CA)
- Integrated Pest Management (IPM)
- Integrated Plant Nutrient Management (IPNM)

Conservation Agriculture (CA)

→ Minimum mechanical soil disturbance

→ Permanent organic soil cover

→ Diversified crop rotations

Emission reductions:

*Fuel emissions: **- 40 to 70%***

*Emissions from input manufacturing: biological processes replacing functions of machinery: **- 50%***

*fertilizer: **- 30-50%***

*pesticides: **- 20%***

Manure handling:

- *biogas*
- *aerobic composting*
- *application into crop residues*
- *knifing into soil (small quantities)*

No burning – avoidance of fire

Total area CA: 105 million ha

Derpsch & Friedrich, 2008

Integrated Pest Management

Insecticides kill both herbivores, such as PBH and their natural predators

Insecticides cause health problems for humans and harm ecosystem services

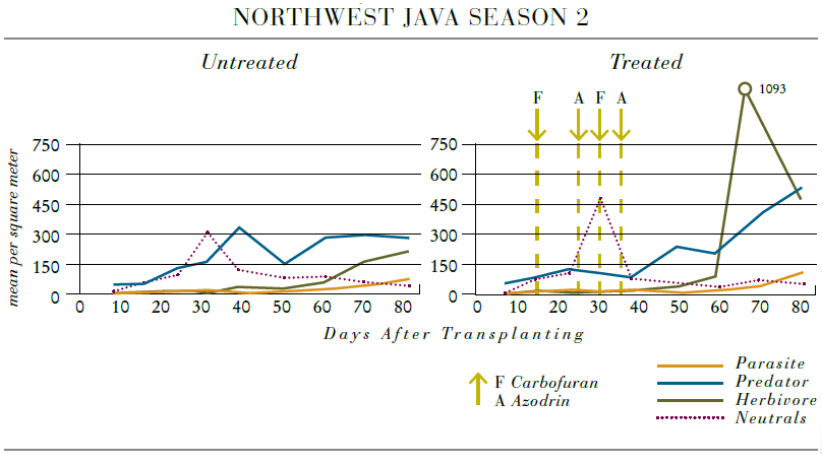
Pest occurrence can increase after application to a higher level than no-spray

Brown planthoppers (BPH) are herbivores that can become a large problem in rice, but predatory spiders can eat over 20 BPH every day

Source: IRRI images

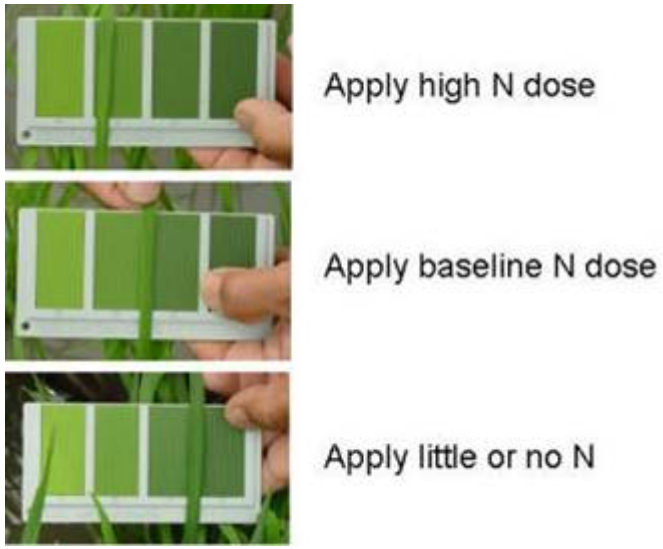
Decision to apply insecticides should be made, based on the number of predators and the condition of the crop

- Requires training (Farmer Field Schools)
- Monitoring is very important in IPM



Integrated Nutrient Management

Integrated Nutrient Management focuses on the use of biological processes, such as mulch and micro-organisms to provide and recycle nutrients. Fertilizer is applied in a balanced manner (N-P-K) and with methods that ensure a high uptake and low run-off of nutrients. Timing can be decided by looking at the leaves of the crop (e.g. by using the Leaf Color Chart)



Deep placement of urea (N) briquettes can increase rice yields, while reducing the use. In Bangladesh, the average paddy yields have increased 20% to 25%, and income from paddy sales increased by 10%, while urea expenditures decreased 32% from the late 1990s to 2006

Farmers and SCPI: scale

Practice	Before SCPI	After SCPI
Seeds	Not quantified	20% to 25% of what was used previously
Chemical fertilizers (NPK + Urea)	up to 400 kg /ha	150 kg / ha
Pesticides	none	none
Use of rice straw	sold in Niger markets	buried prior to transplanting
Yields	2.3 t/ha	5.6 t/ha

Net benefit: $1,190 / ha
Total benefit: $476,000 per annum

Principles of SCPI

1. uses crop varieties and livestock breeds with high productivity per externally derived input
2. harnesses eco-system services such as nutrient cycling, biological nitrogen fixation, predation and parasitism
3. minimizes the use of technologies or practices that have adverse impacts on the environment and human health
4. invests in local knowledge generation, capacity to adapt and innovate
5. a participatory approach to local decision making is essential - *it empowers farmers and creates communities that are more resilient*

Conclusions

The world can *sustainably* produce the food needed in 2050

- It is essential that the policies that support development of the needed capacities and technologies are put in place
- Increasing production is necessary but not sufficient - sustainable livelihood and value chain approaches need to underpin the increase in productivity and diversification
- There is a need for large investments in infrastructure and capacity building for the entire food chain
- Implementing these approaches is knowledge intensive, it is essential to ensure that the knowledge is owned and applied by farmers

Thank you

http://www.fao.org/agriculture/crops/core-themes/theme/spi

www.fao.org





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