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Enhancing the Demands of ZAMPEN-SUCs AFNR Graduates Through Curriculum Intervention Using Modular Approach with High S &T Content

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ABSTRACT

The contribution of the DOST-PCARRD AFNR Project 2.3 from SY 2009-2011 has demonstrated transformed changes in the AFNR curriculum. These changes are well recognized as it has attracted more enrollees in the region's dwindling AFNR courses. The study presented the implementation of the AFNR Project 2.3 in Zamboanga Peninsula as an intervention to the observed down trend enrolment in the AFNR courses since SY 2001 onwards. The AFNR Project 2.3 was implemented for the duration of two years from SY Feb 2009-Feb 2011. The project at the regional level enabled students' preparation for employability, equipped them with entrepreneurial skills, with the integration of strong S & T contents in the courses through the modular approach. The Western Mindanao State University (WMSU) played the lead institution in the region with three collaborating SUCs, namely, JH Cerilles State College (JHCSC), Zamboanga

State College of Marine Sciences and Technology (ZSCMST), and the two campuses of Jose Rizal Memorial State University (JRMSU). Towards the end of its implementation for the second year, the project achieved the following gains based on its objectives: (a) Enriched 10 BS curricular programs (b) reviewed 81 AFNR subjects (c)enriched at least 70 courses in the 10 BS AFNR Programs and (d) introduced 30 short term courses respectively.

Keywords **—** Institutional Research, AFNR Project 2.3, agriculture curriculum, Zamboanga Peninsula, Philippines

INTRODUCTION

The past two decades showed a declining record in the enrolment of schools offering the agriculture and fisheries courses particularly in WMSU, JH Cerilles, JRMSU and ZSCMST in the Zamboanga Peninsula (ZAMPEN).

The enrolment report from SUCS revealed that for over a period of 10 years (1998-1999 to 2007-2008), the enrolment trend in the regional level exhibited a decline for about 70% in the baccalaureate degrees and 38% in the associate courses. The AFNR tracer study conducted by Narvaez and Subong, (2009) cited that agriculture was badly hit by the decline in enrolment. Initially, an increase was observed up to the 3rd year and enrolment was on its peak with 1, 371; however, a drastic decline followed by more than half of the population in 2002-2003. This observation was happening to three HEIs integrated to SUCs which also started offering non-AFNR courses dispersing the enrollment to these courses.

From the same report, agriculture was seen having the highest enrolment in all the AFNR courses in the region and all the other AFNR courses had limited enrolment. In this case, WMSU enrolment followed certain trend showing general increase in the first three years (1998, 1999, to 2000-2001). However, after the semester, the enrolment declined in all courses up to SY 2007-2008. A bigger decline of 50% followed in Forestry course starting 2005-2006. One of the probable reasons of the decline was the transfer of the BS Forestry to become an integral part of the Agriculture campus aggravated by distance. The new site for the College of Forestry was 23 kilometers away compared to its original location in the main campus. For the entire university, the decline was very much pronounced between 30-60% in the various courses for the period of 10 years.

The tracer study of Narvez and Subong (2009) showed that the JH Cerilles in Dumingag had the highest decline by 90% in the enrolment for over 10 years. In this SUC, students were given option to enroll in the non AFNR programs to expand other programs even if it was still a WMSU Satellite campus.

In both campuses of JRMSU in Tampilisan and Katipunan, a decline in agriculture enrolment was observed from 1998-1997 to 2007-2008, respectively. The expansions of the non-AFNR courses as well as the offering of other courses were seen as the contributing factors. However, in contrast, the Agricultural Engineering showed the reverse trend with an increasing trend for five years.

On the other hand, the ZSCMST which initially offered an eight-degree programs with one diploma course also reported a decline in the BS Marine Biology and BS Fisheries. The BS Biology started with 90 students in 1998-1999; however, about 65 students were retained in 2008-2000. Although the BS Fisheries started with 115 students in 1999-2000, it only showed a retention rate of 73 students towards 2007-2008.

As early as 1988, some agricultural institutions in United States had already experience similar trends of steadily dropping enrollment for over the past 10 years at a rate of 1% to 3% annually (National Research Council, 1988). The total agricultural education enrolment that had dropped came from students with traditional farm backgrounds. Consequently, the state felt the need for a traditional production agriculture curriculum in agricultural education programs to sustain the declining students' enrollment (Peasley, & Henderson, 1992). Whereas, when the new students being recruited into the Agriculture programs, the number being retained is far below the level needed to maintain a consistent supply of graduates for the agriculture industry. From the findings of the study, it revealed that the forefront of the challenges was the recruitment and retention of students who are likely to enter employment in agriculture.

