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Health and Environmental Implications of Organic Rice Farming in the Philippines

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ABSTRACT

Organic rice production systems is not an entirely new concept in the Philippines. The enactment of the Organic Agriculture Act of 2004 created a policy environment to move the industry forward. In this study, the term organic farming practitioners refer to practitioners of organic including those that are not yet certified. This consideration is made because the focus is not on the marketability of the produce but rather on the health and environmental impact of the organic production system as compared to chemical based agriculture or conventional rice farming system. Through this study, it was revealed that both organic farmers and conventional farmers perceive organic rice production system as a much safer alternative to conventional means. Both classification of farmers also attributed positive health and environmental effects to organic rice production systems. However, rice farmers in general find it difficult to quantify or put monetary equivalents to these positive health and environmental effects. An interdisciplinary approach in assessing these positive externalities is highly recommended for an in-depth socio-economic valuation in the future.

Keywords: organic agriculture, externalities, health, environment

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HEALTH AND ENVIRONMENTAL IMPLICATIONS OF ORGANIC RICE FARMING IN THE PHILIPPINES

Agnes C. Rola and Guinevere T. Madlangbayan

I. INTRODUCTION

Organic agriculture presents an alternative way of farming perceived by many as akin to a safer, healthier, better, farmer-friendly production system. All over the world, there has been an on-going debate on the merits of the organic farming system. The organic movement was largely propelled by the increasing demand of Western countries for safer food. Sahota, A. (2014) reported that the sale of organic food and drink reached US 64bn in 2012. He added that while demand for organic food is growing much of it is concentrated in two areas only, Europe and America. While it Europe and America have a trade agreement the rest of the organic producing countries were not included. This is further compounded by the fact that international trade on organic products are laced with stringent standards.

In Asia, demand centers for organic products also remain in the affluent countries. The rest of the Asian countries focus on the production and are mainly geared towards the export market (FiBL and IFOAM, 2012).

In the Philippines however, the organic agriculture movement was instigated by a research conducted at IRRI to look into the implications of chemical based agriculture. An NGO called Farmer Assistance Board published "Profits from Poison" which revealed the impacts of chemical based farming. This was followed by the publication of "The Miracle That Never Was" a book which showed that Filipinos were economically better off before the introduction of Green Revolution in the 1960's (UNESCAP, 2002). This gave birth to a farmer-scientist organization aptly called *MASIPAG (Magsasaka at Siyentipiko para sa Ikauunlad ng Agham Pang-Agrikultura),* a non-profit non-stock organization comprised of farmers and scientists. Organic farming was seen as viable alternative to chemical based farming which was found to have an impact on farmer's health (Rola and Pingali, 1993 among others) and the environment (Pingali and Rogers, among others).

In a study conducted by Ara (2002) it was mentioned that farmers can benefit from organic agriculture in two ways. First, is on lowering the cost of production and second is on the positive effects on the environment, biodiversity, soil and water quality, and health of the farmers. Ara (2002) also attributed soil acidity, water pollution, and death of beneficial insects to the intensive use of chemical fertilizers.

A UNEP-UNCTAD (2008) study looked at the different cases of organic farming in Africa. The case studies concluded that organic farming help farmers better

understand the farming system and makes the environment resilient to stress. Nemes (2009) cited an IFAD study conducted in 2005 which study revealed that of the 30 farmers who worked in the organic fields not one felt nauseous after working in the farm. Meanwhile, more than half of the farmers who worked in the conventional farms felt nauseous and vomited. Several literatures compiled by Nemes (2009) mentioned the benefits of organic farming include: presence of 10-60 percent more healthy fatty acids in dairy, 5-90 percent more Vitamin C and 10-50 percent higher phytonutrients, higher minerals and dry matter, 30 percent lower cases of eczema and allergy complaints from 14,000 children fed with organic and biodynamic food, increased fertility in animals fed with organic feed as well as better immune parameters.

A meta-analysis on the environmental impacts between organic and conventional farming revealed that organic farms on average have a much higher organic matter content. This translates to better soil condition characterized by being a habitat for microorganisms, having high filtering and buffering capacity and lower erosion incidence. The study also established that organic farming have better scores in greenhouse emissions and nitrate and phosphorous leaching as compared to conventional farming.

