INDIGENOUS KNOWLEDGE SYSTEMS AND ORGANIC FARMING TECHNOLOGIES: FARMERS ACCESS TO COMMUNITY TECHNOLOGICAL LEARNING

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ABSTRACT

A field study was conducted to document the indigenous and organic farming technologies in selected communities of Southern Luzon Philippines. It was intended to help farmers to be more aware of their well-being and the weakening balances on the environment due to intensive use of agrochemicals. The methodology employed in this study includes physical observation and questionnaire surveys that consisted of open-ended and close-ended questions addressing the farm management skills on indigenous and organic farming practices of farmers. Focus group discussions and formal interviews of key farmer leaders were also carried out. Results were disseminated to a wider audience of stakeholders through learning and information exchange activities. The research findings showed that there were indigenous farm methods that have been practice in the different agro-environments for generations; and farming technologies that are based on organic farming principles but modified to fit the ecological conditions of a given farm setting. There are practices/technologies representing successful ways by which farmers have dealt with pest problems and poor soil quality; and their valuable experiences are shared to other farmers' communities. Collated practices and technologies were categorized as (i) use of synthetic and natural materials (ii) based on traditions with biodynamic farming principles, and (iii) use of plant extracts based on 'nature farming' principles. The potentials of these farming practices and/or technologies to area of similar agro-environment were also evaluated by conducting validity assessment and participatory activities in other selected communities. Results such as these showed the ingenuity of the farmers in improving indigenous practices into modern technologies considering its effect on soil, plant, human and ecosystem health.

Key Words: organic farming, indigenous knowledge, technological learning, nature farming,

Introduction

Agriculture in the Philippines has gone through major changes during the late century. It has developed from more or less extensive subsistence farming to intensive agricultural production that is highly dependent on pesticides and chemical fertilizers. It holds the key in maintaining the country's food security, alleviation of poverty, and survival of the existing and future population. The staggering increase in the use of synthetic farm chemicals in the past few decades have not resulted in a similar increase in crop yields, instead it affects substantial environmental damages to the country's water and soil resources. Tirado and Bedoya (2008) reported that the application of synthetic fertilizers in the country from 1961 to 2005 had increased by 1000%, but the yields of rice and maize had increased only by 200 and 280%, respectively. Similarly, the use of pesticide had increased by 325% from 1977 to 1987, but rice yield had increased only by 30%. Resource generation and conservation are now considered important goals, given the concern for long-term sustainability. It is therefore important to preserve this local knowledge of farmers before they may be lost forever.

Local knowledge or Indigenous knowledge (IK) is the knowledge belonging to a specific community or local group and that the people in a given community have developed over time, and still continue to develop (Grolink, 2005). It is based on the experience, often tested over years of use, adapted to local culture and environment and as their basis for natural resource management. Indigenous practices are part of the existing indigenous knowledge seen in communities or the focus might be on the long history of the practice, in which case it is also known as traditional farming practices. Indigenous knowledge is dynamic and is also depicted as a non-conventional body of knowledge dealing with theory, beliefs, practices and technologies developed without direct inputs from the modern, formal, scientific establishment, and towards the management of farms (Chambers *et al*., 1989; Gilbert *et al*., 1980). Haverkort and De Zeeuw (1992) defined it as an actual knowledge of a given population that reflects the experiences based on traditions and includes more recent experiences with modern technologies . It is not confined to tribal groups or the original inhabitants of an area. It is not even confined to rural people. Rather, any community possesses IK: rural and urban, settled or nomadic, original inhabitants and migrants (Grolink, 2005)

Organic farming in the Philippines, in relation to the increasing awareness of the agricultural sector on health and wellness, are now at the dawn of transforming agricultural production from quantity-driven to quality-driven. Organic agriculture in the country is at its infancy stage. Executive Order 481 "Promotion and Development of Organic Agriculture in the Philippines" was an Executive Order signed by President Gloria Macapagal-Arroyo that seeks to establish the Philippines as an organic capital of Asia (Pangga, 2008). This initiative was followed in July 2010 by the signing of Republic Act 10068 (commonly known as Organic Agriculture Act of 2010) 'An Act Providing for the Development and Promotion of Organic Agriculture in the Philippines and for Other Purposes'. Establishing Philippines as an organic capital of Asia requires great alteration on the chemical-dependent agriculture. The concept of organic agriculture is very ideal but there is a question to be answered, "Is organic agriculture really the answer towards sustainability?" To ensure that organic agriculture is the answer to the sustainability problem, it has to be adapted to the local farming, social, geographical and climatic factors (Kristiansen *et. al*, 2006). Thus, the need to explore the different farming practices employed by local farmers may provide deeper understanding and great impacts on the organic sector. This project was conducted to document the indigenous/traditional knowledge and organic farming practices and technologies in selected communities of Southern Luzon Philippines. It was intended to help farmers become more aware of their well-being and the weakening balances on the environment due to intensive use of agrochemicals. The research project also aimed to increase capability of farmers and other stakeholders in solving the constraints on crop production that will enhance soil productivity and sustainability.