In the Philippines, this drift in the enrolment has also posed a major challenge not only in ZAMPEN HEIs but also in most colleges offering agriculture nationwide. The present challenge calls for a total renewal of the agricultural education system to attract a new breed of students who will play a vital role in meeting the challenges of the future agriculture program. Total renewal specifically entails a new direction, a new sense of urgency, new training and instructional approaches, a new level of scientific and financial support, and a new approach to cooperation among all players more specifically, the academe, the industry, and the society as a whole.

As agricultural development is one of the major concerns in ZAMPEN, efforts to maximize its growth and sustainability lies not only in application of improved innovations, but on highly trained and well-prepared human capital that will manage and sustain agricultural activities in the region. As the national government is geared towards improving agricultural productivity in the face of rapidly increasing population, higher education institutions in the region must be able to respond to the opportunities that can transform agriculture as a new and innovative growth sector in Western Mindanao.

Among other things, the present agricultural education system needs to be enhanced giving emphasis on advancing "knowledge with practice" as a mode for agriculture students to comprehend and internalize information and new methods of managing crops, livestock, fisheries, and agricultural resources. This initiative is imperative to ZAMPEN where agriculture and fisheries are a way of life of the rural populace. The region's agricultural education system should be able to contribute in harnessing the competitive advantage of the region in agriculture and fisheries. For one thing, ZAMPEN is a major producer of coconut, rubber, and marine products like seaweeds and tuna. The economic gains to be brought about by improvement in the region's competitive advantage in these commodities along with other equally important agricultural products will transform the region into an agribusiness hub and a true growth sector in Mindanao. With transformation and economic development comes change in community and people, and a sense of belongingness that hopes to bring about lasting peace that has long been elusive in most regions of Mindanao. This project aims to contribute to this transformation.

FRAMEWORK

The AFNR Curriculum in ZAMPEN-SUCs needs to be nationally and globally competitive. The contribution of the AFNR project to the present AFNR curriculum is widely acknowledge in enhancing usefulness of agriculture education in terms of (i) students' entrepreneurial preparations,(ii) developing human resources in knowledge, skills, and applications, and, (iii) employability of graduates in major sectors like business, government and other profit-oriented organizations. The project followed the Log Model Framework using the *input-process-output*. The AFNR program focused on SUCs collaboration provided mutual benefits and strengthened each SUC niche select areas on banana tissue culture, rubber, and coconut and seaweeds entrepreneurship.

As shown in Figure 1, the inputs involved curriculum enhancement with high S&T, human resources development and facilities upgrading including establishment of business ventures to showcase students' skills in entrepreneurship.

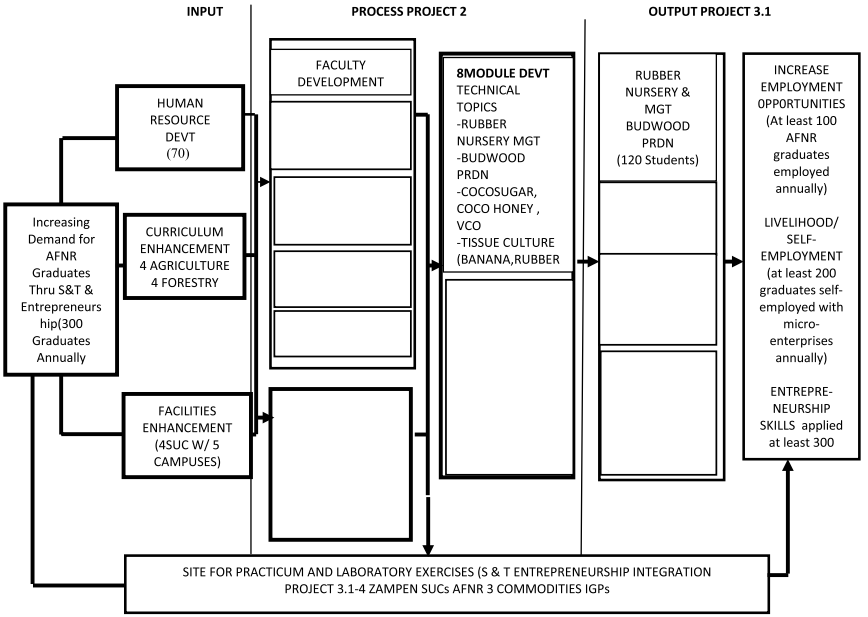

Figure 1. Conceptual Framework of AFNR Project 2.3

The AFNR curriculum enhancement developed learning resources used in training students via modular approach. The five technical and four entrepreneurial modules developed were used as an intervention on the existing AFNR curricular courses across the four ZAMPEN SUCs.