More studies are needed to put values and gather more evidence on the positive impact of organic agriculture. We report of the assessment study (BAR, 2014) to determine indicative health and environmental benefits of organic rice farming. No formal economic analysis was done due to the paucity of technical data to do this.

II. METHODOLOGY

This study gathered data through focused group discussions and farmer survey on organic rice farming practitioners and conventional rice farmers. By definition the term ‘organic’ is used as a labeling term (Philippine National Standards for Organic Agriculture, PNS,/BAFPS 07:2003). As such, the term organic rice farming practitioner was adopted in this study as data for certified farmers and non-certified farmers practicing organic rice farming methods were combined. This definition is adopted because the focus of the study is on health and environmental effects rather than on the marketing aspect. Likewise, the term conventional farming practitioner is used to refer to farmers who employ chemical based agriculture. Camarines Sur, Iloilo, Negros Occidental, and Negros Occidental were chosen as study sites because these areas were known for having early organic rice faming adoptors. The frequency of respondent per mode of data collection per study site is summarized in Table 1.

Table 1. Frequency of respondents by classification

Item	Organic Rice Farming Practitioners (ORFPs)	Conventional Rice Farming Practitioners (CRFPs)	Total
A. FGD			
Camarines Sur	29	31	60
Iloilo	42	47	89
Sub-Total	71	78	149
B. Farmer Survey			
Camarines Sur	53	34	87
Iloilo	26	54	80
Negros Oriental	25	0	25
Negros Occidental	5	0	5
Sub-Total	109	88	197
TOTAL (A+B)	180	166	346

A. CONCEPTUAL FRAMEWORK

This study focuses on the positive externalities brought about by the adoption of the organic farming system in selected rice producing areas in the Philippines. OECD defined externalities as situations where the effects of production and/ or consumption of a good or service imputes cost (negative externality) or benefits (positive externality) which are not reflected in the price charged for such good or service.

Naughton (2013) explained positive production externality using Figure 1 below. In this illustration, it can be seen that the private costs are higher than social costs ($MC_{Private} > MC_{Social}$). He also explained that the quantity traded is lower than the optimal quantity that should be traded ($Q_{Mkt} < Q_{Opt}$) because the market price charged is initially higher than the optimal price that buyers should pay ($P_{Mkt} > P_{B\text{-}Opt}$).

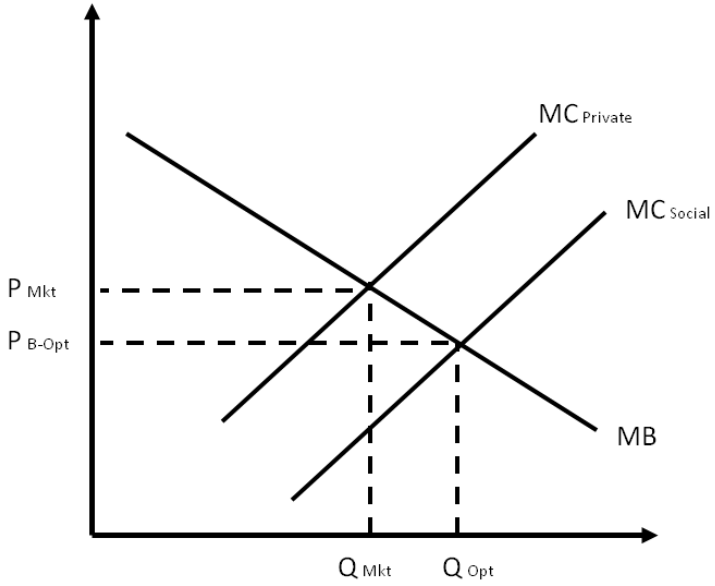

Figure 1. Positive externalities, (Naughton, 2013)

