BACKGROUND

The Green Revolution Technologies aimed to propel the agriculture industry forward





UNSUSTAINABLE AGRICULTURAL PRODUCTION SYSTEM

BACKGROUND

Organic Agriculture...



RATIONALE

The Present Situation...LOW ADOPTION!



The Problem. .

Convincing farmers to adopt organic farming



RATIONALE

The Solution. . .

A sustainable cropping pattern that gives considerable yield during the conversion period



DEVELOPMENT AND ASSESSMENT OF ORGANIC PRODUCTION MANAGEMENT TECHNOLOGIES FOR RICE-BASED AGROECOSYSTEM

IMPLEMENTING AGENCY:

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DURATION: June 2010-March 2016

OBJECTIVES

General:

To develop a sustainable organic cropping pattern during the transitional period thru evaluation and fine-tuning of mostly practiced cropping patterns for rice-based agro-ecosystem

OBJECTIVES

Specific:

To assess the transitional performance of different rice-based cropping patterns under outright organic conversion and gradual conversion

To monitor treatment (cropping pattern) effects and trends in terms of :

- ✓ transitional duration
- productivity performance (yield and its components)
- ✓ pest incidence/abundance
- ✓ soil fertility

- Conducted in two separate conventional rice-based farms:
 - Farm A abrupt conversion (full OF was used to supply the fertilizer requirement of each cropping pattern)
 - <u>Farm B</u> gradual conversion where different combinations of OF and IF were evaluated with combination rates modified per year (gradual increase of OF and decrease in IF until fully OF)

Farm A Cropping patterns monitored for transitional performance

CODE		CROPPING PATTERNS				
CP1	Α	Rice-Corn				
	В	Rice-Garlic				
	С	Rice-Tomato				
CP 2	Α	Rice-Corn-Mungbean incorporated at maturity (MIM)				
	В	Rice-Corn-Mungbean incorporated at flowering (MIF)				
CP3	Α	Rice-Garlic-Mungbean incorporated at maturity (MIM)				
	В	Rice-Garlic-Mungbean incorporated at flowering (MIF)				
CP4	Α	Rice-Tomato-Mungbean incorporated at maturity (MIM)				
	В	Rice-Tomato-Mungbean incorporated at flowering (MIF)				

Nutrient management

- Different rates of solid organic fertilizer and the use of mungbean as green manure, incorporated at maturity and at flowering stage
- Fertilizer treatments (using OF) tried for each cropping patterns
 - Treatment 1 Recommended Rate (RR) + 20kg N
 - Treatment 2 RR
 - Treatment 3 RR-20kg N
 - Treatment 4 Control (no fertilizer)

Farm B

Nutrient management

 Fertilizer combinations and rates during the transition or conversion period

TR	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5
T 1	Control	Control	Control	Control	Control
T2	100% IF	100% IF	100% IF	100% IF	100% IF
T3	100% OF	100% OF	100% OF	100% OF	100% OF
T4	50% IF +	25% IF +	100% OF	100%	100% OF
	50% OF	75% OF			
T5	75% IF +	50% IF +	25% IF +	100% OF	100% OF
	25% OF	50% OF	75% OF		
T6	25% IF +	100% OF	100% OF	100% OF	100% OF
	75% OF				

Farm A

Transitional performance of different rice-based cropping patterns under outright organic conversion



□ Yield of Component Crops

✓ Rice (Base Crop)

Yield trend shows that yield is high in the first two years then gradually decreases from the third to the fourth year after which, a slight increase in yield was observed.

Farm A (Yield trend of Rice as affected by different CP)



Generally, yield was highest in the first year of the conversion period

Figure 3. Yield trend of rice under CP 1C, CP 4A and CP 4B (rice-tomato-mungbean)

Yield was highest when green manure is applied.

Insect Pests and Natural Enemies



Initially, there was a high population of insect pest but it gradually decreases as the conversion progresses. Conversely, there was an observed population build-up of natural enemies

✓ Corn





Fig 5. Yield trend of corn (after rice) as affected by different OF rates

- Yield decreased from the 1st year through the 3rd then gradually increased thereafter
- Without GM (CP 1A) the highest rate of OF application (T1) could be considered in order to produce the highest possible yield
- With GM, the lowest rate of fertilizer application (T3) is suggested considering the comparable yields obtained. Between the two manuring options, MIM could be considered in order to benefit from the economic yield of the GM crop of which could be reflected as additional income of the farm in conversion.

✓ Corn



Insect pests were most prevalent during the first two years of the conversion period but gradually decreases while the population of natural enemies was observed to build-up from the second year onwards.