The Project 2.3 conceptual framework provided the actual hands-on experiences in the operation of the IGP and entrepreneurial activities. It started with an opportunity for students to carry out a mini trial experience on entrepreneurial practices. The module development workshop took off from the input discussion of experts followed by a forum with resource speakers from the business sector having extensive knowledge on business and entrepreneurial ventures.

The human resource enhancement activities involved Group Trainings and in-service trainings of AFNR faculty and non-faculty training specialists

in ZAMPEN-SUCs. The various activities included the module development, educational visits to model institutions which provided access to training materials and information from the visited model schools. The model schools had large number of successful experiences to share that provided the means to impart relevant skills on the production and processing technologies as well as entrepreneurial skills and business ventures. The enhancement also provided industry-academe interfacing to provide supplement strategies by which synergies can be induced to orient education and involved other sectors to program expansion and collaboration.

The training component in Project 2.3 provided hands-on applications, experiences, and the preparation of the students' business plan into the actual entrepreneurship ventures in accordance to the budgetary requirements of their respective IGPs. Correspondingly, the students' business plan describes students' involvement in small groups with a student leader. The plan procedures and steps were carried out and validated as operational outputs to serve as the blueprint of standard operating procedures in the conduct of an e- IGP subsequently carried out in Project 3.1on Students IGPs.

The trainings / workshops adopted the following methods and strategies:

- Participatory approach in carrying out the business plan among prospective trainees;
- Utilization of small groups with student leaders identified by their specified roles and responsibilities laid out in their business plans;
- Presentation of outputs in the plenary after the actual hands-on experiences during the trial runs during the actual training for validation; and,
- Integration, institutionalization and internalization of outputs during the monitoring.

The program flowchart shows the link of Project 2 *(Institutional Capacity Building)* and Project 3 in support to *(IGP)* supported by three components. The Project 2, inputs and process have reached large number of students through oriented trainings with modular intervention in the AFNR courses. The project outputs provided trained and developed new breed of entrepreneurs from AFNR graduates, exposing faculty and student skills training and enhanced AFNR programs from the three major component areas as reflected in the diagram through: (a) human resource development; (b) curriculum enrichment and (c) facilities upgrading.

These three major components in the boxes, (a) (b) and (c) provided inputs to human resource development to support faculty capability enhancement through various mechanisms illustrated in the separate boxes, namely, trainings, module preparation, and exposure to other technology and faculty visits. The AFNR curriculum enhancement through modular approach exposed the students to the needed skills in production, processing technologies, and entrepreneurship to support the three identified IGPs for Project 3 among ZAMPEN SUCs.

The last box illustrates the outputs of the link between Project 2 and 3 showing high employability and entrepreneurship skills for the graduates of the enhanced AFNR curriculum.

OBJECTIVES OF THE STUDY

The project aimed to increase the enrolment in agriculture and forestry courses through curricular enhancement and employability of graduates of agriculture, forestry and fisheries in the ZAMPEN SUCs. Specifically, the project aimed to: 1) Enhance/enrich students' learning and training through modular intervention programs on existing AFNR curricular courses in the ZAMPEN-SUCs; 2) Enhance the capability of faculty and training specialist as Entrepreneurial Educators; 3) Improve the learning environment by upgrading the existing facilities of the ZAMPEN-SUCs and showcasing agribusiness and fishery ventures with S&T application; and, 4)Introduce and prepare students' career entry by linkaging and networking with various organizations and expose them to the world of agribusiness.

METHODOLOGY

The project was implemented in five ZAMPEN SUCs, namely: WMSU (Zamboanga City); JRMSU (Tampilisan and Katipunan campuses, Zamboanga del Norte), JHCSC (Dumingag campus, Zamboanga del Sur) and ZSCMST (Zamboanga City).