III. RESULTS AND DISCUSSION

A. Health Effects

FGD and farmer survey were used to ascertain the perceived effects of organic rice farming system and conventional rice farming system to the health of rice farmers. Table 2 presents a list of these effects. Based on the list provided by ORFPs and CRFPs, it can be deduced that rice farmers in general attribute negative health effects to conventional rice farming systems. ORFPs who have been using organic farming methods attributed positive health effects to organic rice farming. CRFPs on the other hand, have not yet tried practicing organic farming and so their perception on its plausible positive effects may be limited. In the FGD, the positive health effects mentioned include: (1) avoidance of certain diseases, (2) chance at a longer life span, (3) promotes healthy lifestyle, (4) younger body and mind, and (5) “feel good” effect. At the same time, negative health effects attributed to conventional farming system include: (1) becoming unconscious after spraying, (2) experiencing asthma attacks, lung problems, heart ailments, (3) feeling dizzy, extremely tired/ vomiting after spraying, (4) suffering from cancer, tuberculosis, (5) coughing, (6) skin irritation, (7) over fatigue, (8) cancer and diabetes, (9) death secondary to illness due to spraying. The CRFPs also attributed negative health effects to conventional farming systems. The CRFPs list include: (1) cancer, (2) asthma, (3) ulcer, (4) high blood pressure, (5) pneumonia, (6) rheumatism, (7) over fatigue, (8) dizziness, (9) lung failure, (10) heart

failure, (11) nausea, (12) skin irritation, (13) toenail deformation, (14) aggravate wound infection, and (15) shorter lifespan.

Table 2. Health effects of organic rice vs. conventional rice farming, by farmer type, FGD results, 2013

Health Effects	ORFPs		CRFPs
	Organic Rice Farming	Conventional Rice Farming	Conventional Rice Farming
Positive Health Effects	(1) Avoidance of certain diseases (2) Chance at a longer life span (3) Younger body and mind (4) "Feel Good" effect		
Negative Health Effects		(1) Becoming unconscious after spraying (2) Experiencing asthma attacks, lung problems, heart ailments (3) feeling dizzy, extremely tired/ vomiting after spraying (4) Suffering from cancer, tuberculosis (5) coughing (6)skin irritation (7) over fatigue (8) cancer & diabetes (9) death secondary to illness due to spraying	Cause illnesses such as: (1) Cancer (2) Asthma (3) Ulcer (4) High blood pressure (5) Pneumonia (6) Rheumatism (7) Over fatigue (8) Dizziness (9) Lung failure (10) Heart failure (11) Nausea (12) Skin irritation (13) Toenail deformation (14) Aggravate wound infection (15) Shorter lifespan of farmers

Farmer Survey

Using farmer survey, ORFPs and CRFPs were asked about their perception on the health hazards of producing conventional rice. Table 3 presents the percentages and the number of rice farmers who got sick while producing conventional rice. Although the number of rice farmers who said they did not get sick, 40% is still considered a relatively large number of rice farmers who said that they did get sick while producing rice in a conventional way. The type of illness associated to conventional rice farming method were: cough, asthma, and headache. A slightly higher number of farmers (54%) consulted a medical doctor as compared to those who opted not to consult a doctor

(45%). The illnesses mentioned were not debilitating in itself but it could be a symptom of a much more serious illness.

A chi square test of independence conducted using these variables revealed a *p* value of 0.34, considering 5% as the level of significance, the result is significant however, it revealed a Phi coefficient of -0.151. This means that there exists a weak significant relationship between experiencing illness and the farming system employed.

Table 3. Perception of rice farmers on health hazards of producing conventional rice, farmer survey results, 2013

Perception	Organic (n=109)		Conventional (n= 88)		TOTAL (n=197)	
	N	%	N	%	N	%
Experienced illness while producing conventional rice						
Yes	37	34	43	49	80	40
No	72	66	45	51	117	60
Total	109	100	88	100	197	100
Type of illness[a/]						
Cough		14		26		20
Asthma		24		9		16
Headache		14		14		14
Consulted with a medical doctor						
Yes		49		58		54
No		51		40		45
No response				2		1
Total		100		100		100

a/- percentages were derived using multiple response

B. Environmental Effects

B.1 Soil

FDG Results

The farming system employed may have an effect on the soil. As such, rice farmers were asked to compare the effect of organic rice farming and conventional rice farming methods on the soil. Table 4 shows that ORFPs attributed positive effects to organic rice farming and negative effects on conventional rice farming. Both categories of farmers, however, were agreed that the conventional rice farming system has a negative effect on soil. Alteri, M.A. and C.I. Nicholls (2003) noted in their study that

the ability of a plant crop to resist certain pest and diseases is related to the physical, chemical and biological properties of the soil.

