



Integrating Plant Genetic Resources Conservation and Management into the State University's Mandates: An Initiative for Sustainable Development

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Abstract Plant genetic resources (PGR) are plant materials of actual or potential value for the present and future generations. (Borromeo, 2007). Its conservation, management and sustainable utilization are important in environmental protection, crop improvement and food security. In the Philippines, the National Plant Genetic Resources Laboratory, ensures that a number of accessions of crops species are secure and accessible. (Hautea, 1998); Philippine Coconut Authority, Davao National Crop Research and Development Center, Bureau of Plant Industry (Bautista, 1994); and International Rice Genebank Collection (IRRI, 2012) also maintain germplasm collections. Foregoing institutions are non-academic. Hence, Bohol Island State University (BISU) in Bohol, Philippines with South-East Asia Regional Initiative for Community Empowerment (SEARICE) worked on PGR conservation through Farmers Field School (FFS) and Agriculture Curriculum Enrichment (ACE) Projects purposely to mainstream the principles of sustainable agriculture and development through conservation, improvement and utilization of PGR in the communities. Participatory basic needs assessment; FFS curriculum formulation; ACE following protocol and networking with Local Government Units, Department of Agriculture line agencies, non-government and peoples' organization were employed. As a result, 16 FFS were conducted while ACE project successfully integrated Plant Genetic Resources Conservation and Management (PGRCM) into the two Agriculture curricular programs of BISU. Seventy-five students passed the PGRCM course who also graduated from FFS with 290 farmers, five faculty-trainers and nine agricultural technician-trainers with skills in participatory varietal trials, selection and plant breeding that raised rice diversity in villages by 25-33 percent, produced three stable rice accessions, 25 selections and 18 breeding lines at F₃ today apart from a number of bonus accomplishments. These developments are realities justifying that PGRCM can be successfully integrated into the state university's mandates: instruction, research, extension and production and be capitalized as valuable initiative for sustainable development in the communities which the academe serves.

Keywords plant genetic resources, plant genetic resources conservation and management, farmers field school (FFS), state university, mandate, sustainable development

INTRODUCTION

The Philippines is one of the mega diverse countries in the world both at ecosystem, species and genetic level. Nevertheless, it is also one of the hot spots. For this reason, agencies responsible on the Philippine fragile super-diverse ecosystem that houses animal and plant genetic resources are calling to pool in efforts on its conservation and management. Like other government entities, higher education institutions like BISU unifies with other agencies on this noble task of managing life indispensable reserves.

For relevance to local and global trends on sustainable development, BISU has collaborative endeavors with SEARICE, an institution advocating Sustainable Agriculture (SA) and Community Biodiversity Conservation and Development (CBDC). From this partnership emerged the initiative

of integrating plant genetic resources conservation and management into the state university's functions empowering its faculty and students on this very important task commonly carried out by non-academic institutions.

The objective of this initiative was to mainstream the sustainable agriculture principles and approaches into the curricular, research and extension programs of the academe, hence, this reality project on the integration of PGR conservation, improvement and utilization at the BISU-Bilar, Bohol, Central Philippines since 1998 to the present.

OBJECTIVE

The main purpose of the project is to mainstream the principles of sustainable agriculture and development particularly on the conservation, development and utilization of plant genetic resources into the university's mandates.

The initiative has the following specific aims:

1. To integrate the course PGRCM into the Bachelor of Science in Agriculture (BSA) and Bachelor in Agricultural Technology (BAT) curricular programs of BISU;
2. To produce Agriculture graduates with knowledge and skills in PGRCM;
3. To organize and implement a research program on PGRCM at BISU;
4. To empower farming communities in Bohol on rice PGRCM; and
5. To document the issues and lessons learned during the project implementation.

METHODOLOGY

The project was planned and implemented in partnership with SEARICE. To attain its objectives, the project team utilized a combination of strategies.

PGRCM integration into the instruction mandate through ACE was made by reviewing and revising the BAT and BSA Curricular Programs in coordination with the Curriculum Committee of BISU following the Guidelines on Curriculum Enrichment of the university and the Circular Memorandum Order (CMO) of the Commission on Higher Education (CHED). Implementation in BISU-Bilar where the programs are offered followed after its approval and preparation of its syllabus. Class enrolment and activities were monitored and recorded.

PGRCM integration into the research mandate was organized through the genetic diversity conservation (GDCon) project implementation. Center-based and on-farm research projects on PGRCM were conceptualized and conducted like the Participatory Varietal Selection (PVS) and Participatory Plant Breeding (PPB) along with FFS. Experimental research techniques, data collection and analysis were employed for completed studies while monitoring was made for on-going activities.