The activities are focused on students enrolled in the AFNR courses of the collaborating institutions, the unemployed AFNR graduates and retooling of SUCs faculty members. For students currently enrolled in the AFNR, the trainings were initiated on the2ndyear of the program as preparatory period prior to engagement in actual business enterprise. The actual business ventures were conducted during the last year of the students' academic program through the income generating projects (IGPs) established by the SUCs.

Component 1. Capability Building of Faculty/Specialist

Instructional Materials Development. A critical mass of faculty members was selected in the preparation of the nine training modules and one training manual.

Training of Faculty/Specialist. The 70 faculty specialists from the various SUCs in ZAMPEN underwent four short-term in-service trainings to prepare them for entrepreneurial attributes prior to the implementation of the AFNR enhancement program. The short-term training identified faculty specialist to at least attend four trainings in entrepreneurship modules and one technical skill module. The training duration lasted from two (2) days for skills and additional five (5) days per module training as required.

Educational Visits to Model Institutions. Educational tour and field visits were conducted to selected SUCs and private Universities with established agribusiness farms and success stories on entrepreneurships. The SUCs visited included Bicol University, Cavite State University, University of Asia and the Pacific, University of the Philippines at Los Baños, Central Luzon State University, Benguet State University. These institutions are known to implement innovative strategies in curriculum enhancement and development in entrepreneurship, curriculum delivery, quality assurance, learning resources, field demonstrations, commercialization of technology, regulatory and policy frameworks relating to applications of science technology and biotech parks. A total of 18 strong faculty specialists were part of the AFNR educational tour to model institutions in Luzon conducted at the early implementation of last March 29 to April 7, 2009.

Academe-Industry Linkaging and Interfacing. Linkage is necessary for building connections with local farmers, industries and prospective Agribusiness sectors on farm production and marketing. As the students started to venture in business on their final year in the academic program, the faculty mentors assisted the students in networking and building connections with the local businesses, markets, extension programs, farm demonstrations with interested farmers, and part time farmers. This enabled students to directly market their produce, enrich their skills in

production management and farm planning. The focus was on enterprise, based on local market needs and production management to meet market requirements (organic, local, and high quality).

In interfacing, activities were related to marketing and alternative enterprises connection with local agriculture community sectors. The activities also included students monitoring, reporting results and evaluation for program improvement. The interfacing served as an avenue for graduating students seeking prospective employers or possible sources of funding for entrepreneurial undertakings.

Mentor Relationships. All students were assigned to Entrepreneurial Educators/ Mentors to provide advice and support in developing their entrepreneurial skills and interests as their proposed as program of work. The mentoring involved areas like risk assessments, venture capitalization, change management and issues related to organization start up. Faculty members were assigned to students who worked as a team to create a new venture plan which could result to a feasible business proposal.

Component 2. Enhancement of Student Learning Through Modular Training

Development of Manuals and Modules. Nine modules and one training manual for the faculty trainers were developed to enriched the existing AFNR curricular offerings. The modules were used as a course enrichment to enhance students' skills on processing, production management, and entrepreneurship. The training on module preparation was part to equip ZAMPEN SUCs involved in the AFNR curriculum enhancement program. The timeline for module preparation, pilot testing and application of its copyright was done in eight months.

Likewise, the course syllabi of the various AFNR subjects offerings were enriched to match the use of the modules and laboratory manual. The modules and the training manual served as a guide for the laboratory activities of students in the AFNR courses, including agribusiness and entrepreneurship subjects during the semester. Subjects from the different courses that were included in enhancement program were also realigned to maximize the use of the laboratory facilities.

Course Enhancement using the Modules. The modules were used as course enrichment on the major courses offered in Agriculture and Fisheries. The subjects were incorporated with entrepreneurship principles based on the nature and content of each course and technical skills component for internship subjects.

Conduct of Short-Term Training Courses. The short-term training course was conducted for students and unemployed AFNR graduates within the duration of two years during the project implementation. The trainings involved two aspects namely, the ***technical skills*** and ***entrepreneurial skills enhancement.***

The first phase focuses on the enhancement of **technical skills** of the students/participants on selected topics with high S & T content and market opportunities. A total of five short training courses were conducted during the implementation period. At least 20 participants were expected per training course with 4 batches per topic. Thus, a total of 80 trained participants were expected per topic and a total of 450 trained participants for the six topics were proposed for the duration of the project.

