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Journal of Developments in Sustainable Agriculture 4: 57-63 (2009)

Contribution of Student Research to the Accumulation of Knowledge on Farmer's Practices, Indigenous Knowledge and Conversion Process to Sustainable Agriculture at the UPLB College of Agriculture

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The interface between student research and education is best exemplified in the studies done by students as part of the requirement for graduation. With the implementation of the revised Bachelor of Science in Agriculture (BSA) at UPLB-CA in 1997, professional practice options to thesis research as requirement for graduation had been expanded to include: major (farm) practice, research internship, extension/community internship, teaching and agricultural entrepreneurship.

Since the implementation of the BSA curriculum, more and more BSA undergraduate students majoring in Crop Science (particularly in Agronomy) had opted for extension/community internship or major (farm) practice from 24 in SY 1989-1996 to 103 SY 1997- SY 2008 and had conducted on-farm research, case documentation and analyses of local practices and adaptation of sustainable agriculture practices at both farmer and community level, including indigenous communities in various parts of the Philippines.

Many indigenous knowledge systems are ecologically sound and its contribution in enriching scientific and technical knowledge on sustainable agriculture cannot be overemphasized. Some of the students' outputs include indigenous agricultural practices of indigenous people focusing on indigenous practices for genetic conservation, farm diversification as a common strategy used by all tribes to ensure household food security and pest management, seeds storage using local materials are effective means of conservation and the indigenous people use practical indicators on site selection, determination of fertile soils, appropriate seeds/planting materials and practices that have sound scientific (such as seed rejuvenation, seed storage) and has ecological basis (such as nutrient recycling, pest management, soil and water conservation and fallow period).

Similarly at the post-graduate level, there were students who have had conducted their MSc thesis on indigenous seed management, knowledge and rice production practices of the Maranaos in Lanao del Sur, seed management of a Manuvú community in Mindanao, and documentation of farmer's approaches in the conversion process from conventional to sustainable agriculture. Some key findings of these studies include economic and environmental considerations as the major reasons farmer convert from conventional to sustainable agriculture, input substitution done in small parcels of land is adopted to minimize risk of failure and also allows farmers to gain experience and gradually expand the practice to their farm; and building up farm resources is essential in the conversion process.

These students' outputs have enriched the knowledge base on sustainable agriculture technologies in the areas of seed conservation, storage, rejuvenation, and utilization, soil and water conservation, diversification strategies, nutrient recycling, fallowing and pest management. This knowledge base has been used by faculty in the courses that they are teaching at the University.

The challenge of adopting and implementing sustainable agriculture is that it is culture and location specific. Researchers learn to develop approaches in working with indigenous people recognizing that their experience of survival in marginal conditions has great contribution in development strategies and in building and strengthening some indigenous knowledge and practices.

Received: October 31, 2008, Accepted: November 14, 2008

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Key words: sustainable agriculture, student research, indigenous people

Introduction

The curriculum of the Bachelor of Science in Agriculture (BSA) course at the University of the Philippines Los Baños College of Agriculture was revised in 1997 in response to the need to focus more on the integrative and interdisciplinary nature of agriculture, and to balance the emphasis on the biophysical, ecological, socio-cultural, and political dimensions of agriculture with sustainable agriculture (SA) as the overarching principle. One of the changes in the revised curriculum was the provision of several professional practice options. In addition to the thesis by research, students can choose from major (farm) practice, research internship, extension and community internship, teaching, or agricultural entrepreneurship. These professional practice options were provided to 1) accommodate variations in students' interests, 2) address changing demands in the expanding job market for agriculture graduates; and 3) make available to students options to the thesis or laboratory work. This paper aims to provide documentation and analyses of how student research through the professional option enrich the knowledge base on SA particularly on farmer's practices, indigenous knowledge and conversion strategies from conventional modern agriculture to SA.

Choice of the Professional Practice Option

Although the revised curriculum was implemented only in 1997, the integration of sustainable agriculture (SA) concepts and principles in UPLB was initiated as early as 1989–1990 by some professors who were already engaged in research on SA. Information on the professional practice options chosen by students from different major fields from 1989 to 2007, from the Office of the College Secretary of the UPLBCA, revealed the number of students who graduated from each field: 41% in animal science, 27% in horticulture, 13% in agronomy, 9% in plant pathology, 6% in entomology, 4% in soil science, and 1% in agricultural extension (Fig. 1). About 50% of students chose the thesis option, 48% for major farm practice, and the remaining 2% for the research internship and teaching (Fig. 2). Teaching as an option is the least popular with only two students. This is partly due to the unavailability of faculty members who are willing to accept students opting for this option. The various options are designed to temper the theories and principles learned in the classroom that tend to emphasize on ideal or assumed conditions, with realities and actual difficulties obtained in the farm (Zamora and Sumayao, 1999).