Table 4. Effect of organic rice farming vs conventional rice farming on soil, by farmer type, FGD results, 2013

Effects on soil	ORFPs		CRFPs
	Organic Rice Farming	Conventional Rice Farming	Conventional Rice Farming
Positive Health Effects	(1) Lowers acidity/ improves soil pH (2) Absence of chemicals in the soil (3) Presence of helpful microorganism (4) Increased water holding capacity		
Negative Health Effects		(1) Makes soil acidic (2) Lower/ poor water holding capacity	(1) Acidic Soil (2) Soil nutrient depletion (e.g. zinc deficiency) (3) Change in soil structure (low water holding capacity) (4) Low soil fertility

Organic rice farming appear to improve soil acidity, soil structure, and overall soil quality. Helpful microorganisms in the soil were observed to have been present as well. Increased water holding capacity helps farmers during dry season as this could spell lower costs on irrigation. Alteri, M.A. and C.I. Nicholls (2003) stated in their study that" soils with high organic matter content and active soil biology generally exhibit good soil fertility".

Conventional rice farming practice on the other hand, was seen by both ORFPs and CRFPs to have a negative effect on soil. It makes the soil acidic and makes the soil loose lowering its ability to hold water. According to CRFPs, conventional rice farming system lowers soil fertility. Bachman, L., E. Cruzada and S. Wright (2013) mentioned in their study that intensive fertilizer use had the following effect soil acidification and contamination of water (streams and ground water) due to high leaching losses.

Farmer Survey

A farm survey with 197 rice farmers respondents revealed that both ORFPs and CRFPs (69%) believe that organic farming has an effect on soil quality. The effect seen was on soil quality, soil fertility, soil structure and texture and soil acidity. These results were affirmed Bachmann (2013) in his paper where it was stated that 84% of organic farmers reported increases in soil fertility whereas only 3% of conventional farmers reported the same. A similar phenomenon is observed by J. Pandey and A. Singh (2012)

who surmised that organic farming practices aid in nutrient management by improving nitrogen fixation and by reducing nutrient leaching and stabilizes soil fertility as a result. A summary of the farm survey on the effect of organic farming on soil quality is shown in Table 5.

Table 5. Perception of rice farmers on the effects of organic rice farming to soil quality, farmer survey results, 2013.

Perception	ORFPs (n=109)		CRFPs (n= 88)		TOTAL (n=197)	
	n	%	n	%	n	%
With effect on soil quality						
Yes	87	80	49	56	136	69
No	22	20	38	43	60	30
No response			1	1	1	1
Total	109	100	88	100	197	100
Effects on soil[a/]						
Soil quality		63		47		57
Soil fertility		22		22		22
Soil structure & texture		11		10		11
Soil acidity		9		14		11
Perception on savings/ costs						
Yes		65		78		76
No		13		18		16
No response		9		4		8

a/- percentages were derived using multiple response

B.2 Water

FGD Results

The effect of organic farming on water quality is ascertained in this study using FGD. Results as seen in Table 6 reveal that ORFPs were hesitant to ascertain the effects of organic rice farming to water quality stating no water quality test has been conducted to support their claim whether positive or negative. However, when effect of conventional rice farming on water quality was asked, both ORFPs and CRFPs were quick to enumerate the negative effects. According to ORFPs, the conventional rice farming methods has the following effects (1) water in the paddy cause skin irritation, (2) fishes in the paddy die, (3) water from deep wells became salty, and (4) water is believed to be contaminated with harmful chemicals at tolerable levels.

Table 6. Effect of organic rice farming vs. conventional rice farming on water, by farmer type, FGD results, 2013

Effects on water	ORFPs		CRFPs
	Organic Rice Farming	Conventional Rice Farming	Conventional Rice Farming
Positive Health Effects	No effect was ascertained as water quality has not yet been tested		
Negative Health Effects		(1) Water in the paddy causes skin irritation (2) Death of fishes in the paddy was observed (3) Water from deep wells became salty (4) Water is believed to be contaminated with harmful chemicals at tolerable levels	(1) Contaminated water causes skin irritation (2) Water from paddies upon reaching the lakes kills fishes and other microorganisms (3) Bad odor of water from deep well (4) Salty taste of water from deep well

Farmer survey

Farmer survey to determine the effect of organic rice farming on water quality revealed that a great majority (57%) believe that it has no effect but a close percentage (42%) believe otherwise. Rice farmers who perceived organic rice farming to have an effect on water quality stated that organic practices makes water safe to humans and the natural enemies and it reduces chemical contamination of ground water, other related effects mentioned include growth of plants in ditches, increased level of water in the water table and higher yield. While most of the farmers (64%) believe that the change in water quality could be translated into savings or costs, farmers were hesitant in assigning monetary values to this change. As a result, monetary values given were arbitrary and with high variability.