The second type of training was on **entrepreneurial skills**. The participants who attended the short-term training courses on technical skills were those who had already identified their specific enterprise prior to use and engage on the chosen enterprise as the focus of the training. A series of four trainings corresponding to 4 modules were also done involving 25 participants per short training course. Thus, a total of 100 participants were projected to be trained on entrepreneurship.

The skills training hoped to instill on students a degree of healthy competition, combined with shared goals, personal friendships and feeling of trusts and confidence among students involved in applying their newly acquired skills in the business ventures.

Component 3. Facilities Upgrading & Establishment of Demonstration Enterprises

The AFNR facilities upgrading included all of the following; a) Expansion of Rubber Nursery and Budwood Garden, b) Production and Processing Room for Coconut Sugar, c) Seaweed Production and Drying Facilities and; d.) Training Room with Audio Visual Facilities.

The upgrading of facilities with the necessary equipment provided support on the enhanced courses, short course training and workshops for the income generating projects of the ZAMPEN-SUCs involved.

RESULTS AND DISCUSSION

A. INSTITUTIONAL CAPABILITY ENHANCEMENT

1. Formal Curricular Program Innovations

Table 1 presents the curricular enhancement across the four SUCs in five campuses. It can be noted that the reviews and enhancement exceeded more than 100% from its set target initially, having reviewed and enriched a total of 10 curricula during the project implementation. The same table presents the 81 courses reviewed on the third, fourth, and fifth year levels of the AFNR courses during the first and second semester of School Year 2009-2011, respectively. Across the implementers, the frequency of subjects/ courses enriched/ and reviewed revealed 10 courses as the least compared to the highest at 36.A total of30 new short-term courses were offered, however, each SUC showed an average of 5-7 new short-term courses offerings. Among all the SUCs, no one reported to have revised their curriculum. Furthermore, it was because when the AFNR was implemented, the curriculum was recently revised. Curricular revision must be done within the last three years in compliance with the CHED Memo Order 14. The CHED order explicitly defines curriculum revision to be done every three years for the BS Agriculture degrees and other related programs. The latest curriculum revision was done in 2008 prior to the implementation of the AFNR project in Feb 2009.

Table 1. Curricular Enhancement

CURRICULA ENHANCEMENT	SUCs implementing AFNR Curricula					Total Target	Actual Accomp.
	WMSU	ZSCMST	JRMSU Tampilisan	JRMSU Katipunan	JHC-SC		
No. of Curricula Reviewed	5	6	4	5	1	**9**	**10**
No. of Curricula Enriched	5	5	4	5	1	**9**	**10**
No. of Curricula Revised	0	0	0	0	0	**4**	**0**

No. of Newly Developed Curricula	0	0	0	0	0	-	**0**
No. of Courses/ Subjects Reviewed	36	9	16	10	10	-	**81**
No. of Courses/ subjects Enriched	29	5	16	10	10	-	**70**
New Short-term courses offered	7	5	6	7	5	-	**30**

Figure 2 presents the 10 curricular programs involved in the AFNR curriculum enhancement across the four SUCs. The same table shows the five programs in Agriculture, one for the BS Forestry and Environmental Science, and four for the Marine Sciences.