Materials and Method

Resource assessment and site characterization of the different farming systems in selected provinces (Cavite, Laguna, Batangas, Rizal and Quezon) of Southern Luzon Philippines was conducted. In order to assess and analyze the potentials and suitability of documented local farming practices or technologies to area of similar agro-environment, agro-climatic data from existing agro-meteorological stations at the selected provinces were collected and analyzed. Some missing data are attributed to defective weather instruments and devices. Two important weather parameters, rainfall and temperature, were gathered from Philippine Atmospheric Geophysical and Astronomical Services Administration (PAGASA) stations within each provinces (Appendix Table 1).

This study was implemented in collaboration with local government units and agencies of selected provinces in the region. Semi-detailed surveys were conducted, and data consist of the following information: soil and cultural management (crop grown and variety, cropping pattern, soil conservation and soil fertility management practices, crop protection, crop yields) and socioeconomic-determinants. Farm management skills on the indigenous/traditional practices of farmers were documented mostly in rice and vegetable areas. Focus group discussions in selected communities were facilitated to gather actual farmers' farming experiences. A formal interview of key farmer leaders in identified provinces using survey forms were also carried out. The questionnaire was administered to each of the municipalities under studied, and information obtained from the surveys was complemented by interviews of local officials in the relevant departments. Results of the project

were disseminated to a wider audience of stakeholder (farmers, community development workers, local government units, research institutions, organic producers and traders) through learning and information exchange activities such as seminars, farmers' forums and training of farmers. Technical assistance was also provided in the use of local available resources and maximizing the ability of farmers to intensify production within the existing economic environment. There were also study tours ('lakbay-aral) on best farmers' field, research and demonstration farms to consummate an effective and sustainable production system.

Results and Discussion

Majority of the vast lands in Southern Luzon, described with flat, undulating and sloping topography, are used mainly for agricultural production. This region possesses copious indigenous organic farming practices because history imparts that these areas have long been agricultural lands with rich natural resources. These practices have found to exist and were retrieved from local farmers and key informants of different municipalities in the region. Research findings showed that there were site-specific management strategies that have been practiced in the different agro-ecosystems for generations; and farming practices that were based on organic farming principles but modified to fit the ecological conditions of a given farm setting. These practices varied in the degree of adaptability because of its environmental conditions. According to Grolink (2005), it is sometimes difficult to decide whether a technology or practice indeed is indigenous, or adopted from other places or a blend of local and introduced components because indigenous knowledge changes over time. There are also local practices in the lowland and upland communities that have never been recognized and are replaced by modern technologies. Many countries worldwide have already proven that organic and sustainable agriculture can provide sufficient food, increase food security, replenish natural resources and provide a better livelihood for farmers and local communities (Badgley *et al*. 2007).

Data collected were analyzed and categorized as (i) use of synthetic and natural materials (ii) based on traditions with biodynamic farming principles, and (iii) use of plant extracts based on 'nature farming' principles. Figure 1 presents the summary of research results and farmers' access to technological learning.