The difficulty of assigning monetary values to positive externalities from agriculture was also noted in the study of Pretty J. (2001), where it was stated that several effects (particularly the cost of negative externalities) are difficult to be expressed in monetary terms and there are those which seem to be arbitrary. Pretty, J. (2001) in his study on policy changes and priorities for internalizing the externalities of modern agriculture discussed agriculture's multifunctional nature.

Table 7. Perception of rice farmers on the effect of organic rice farming on water quality, farm survey results, 2013

Perception	ORFPs (n=109)		CRFPs (n= 88)		TOTAL (n=197)	
	n	%	n	%	n	%
With effect on water quality						
Yes	38	35	45	51	83	42
No	71	65	42	48	113	57
No response			1	1	1	1
Total	109	100	88	100	197	100
Effects on water[a/]						
Safe water for humans and natural enemies		55		31		42
Reduction in chemical contamination		16		33		25
Other related (+) effects[c/]		18		22		20
Perception on savings and costs						
Yes		63		75		64
No		29		25		29
No answer		5				5
Don't know		3				2
Estimated savings/cost (in Php)[b/]						
No. of respondents	19		3		22	
Min. Value	0		500		0	
Max. Value	5,000		2,000		5000	
Average	744		1,166		802	

a/ - multiple response
b/- included 131 respondents only
c/-growth of plant in ditches, increased water table, higher yield

B.3 Biodiversity

FGD Results

ORFPs compared the biodiversity effect of organic rice farming practice with that of the conventional rice farming practice. According to ORFPs, organic rice farming practice has the following positive effect on biodiversity: (1) promotes balance between harmful and beneficial insects, (2) less odorous rice bugs, (3) presence of spiders and other beneficial insects, (4) promotes ecological balance (e.g. snakes vs. rats), and (5) presence of inland fishes, frogs and earthworms. However, ORFPs attributed the following negative effects to conventional rice farming: (1) mutation of insects, development of higher resistance to chemical insecticides, (2) eradication of beneficial insects, (3) insect resurgence, and (4) eradication of dragon flies, spiders, earthworms and inland fishes. The latter observation of ORFPs were parallel to the

observation of CRFPs. According to CRFPs, conventional rice farming methods brought about the following negative effects: (1) problem with rice bugs (needs a stronger chemical combination), (2) not all pests are killed but beneficial insects are wiped out, and (3) disappearance of frogs, native fish, friendly insects, and earthworms (Table 8).

It should be noted that the CRFPs mentioned the use of a chemical combination, locally dubbed as "cocktails". Cocktails are mixtures of two or more chemicals which provides a stronger or more potent chemical combination that are done by the farmers themselves. As such, cocktails are prohibited because of the unforeseen potential danger that may result from such mixtures in the short and long run.

Table 8. Effect of organic rice farming vs conventional rice farming on biodiversity, by farmer type, FGD results, 2013.

Effects on water	**ORFPs**		**CRFPs**
	Organic Rice Farming	Conventional Rice Farming	Conventional Rice Farming
Positive Health Effects	No effect was ascertained as water quality has not yet been tested		
Negative Health Effects		(1) Water in the paddy causes skin irritation (2) Death of fishes in the paddy was observed (3) Water from deep wells became salty (4) Water is believed to be contaminated with harmful chemicals at tolerable levels	(1) Contaminated water causes skin irritation (2) Water from paddies upon reaching the lakes kills fishes and other microorganisms (3) Bad odor of water from deep well (4) Salty taste of water from deep well

Farmer Survey

The perception of ORFPs and CRFPs on the effect of the change in the cropping pattern on biodiversity was also assessed in this study. Farmer survey results are shown in Table 9.