Students who opted for the major farm practice wanted hands-on field experience and exposure to the realities in the field, farm, or community, in addition to the actual learning experiences and sharing of knowledge by farmers. These students also developed social skills in dealing with people from different backgrounds and status. Students who opted for the thesis option aimed to develop their research skills and to obtain employment in research institutions after graduation. Most of them were interested in pursuing graduate studies, although several who opted for the farm practice option were also suited to graduate studies. The number of students who preferred the farm practice option could have been more than the number recorded, since some professors advise their students to pursue thesis research owing to limited placements for farm practice or community intern-

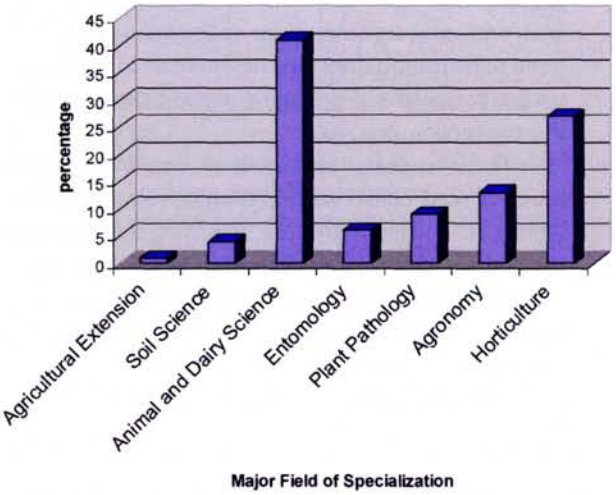

Fig. 1. Distribution of BSA students according to field of specialization, 1989–2007.

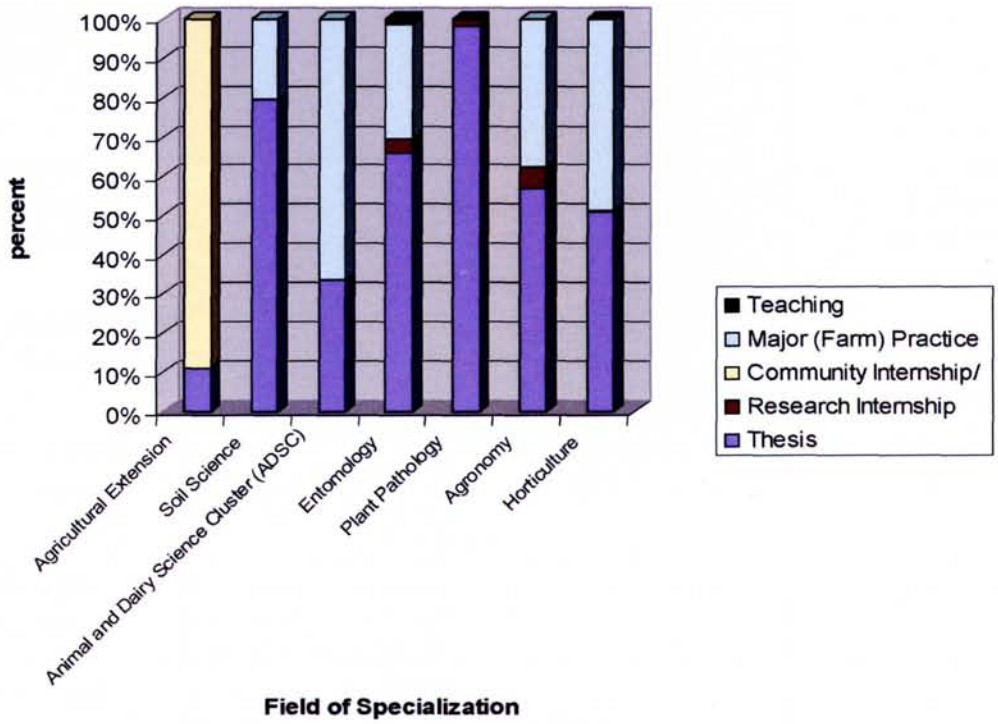

Fig. 2. Distribution of students according to major practice option, 1989–2007.

ships. Teaching option is for those who plan to stay in the academe after graduation and teach courses in their field of specialization or agriculture in general. Agricultural entrepreneurship is a good experience and training ground for those who want to establish agriculture related business when they graduate. Research internship is a growing option, as more research programs and research laboratories are being developed and made available for UPLB students.