For the extension function, FFS on Community-based Organic Rice Diversity and Development (CORD) was conducted by the team in selected rice farming communities of Bohol. On-farm experiments were utilized for the hands-on activities of the FFS. The BISU-SEARICE dual collaboration was also expanded for a better and wider implementation.

Issues and lessons from the integration were also documented. Most of the data collection and documentation were prepared by a team member teaching and implementing the PGRCM research and extension activities. This has been done for six year years now.

RESULTS AND DISCUSSION

BISU envisioned to be a premier Science and Technology university for the formation of a world-class and virtuous human resource for sustainable development in Bohol and the country. Attaining this requires the university to operate its mandates along with this vision. This endeavor had conceptualized initiatives which partly generated results that manifest its realization.

ACE Initiative

Based on the curricular review conducted in 2003, BISU offered BAT major in Crop Production Technology and Animal Production Technology and BSA with specialization in Crop Science, Animal Science and Crop Protection. The BAT curriculum was introduced by the Agricultural Technology Education Program of the government since 1990 while the BSA was based on certain DECS and CHED Memorandum Orders. Both programs contained important courses but short of those related to sustainable agriculture and development which are the cry of the times since the late 80s. Hence, Sustainable Agriculture and PGRCM were recommended for integration to make the programs relevant to the needs.

Following the university protocol on curricular changes, the integration was approved by the Board of Trustees in 2004 placing PGRCM as an elective subject in the fourth year Crop Science and Crop Production Technology specialization. The course was offered and Table 1 shows its successful takers. By this, BISU manifested support on the international concerns like environmental health, biodiversity conservation for food security and sustainable development through its flagship program in Agriculture.

Table 1 Population of Agriculture student-enrollees and passers of the PGRCM course and its percentage from the roster of graduates, AY 2007-2012

Academic Years	Total Agriculture (BAT & BSA) Students		Total (BAT & BSA) PGRCM Students ^a		% Agriculturists with PGRCM Knowledge & Skills
	Enrolled	Graduated	Enrolled	Passed	
2007-2008	83	83	21	21	25.30
2008-2009	54	53	22	22	41.50
2009-2010	37	37	8	8	21.62
2010-2011	31	29	16	16	55.17
2011-2012**	63	62	1	1	1.61
2012-2013**	53	53***	11	10	18.87 ***
TOTAL	321	317***	79	78	24.61 ***

* BSA - Crop Science major, BAT-Crop Production Technology major students

***projected

**year when BAT was revised into a generalist program

Source: Office of the Registrar

PGRCM research projects

Apart from the rice PVS and PPB, the FFS participants were exposed to the projects established and sustained by BISU-Bilar to level up their PGRCM knowledge and skills in industrial and other economic crops. Table 2 shares data on these projects.

The FFS manifests the super-imposing services in research, instruction and extension. Before the FFS, a benchmark study on the diversity of rice in area was done, then a monitoring activity through the local technicians. Table 3 reveals the seed increase at the FFS sites for a period of six years implying a considerable increase in rice diversity in the areas.

The FFS participants were able to produce “rice selections” and breeding lines from their PVS and PPB activities. The teaching-learning exercises of FFS partakers have already developed rice breeding lines at F₃ as initial products of participatory research as presented in Table 4.

FFS- on community-based organic rice diversity and development (CORD)

BISU organized with the Bohol-Provincial Agriculture Office (PAO) a season-long FFS-CORD for villages that need it. This was tapped as the laboratory field for PGRCM students. The 14-session FFS provided a shared experiential learning opportunity among students, partners like farmers, LGU technicians, faculty-trainees on PGRCM, SEARICE staff and BISU trainees on actual PVS, PPB, vrietal rejuvenation, characterization and other field demonstration on ecological pest management and soil fertility management using organic fertilizers. Table 5 presents the venues and number of FFS participants.

Table 2 Functional PGRCM research projects at BISU-Bilar, Zamora, Bilar, Bohol, Philippines useful for instruction, extension and income generation

PGRCM Projects	No. of Species	No. of Accessions	Year Established	Utilization
Clonal Nursery	22	35	2012	Source of planting materials for the National Greening Project of the Philippines; instruction, research
Sweet Sorghum	1	6	2010	Tourism, instruction, research Show-window for enterprise development
Abaca Nursery	1	3	2009	Instruction, research, source of planting materials for farmers
Molave Provenance cum Progeny Trial	1	5	2008	Instruction, research, source of planting materials for farmers
Fruit Genebank	11	27	2005	Source of gene/seeds; source of planting materials for the clonal nursery; income
Anthurium	2	33	2003	Instruction, research, show-window for enterprise development
Rice Seedbank	2	240	2001	Back-up supply of organic rice seeds for farmers & breeders; Agro-eco-tourism, instruction, research Show-window for farmers for income-generating project (IGP); Source of organic rice seeds for farmers & breeders
Timber Genebank	60	65	1998	Source of genes/seeds; source of planting materials for the clonal nursery
Coconut Genebank	1	5	1983	Instruction; research; source of gene; income
TOTAL	105	229		