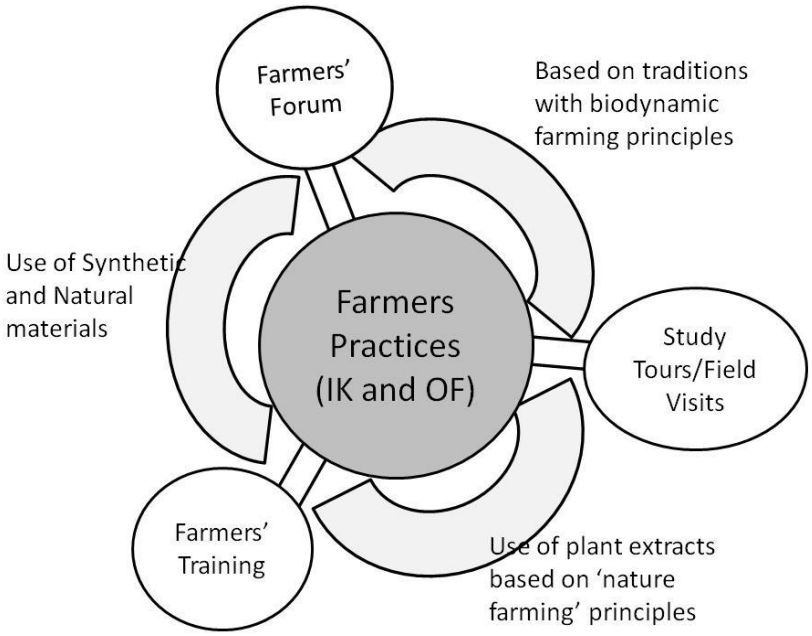

Figure 1. Farmers access to technological learning.

A. Use of synthetic and natural materials

The use of ‘small flags (‘banderitas’) made of plastic or paper sheets and strings attached to a long rope or plastic twine are examples of materials commonly used by local farmers to prevent birds from feeding on mature rice grains (Fig. 2). These small flags are placed across the rice fields before harvest. Figure 3 presents inverted coconut fronds. Coconut fronds are placed in strategic locations in the rice field in an upside down position resembling an owl or a cobra to prevent rodent infestation.

Figure 2. Use of small flags (‘banderitas’) from colored-synthetic materials

Figure 3. Inverted coconut fronds.

The use of natural materials by farmers found to be different in every province depending on the availability of plant materials. The incorporation of rice straws into lowland paddy soil and the use of straw as mulch harvested from first rice crop for use to the second crop i.e. *Brassica chinensis*, were known to be part of farm management systems in Laguna and Batangas Provinces (Figures 4 and 5). In Cavite, coffee hull collected from coffee mills are incorporated into the soil as organic fertilizer. Hargrove *et al.* (1991) reported that decomposition rates were significantly faster when residues were incorporated into soil than they were maintained in the surface. Nevertheless, surface crop residues have been found to benefit crops by maintaining cooler temperatures during critical hot spells and conserve or increase surface soil organic matter levels (Powell and Unger 1997). The use of rice hulls and straws as mulch to vegetables are common practice in the region, while the use of Anahaw (*Livistona rotundifolia)* leaves as mulching material in asparagus (*Asparagus officinalis*) production can only be observed in the Quezon province (Fig. 6).

Figure 4. Rice straws are incorporated in rice field after threshing.

Figure 5. Rice straw as mulch to *Brassica chinensis*.

Figure 6. Anahaw (*Lavistonia rotundifolia*) leaves as mulch.

'Kakawate' (*Gliricidia sepium* Leguminosae), is popularly known to farmers for its nutrient composition and pesticidal property. The availability of kakawate in most lowland and upland areas of Laguna province makes it easier to use it as fertilizers (Villegas-Pangga, 2010). The advantages of 'kakawate' as soil ameliorant were presented in the reports of Badayos and Pangga (2002) and Dela Cruz (2003). Alternative agricultural practices and the ultimate goal of a long-term sustainable agriculture depend largely upon the addition of organic amendments to soil leading to the improvement of soil quality (Parr *et al.* 1992). Pretty *et al* (2003) stated that the future of farming lies in a modern type of agriculture that works with nature and with people, not against them.

B. Based on traditions and biodynamic farming principles

Traditional stories like myths, legends and folktales are part of Filipino culture. These stories are translated into IK that differed between rural and urban societies. There were farming practices that are considered true by farmers in a certain locality, but considered fictional in another community. Chhetry and Belbahri (2009) explained that traditional beliefs, folklore, rituals and rites may not hold any truth and practical value but are expected to hold some message and therefore need in depth observation in the light of empirical sciences to discover some of these beliefs as sound

agricultural practices. Examples of these traditional practices are: rice grains in flat containers are placed uncovered in the rice field as peace offering to rodents while the farmers are talking to the rodents begging not to attack his crop. Another farm practice based on the principle of biodynamic is the passing the rice seeds (for 'dapog' transplanted planting or direct planting) through dried python's mouth inserted into the bamboo to avoid the rice crop from rodent attack (Fig. 7). Reganold (1995) reported that biodynamic farming systems generally provide better soil quality, lower crop yields, and equal or higher net returns per hectare than their conventional counterparts. These statements support the results of the study that account the lunar-based planting of root crops and banana in the provinces of Quezon, Laguna, and Cavite. This is also being practiced in other countries like India wherein banana is planted during full moon (Barooah and Pathak, 2009). Kollerstrom and Staudenmaier (2001) also confirmed the 'thun effect' of biodynamic farming with regards to planting based on lunar phases and constellations.