Research Topics Related to Sustainable Agriculture

A survey of studies and researches done in the past 18 years covering the period of 1989 to 2007 was undertaken. Data were gathered from the university library and were categorized under topics related to sustainable agriculture. Undergraduate students studied integrated nutrient and pest management (26%), farming systems (24%), decision support systems (10%), improvement of indigenous crops and livestock and collection of seed and animal banks (7%), soil and water conservation (7%), cropping systems (7%), and agroforestry (7%). In integrated nutrient and pest management, many students focused on the use of organic amendments in relation to soil properties, pests, and productivity, and on pest management strategies. Studies on farming systems were designed to expose students to actual conditions and to train them in interdisciplinary methods and applications of scientific inquiry in promoting the sustainability of agricultural production systems.

Within crop science, students conducted on-farm researches, case documentations and analyses of local practices, and adaptation of SA practices at both farmer and community levels, including in indigenous communities in various parts of the Philippines. Many indigenous knowledge systems are ecologically sound, and their potential contribution to the enrichment of scientific and technical knowledge of SA cannot be overemphasized.

Studies by Students Related to Sustainable Agriculture

Work with Indigenous People

Seven undergraduate and two graduate students in crop science studied the indigenous agricultural practices of the Alangan Mangyan of Mindoro Oriental, the Molbog and Batak of Palawan, and the Tulgao and Imangali of Kalinga, Manuvu of Davao (Fig. 3). These tribes are scattered in various