Source: Project In-Charge

Table 3 Rice seed increase in the FFS-CORD and PGRCM laboratory/demo sites in Bohol, Philippines, Academic Years 2007-2013

Years/ Season	Locations in Bohol, Philippines	No. of Varieties/ Accessions			% Seed Increase
		Used Before FFS	On-Trial	Used After FFS	
2007-2008	Campagao, Bilar	16	20	11	145.45
2008-2009	San Miguel, Dagohoy	8	25	10	80.00
2009-2010	Untaga, Alicia	9	25	10	90.00
2010-2011	BISU-Bilar, Zamora	15	160	21	71.43
2011-2012	Poblacion, San Isidro	10	30	12	83.33
2012-2013	BISU-Bilar & Loboc	11	45	9	122.22

Source: RDE Library, 2012

Table 4 Number of rice breeding lines produced by FFS participants and facilitators during the PPB activities in Bohol, Philippines, Academic Years 2007-2013

Academic Years	FFS Sites in Bohol, Philippines	Number Involved			No. of Breeding Lines/Selections
		Students	Farmers	Trainers	
2007-2008	Campagao, Bilar	21	10	3	6
2008-2009	San Miguel, Dagohoy	22	25	3	4
2009-2010	Untaga, Alicia	8	10	3	2
2010-2011	BISU-Bilar, Zamora	16	0	1	13
2011-2012	Poblacion, San Isidro	1	28	3	6*
2012-2013	BISU-Bilar & Loboc	11	17	4	18*
TOTAL		79	90	17	49

Source: RDE Library, 2012

*breeding lines at F_3

Table 5 Venues and partners/graduates of the off -campus PGRCM activities with the FFS-CORD in Bohol, Philippines, Academic Years 2007-2013

Academic Year/Crop Ping Season	Locations in Bohol, Philippines	Number of Partners/Graduates					
		Students	Farmers	Technicians		Faculty-Trainees	GO & NGO Trainers
				LGU	PAO		
2007-2008	Campagao, Bilar	21	10	0	0	2	3
2008-2009	San Miguel, Dagohoy	22	25	1	2	2	3
2009-2010	Untaga, Alicia	8	10	1	2	2	3
2010-2011	BISU, Zamora*	16	0	0	0	0	1
2011-2012	Poblacion, San Isidro	1	28	3	3	1	3
2012-2013	BISU-Bilar & Loboc	11	17	3	3	0	4
TOTAL		79	90	8	10	7	17

Source: RDE Library, 2012

*- The batch decided to have the in-campus activities only due to conflicting schedules with the farmers

Issues and lessons learned

Despite the significance of PGRCM to food security, it is only recognized as an Elective subject where only limited number of Crop major students will enroll, thus the need for it become a basic subject so all Agriculture students will take. The non-production of stable materials by the students due to too many activities they have for a limited time was noted. Besides, space and seed bank facilities are inadequate for the very delicate work of growing and handling selections and breeding lines, hence, the need for a wider handling area.

A highly appreciated observation was the great synergy that developed among the young inquisitive students vis-as-vis the adult, experienced practical farmers as well as the technical experts which provided scientific basis on the practices and beliefs that demand for it.

FFS participants also automatically become partners in the disseminating the planting materials, thus, diversifying their farms in dispersing information on sustainable organic farming techniques including indigenous repellents for pest management.

CONCLUSION

1. The PGRCM was successfully integrated into the BAT and BSA curricular programs of BISU as an Elective subject of the students with major in Crop Production Technology and Crop Science respectively;
2. For a period of six years, BISU has produced 78 out of the 317 equivalent to 24.61% of the Agriculture graduates major in Crop Production/Crop Science with knowledge and skills in PGRCM;
3. BISU was able to organize and implement one research program with eight component projects that advocate PGRCM;
4. Through the FFS initiative, the university was able to empower six farming communities in Bohol with 90 farmer-graduates on rice PGRCM apart from training eight LGU technicians, 10 PAO staff and seven faculty; and
5. The most important issue noted during the project implementation was the recognition of the subject PGRCM as an Elective where only few will enroll and the lesson learned during the project implementation was the synergy of the FFS participants advocating PGRCM.

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