Yield trend follows that of the other crops where yield is lowest in the first two years then gradually increases

Fig. 7. Yield trend of garlic as affected by the different OF rates in an abrupt organic conversion scheme

- Regardless of the rate of fertilizer applied comparable yields could be obtained. In this case, the lowest rate (RR-20kg) is a good option in order to reduce production cost.
- Green manuring (MIM) is a good option in order to benefit not only from the economic yield but also on the perceived effect on soil fertility.

✓ Garlic



Thrips was the most prevalent insect pest documented, its population was higher as the crop matures. Natural enemies include coccinelid beetle and spiders.

✓ Tomato





Low yield was initially obtained. A progressive yield increase was observed except in the last year.

Result suggests the high potential of tomato for organic production management system during the conversion period as evidenced by the good yield obtained.

Higher yield was obtained when GM is employed. In this case, MIM is a good option to benefit from the yield of the GM crop which is reflected as additional income of the farm in conversion.

✓ Tomato



Figure 10. Insect pests and natural enemies population within the organic tomato farm under abrupt conversion scheme from 2011-2014

As the conversion period progress, there is a notable decrease in insect pest count on all species. Population count of the natural enemies was also noted to increase

Farm B

Transitional performance of different rice-based cropping patterns during the gradual organic conversion period



Component Crops

✓ Rice (Base Crop) 4- TREATMENT 6

Yield significantly differs among treatments in all cropping patterns in the 4-year conversion period

✓ Rice (Base Crop) – Yield trend

All plots applied with pure IF consistently produced the highest yield in all CPs and throughout the conversion period. The control produced the lowest.

- Fig \succ As the conversion progresses and the amount of IF is decreased, yield from those applied with combination of IF and OF increases and at some point comparable with those applied with pure IF
 - The combination of IF and OF regardless of the ratio produced higher yield than the control.
 Most promising is the initial application of 75%IF + 25% OF ratio.

✓ Corn





Initially, no significant differences on yield were observed among treatments. From the second year onwards, pure IF significantly produced the highest yield.

- Most prevalent among the insect pests documented were thrips, katydid, and cornborer. Higher population was observed on treatments with higher amounts of IF.
- Natural enemies include coccinelid beetle and spiders.

✓ Garlic



- Initially, all treatments except T6 produced comparable yield.
- After which, all treatments applied with fertilizer produced a comparable yield which is significantly higher than the control



- The most prevalent insect pest was thrips
- Population count markedly decreased in the last year
- Higher counts were observed on treatments with higher IF

✓ Tomato



- Initially, all treatments with fertilizer significantly produced higher yield
- Yield decreased on treatments with higher amount of OF
- Toward the end of the conversion period, a considerable increase in yield was observed on trts. with OF



- Higher population of insect pests was observed on treatments with higher IF
- Natural enemies include spiders and coccinelid beetle

RESULTS Soil Fertility



Fig. 35. Soil organic matter as affected by the different rates of fertilizers in a gradual organic conversion scheme.

RESULTS Soil Fertility



Fig. 32. Soil nitrogen (N) as affected by the different rates of fertilizers in an abruptl organic conversion scheme.



Under outright conversion, there is a decrease in yield toward the midconversion period after which, yield gradually increases.

 Without green manure, corn yield increased with the application of the recommended fertilizer rate using organic fertilizer

With green manure, high yield is obtained with lower rate of organic fertilizer

 For garlic, the application of fertilizer irrespective of the rate and GM produces higher yield.

Tomato has the highest potential for organic production management system as evidenced by the high yields obtained throughout the conversion period

Under gradual conversion, highest yield is obtained initially when IF is applied in combination with OF. As the conversion progresses and the amount of OF is increased, a corresponding increase in yield is expected until farm is fully converted

For the DS crops, yield in the first year is high then gradually decreases but midway to the conversion period yield starts to increase.

Insect pest population is higher during the initial stage and gradually decreases as the conversion period progresses.

As the insect pest population decreases, there is a corresponding increase in the population of natural enemies



The application of organic fertilizer, either singly as compost or with GM applied either at flowering or at maturity, does improve soil fertility.

A comparable yield is produced when mungbean is incorporated either at flowering or at maturity.



Soil N and OM increases after the conversion period.

RECOMMENDATIONS

With green manuring, application of the lowest rate of fertilizer is recommended to reduce production cost.

Tomato is highly recommended as a component crop during the conversion period.

There is a need to develop an effective organic pest management strategy for solanaceous crops.

When mungbean is used as green manure crop, it is recommended that incorporation be done at maturity (after at least two priming)

Gradual conversion is recommended so as not to experience an abrupt decrease in yield during the conversion period.



When abrupt conversion is preferred, green manuring is recommended.

Thank you!