Figure 7. Dried python's mouth.

C. Use of plant extracts based on nature farming principles

The uses of botanicals in enriching the soil and in managing pests are common in all the provinces under studied and the choice of plants depends on its availability in the locality. This includes the use of fermented plant and fruit juices of useful plants that are available in the farmers' environment. Among the documented plants, the most common are the following: kakawate or madre de cacao, makabuhay (*Tinospora rumphii* Boerl.), hot pepper (*Capsicum annuum*), kangkong or water spinach (*Ipomoea aquatica*), tobacco (*Nicotiana tabacum*) and serpentina (*Andrographis paniculata*). Most of the farmers utilized these plants as organic fertilizers and botano-pesticides. There are also resourceful farmers who formulated concoctions/plant extracts by mixing the botanicals with either brown sugar, molasses, vinegar, alcohol or charcoal.

The aspect of environmental degradation was also taken into account when these farming practices were evaluated. Results of surveys and key informant interviews revealed that there were still big number of farmers employing crop production practices which appeared to be highly profitable in the short run but likely to lead soil erosion, soil nutrient depletion, and surface-and groundwater pollution. Such consequences would outweigh the short-term profitability and cause their farm unproductive in the coming years. Changes in farming practices have accelerated soil erosion in many years as farmers shifted from traditional rotation to continuous row cropping in response to a growing population and increased need for food."Putat", Filipino name for *Barringtonia racemosa*, is a shrub grown by many farmers in the province of Quezon. As a good soil stabilizer, it is commonly planted along rice dikes and paddies, on stream banks and other upland areas that are actively eroded. Burger (1972) reported that this shrub is commonly planted to rehabilitate coastal strand vegetation and lowland woodland. "Buho" Filipino name for *Schizostachyum lumampao*, is endemic to the Philippines and local farmers planted this bamboo along the waterways. Because of these features, "buho" is used as one of the plant species conserving the soil and water in the watersheds.

To elevate the importance of these indigenous and organic farming practices, networking with Local Government Units of those provinces where farmers are interested to adopt these practices were

strengthened. The farmer cooperators of the research project established close collaborations with other farmers within their community and with farmers of other provinces to promote exchanges of their best farm practices that will help in the development of sustainable farming systems for their specific community, and for many Filipinos in general.

Summary and Conclusion

After studying the indigenous and organic practices and technologies in selected farmers' communities, and disseminating these practices to a wider audience of stakeholders through learning and information exchange activities, what is needed now is to study the potentials of these farming practices or technologies to other areas (communities) of similar agro-environment.

Leading a brighter path for small farmers in developing countries like the Philippines and providing the small farmers the access to farming technologies or best management practices would likewise be difficult, considering other factors such as the variability of socio-cultural, economic and environmental conditions among the countries. Moreover, majority of small farmers in the Philippines need farm interventions. By sharing and learning from each other's farming experiences may provide possible opportunities to other small farmers to mimic the path of successful farmers. The appropriateness and adoption of these indigenous practices and soil management systems will depend largely on their profitability and other advantages in the eyes of the farmers. The future of the small-holder farmer will be determined by his ability to maintain an economic operation while simultaneously sustaining the farms production potential.

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Appendices

Appendix Table 1. PAGASA stations of five provinces in Southern Luzon areas.

Category	Location
Agro-met Station	U. P. Los Baños, College Laguna, 4031
Surface Synoptic Station	Brgy. Lita, Tayabas Quezon 4327
Agro-met and Wind Turbine Experimental	Tagaytay City, Cavite
Upper-Air, Surface Synoptic and Radar Station	Brgy. Mayagay, Sampaloc, Tanay, Rizal 1909
Surface Synoptic Station	Brgy. Ambulong, Tanauan, Batangas 4232