Between ORFPs and CRFPs, there is a difference of opinion on whether the change in cropping pattern does affect biodiversity. While ORFPs (58%) believe that a change in cropping pattern would affect biodiversity, CRFPs (52%) believe otherwise. The perceived effect of the change in cropping pattern are as follows: (1) presence of diverse kinds of insects and animals, (2) prevention of air pollution, and (3) overall

improvement in ecology/ecosystem/environment. Whether this perceived effects would be translated into costs in producing organic rice, most of the respondents answered "no". Further quantification of this statement as to actual monetary values is not available as rice farmers in general find it difficult to translate these perceived changes into monetary values.

Table 9. Perception of rice farmers on the effects of a change in cropping pattern on biodiversity, farm survey results, 2013.

Perception	ORFPs (n=109)		CRFPs (n= 88)		TOTAL (n=197)	
	n	%	N	%	n	%
Do you think there is an effect in biodiversity as a result of changed cropping pattern?						
Yes	63	58	41	47	104	53
No	46	42	46	52	92	47
No answer			1	1	1	1
Sub-total	109	100	88	100	197	100
What kind of effect on biodiversity?[a/]						
Presence of diverse kind of insects/ animal life	19	30	17	41	36	35
Prevention of air pollution	9	14	4	10	13	13
Overall improved ecology/ecosystem/ environment	6	10	5	12	11	11
Do you think that you are incurring costs in producing organic rice because of the perceived change in cropping pattern?[b/]						
Yes	14	13			14	11
No	60	55	14	64	74	56
No answer	35	32	8	36	43	33
Sub-total	109	100	22	100	131	100

a/ multiple response, listed only top 3 answers

b/ asked from 131 respondents only

B.4 Air

Farmer Survey

Perception of conventional farmers on the effect of producing conventional rice on air quality is summarized in Table 10. Based on their response, a great majority (91%) of CRFPs believe that the conventional rice farming system affects air quality. The top three perceived effects were: (1) air becomes polluted, (2) air poses health hazard when inhaled, and (3) presence of hazardous/ poisonous gas on air. While the effect mentioned were mostly negative, only thirty eight percent (38%) of the total number of respondents considered doing something about these effects. The actions taken to thwart the negative effects include: (1) lessen the use of chemicals, (2) protect self (using a mask), and (3) avoid burning of rice straw. Other suggestions to limit the effect on air include eliminating or limiting the use of pesticides and chemicals and shifting to organic farming. This proves that CRFPs also view organic rice farming as a safer and much healthier alternative to the conventional means of producing rice. Most of the respondents (71%) also expressed that the change in quality could be translated into costs or savings. However, the rice farmers found it difficult to translate their perceived effects into monetary values.

IV. CONCLUSION

This study provides indicative health and environmental implications of growing organic rice in the Philippines. In general, rice farmer in developing countries are characterized by small landholdings and a large number of them are subsistence farmers. The primary concern is the ability to send their children to school. This underscores the importance of increased crop yield and income.

Results from the FGD and the farmer survey revealed that rice farmers in general perceived the practice of organic farming as safer compared to conventional farming practice. Rice farmers in the Philippines attributed positive health and environmental externalities to the practice of organic rice production. In the same manner, negative health and environmental externalities were attributed to conventional rice farming.

Perceived health benefits in organic rice farming include longer lifespan. Environmental benefits on the other hand, include increased biodiversity, improved quality of water in the paddies, better air quality, improved soil quality. Although, the perceived benefits are astounding in itself, farmers still find it difficult to assign monetary values to these types of benefits as such a more rigid study on externalities with in-depth technical descriptions and definitions is necessary in order to come up with a sound economic analysis of the perceived implications. Overall, what the study has provided is an indicative health and environmental benefit assessment associated with the practice of organic rice farming in a developing country.

V. RECOMMENDATION

Cognizant of the fact that while organic agriculture has been formally introduced as an alternative farming system, much work is needed to fully implement any organic agriculture program in the Philippines. As such, the study recommends that a multidisciplinary team look into the various agro-technical details, environmental impact and sustainability analysis into the practice of organic rice farming. Technical experts are needed to come up with the coefficients needed in the valuation of benefits of organic agriculture. For example, improved soil quality attributed to farming and how it contributed to increases yield would be an interesting study. The same is true in investigating the relationship between improvements in higher quality and improvements in yield. Improvements in yield due to higher biodiversity index can be a requisite study towards the economic valuation of the impact of organic production.

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