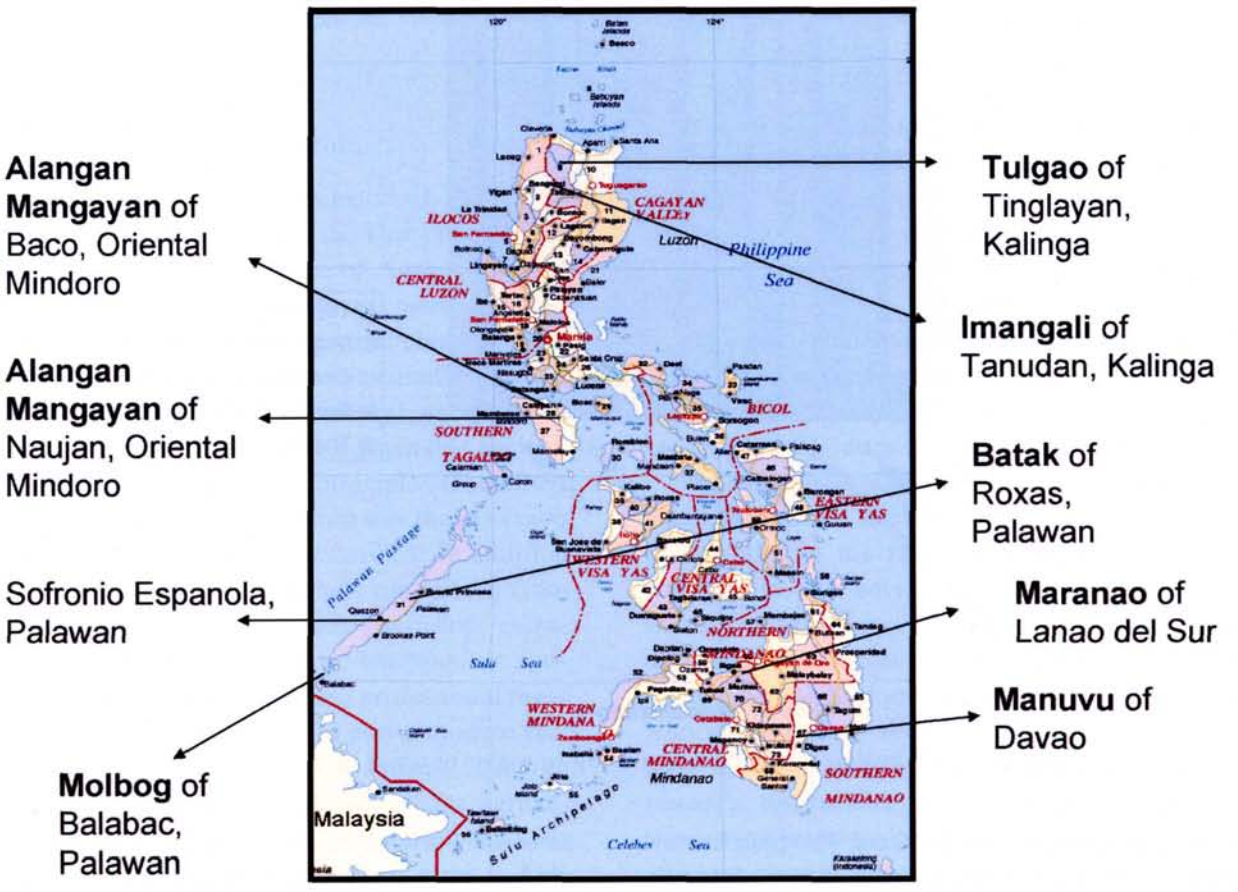

Fig. 3. Location of tribes in the study.

parts of the country. These studies documented the sustainable practices and biodiversity conservation methods of the indigenous people. The students spent a month or so immersed in the communities.

These indigenous people are generally upland dwellers engaged in shifting cultivation, but a few are moving towards a permanent or settled farming system. Their farms can be considered as field gene banks of local food crops, and can be characterized by species and varietal diversity, being planted mainly with rice (de Jesus, 2001) and root crops (Hilario, 2000; Resuello, 2003; Bequillo, 2004; Lopez, 2005). The indigenous people grow an average of six or seven species with a minimum of three landraces of each species, often in an area of less than half a hectare. Common indicators for site selection include the type of vegetation (Hilario, 2000; de Jesus, 2001; Resuello, 2003; Bequillo, 2004; Lopez, 2005; Vanzuela, 2005; Isican, 2006) and the soil color (Hilario, 2000; de Jesus, 2001; Resuello, 2003; Bequillo, 2004; Isican, 2006). Black soil is preferred because the color indicates high organic matter (Zamora, 1995), unlike red soils, which usually are highly acidic. The presence of big trees and good growth of weeds indicate fertile soil. Presence of *Imperata cylindrica* and *Saccharum spontaneum* (family Poaceae) indicates acidic soil (Zamora, 1995). Since areas of shifting cultivation are fragile due to steep slopes, the dibble method of planting (Fig. 4) is practiced to minimize erosion. The indigenous peoples are aware that the soil needs time to rejuvenate for high productivity in the next cropping, and allow a fallow period of five (5) to seven (7) years. However, most are now shortening the fallow period to 3 years because of limited land, increasing population, and encroachment of lowlanders. They plant several seeds to ensure germination of at least one, and thin to the healthiest plant. To maintain planting materials, the Mangyan plant crops in an uncropped field (Resuello, 2003). This also conserves plant genetic resources by reducing the risk of losing landraces to biotic and

Photo by: Vanzuela, 2005

Fig. 4. Use of the common dibble planting method minimizes soil erosion.

Photo by: de Jesus, 2001

Fig. 5. The *pud-pu-sit,* a handmade bamboo sprayer that sprays pounded sunflower leaves to control insects.

Photo by: Hilario, 2000

Fig. 6. Cut logs are placed along boundaries to control erosion, and crops are planted across the slope to minimize runoff.

abiotic stresses. The indigenous peoples may not be familiar with green manuring or composting, but weeds are recycled or are allowed to decompose within the farm (Hilario, 2000; Lopez, 2005) to help rejuvenate the soil. They are keen observers of the changes in the environment and the behavior of animals towards changes in weather; for example, certain clues signal that it is time to plant (Isican, 2006). The Alangan Mangyan grow medicinal plants, such as *alagaw* (*Prema odorata,* family Verbenaceae) to treat pig scours, and bathe animals in chopped banana (*Musa* sp.) plant and *kakawate* (*Gliricidia sepium,* family Fabaceae) with soap to cure scabies (Resuello, 2003).

Many of the pest management practices have a sound scientific basis requiring follow-up research. The Tulgao use a handmade bamboo sprayer called *pud-pu-sit* (Fig. 5), which sprays a concoction of pounded sunflower leaves to control insects (de Jesus, 2001). Smudging (smoking) is a common practice of all tribes to drive away insects. The Mangyan place cut trunks as barriers along the slope and plant along the slope to minimize erosion and runoff (Fig. 6). Manual weeding with the use of traditional tools is common. After harvesting, rice panicles are dried and placed in a storage house near the field or house or are hung above the hearth to prevent weevil attack.

The Manuvú community in Davao uses simple seed storage techniques that produce high-quality rice seeds for planting. The combined use of a container made of the bark of the *lauan* (*Shorea negrosensis*) and a storage hut (Fig. 7) breaks the dormancy, precisely matching the once-a-year planting schedule of the Manuvu (de Guzman, 2000). The Mangyan and Molbog store rice seeds in bamboo (*Schizotachyum lumampao*) containers. The bamboo's thick walls prevent the entry of insects, and the dry bamboo regulates seed moisture content and provides a cooler atmosphere (Parreno, 1994).

The decrease in agrobiodiversity is one of the problems the indigenous peoples face, as they are being influenced by people and organizations who are introducing new cultivars or technologies that

Photos by: de Guzman, 2000

Fig. 7. A hut used by the Manuvu in Davao to store seeds.

change their whole farming system. However, the indigenous people still maintain some of their landraces as a means of survival and are modifying introduced practices to fit their natural environment.

Analyzing and understanding the resource management of the indigenous peoples is important from the academic and practical point of view, and provides an effective means of training students in acquiring skills and integrative knowledge in promoting productivity, efficiency, stability, sustainability, and equity of agricultural production systems from the point of view of the farmers and local communities. Students exposed to the indigenous peoples learn to translate technical knowledge into practical use and assist the indigenous peoples in the dissemination of information about SA.

Conversion Strategies of Farmers and Local Communities

Since more farmers are getting interested in sustainable agriculture and usually ask how to go about the conversion process, students documented some success stories of farmers who had already converted their farms to SA. Case documentation of farmers who converted from conventional to SA shows that the shift is a gradual process. Changes are made on a small portion of the farm, and SA practices are gradually expanded as farmers gain experience and knowledge. Farm diversification, involving increases in both crops planted and animals raised, are common SA practices, coupled with input substitution and farm redesigning (Edaño, 2003).

Most nutrient management practices in the conversion process are focused on the application of organic materials to the soil (Edaño, 2003). Practices include incorporation of animal manure, plant residues, composts, and green manure (Edaño, 2003; Resuello, 2005).

The Student Research and Instruction Interface

The studies conducted by the students can be generally categorized into resource conservation, socio-cultural, economic and political viability of practices, integrated or systems research, and conversion from conventional to sustainable agriculture. Studies on resource conservation involving indigenous peoples and traditional landraces are very useful in increasing academe's appreciation of the rich genetic resources that are under threat by unsustainable development interventions. Genetic resources are being maintained by indigenous peoples as part of their culture and as a means of survival in the environment they have to contend with. The studies reflect the dynamics of society, government, and other non-government organizations (NGOs) and how they interact towards a common goal. The efficient use of resources, equality and respect for human rights, and understanding of the complex ecological system are better

appreciated from the results of the studies.

The results of research studies are used as examples in classroom discussions. During classroom discussions and field trips, students are encouraged to form multidisciplinary teams that assess and formulate recommendations for the community to incorporate sustainable production systems that benefit the community. Participatory approaches are encouraged. The use of participatory approaches also empowers the community to share their experiences and assessment of their condition. Since students learn about SA in some of their courses, they can also assist in the dissemination of SA information when they go out and work with farmers.

Assessment, generation of technologies, and research traditionally focus on productivity goals. However, after working with communities, students change their perception to include sociocultural, economic, and political factors. Successful conversion of farmers from conventional to SA is facilitated by genuine commitment to working for change, a positive attitude, keen observation, and the initiative to experiment on farms. Support from the government and NGOs to implement programs on SA can hasten the conversion process of farmers.

Conclusion

Students' research outputs enriches our knowledge of SA technologies in the areas of seed conservation, seed storage, seed rejuvenation , utilization and conservation of resources, soil and water conservation, diversification strategies, nutrient recycling, fallowing, and pest management and the conversion process to SA. Some UPLB staff use these projects in teaching SA in the classroom.

SA is culture- and location-specific. Researchers could learn a lot from the empirical and accumulated wisdom of the indigenous peoples who had survived for centuries in very marginal and fragile conditions. Knowledge gained from studies with indigenous peoples is very useful in developing practical strategies that could be used by other communities opting to convert from conventional to sustainable agriculture.

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