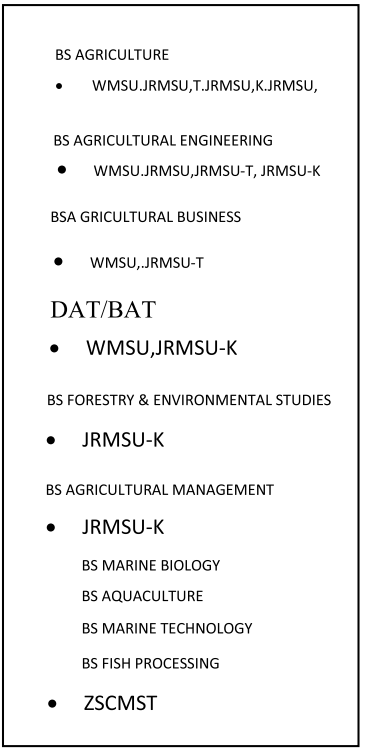

Figure 2. Implementing SUCs with AFNR Enriched Curriculum

Upon the implementation of the AFNR curricular enhancement in SY 2009, all the ten BS courses were provided with enrichment. In general, most agriculture courses were introduced with Entrepreneurship modules. Three course subjects, Agri Econ 120, Agri Econ 130 and Ag Mgt 101, were integrated with the four entrepreneurship modules among 4th year students in their first and second semester. Among 3rd and 4th year students in the first and second semester, entrepreneurship modules were integrated in courses such as Agri RES 101, Agri Tech 136, Agri Bus 117 & 105, and MB 112 for Module 1 (*Feasibility Study, Project Proposal & Business Plan*); An Sci 106, Crop Sci 105, Agri Tech 143, Agri Bus 117 & 141, Maj. 105 and Elec 2 for Module 2 (*Product Development*);Agri Bus 153 & 104 and Ag Econ 120 for Module 3 (*Marketing Management*); An Sci 108, Agri Bus 115 and Agri Bus 108 for Module 4 (*Accounting for Non-Accountants*).

Technical skills module is vastly integrated from 2nd year to 5th year, mostly in the second semester. Module 5 (*Tissue Culture of Abaca & Banana*) was integrated in seven courses; An Sci 113, Crop Sci 107, AE 153, 154 & 157, Agri Bus 117 and ABM 190. This was implemented among 3rd, 4th and 5th year in the first and second semester. Module 6 (*Coco Sap Sugar Processing*) was integrated in most courses and implemented from 2nd to 5th year. All technical skills module was integrated in Crop Sci 112 and Agri Tech 119 and implemented among 4th year students in the second semester.

For the BS Fisheries and related courses, the subjects like Marine Bio 112, Aquaculture 1 and Aquaculture 4, Aquatic Fisheries 2 and Mar Tech 112 were introduced with Module 7 (*Deepsea seaweeds Farming*) in the 4thyear programs. For the enrichment of student entrepreneurial knowledge and skills Ag Econ 120/ Ag Mgt 101, Agtech 136, Practicum, Marine Bio 12 and Aquaculture, Aquaculture 4 was introduced with Module 3 (*Marketing Management*) in the third year.

During the curricular enhancements, the BS courses in Marine Science in their senior years were exposed on the actual seaweed enterprise making use of the facilities provided. Prior to this, the students underwent immersion on deep sea seaweed production through pilot farms. On the last year of their academic programs they were introduced with enterprise management through the organized seaweed farming, including market and trading activities.

The Agri Bus 108 and ABM 171 were integrated with modules 7 (*Seaweed Farming*), 8 (*Rubber Nursery Management*) and 9(*Rubber Budwood Production*) on 4th year students in the first and second year. All the BS courses contained more

S&T content integrated with biotechnology specifically on plant propagation and tissue culture techniques relating the content to the scientific and technical nature of the field of agriculture. The fisheries curricular courses were also introduced for students to acquire skills and techniques in seaweed production and management.

2. Facilities Upgrading & Equipment Procurement

Table 2. Facilities Enhanced

Name of Facility	Target	Actual	Total Investment		Location
			DOST-GIA	Counterpart	
Training Room	1	1	500,000.00 ($10,000)	27,000.00 ($540)	WMSU
Coco-sugar Processing Room	1	1	500,000.00 ($10,000)	17,000.00 ($340)	WMSU
Deep Sea Seaweed Production and Processing Room	1	1	300,000.00 ($6,000)	-	ZSCMST
Rubber Nursery Garden	2	2	250,000.00 ($5,000)	10,000.00 ($200)	WMSU & JRMSU-T
Rubber Budwood Garden	2	2	250,000.00 ($5,000)	250,000.00 ($5,000)	WMSU & JRMSU-T

Note: 1 USD= 50Php

Table 2 shows the facilities upgraded by SUCs and the total budget for each facility provided for the period of two years SY 2009-2011. The budgetary cost of the total project was Php 9,804,126.00 ($196,082.00) comprising the amount of Php 2,784,000.00 ($55,680.00) for the facilities and equipment enhancement. Among the SUCs implementers, only WMSU, JRMSU Tampilisan Campus and ZSCMST were provided with facilities and equipment upgrading.

Prior to the finalization of the actual cost for each of the SUCs implemented, it was felt by the concerned proponents during the proposal preparation the need to prorate the proposed amounts in specified areas like Processing and Drying facilities for Seaweeds, Training room for the expanded number of clients taking new courses in Agriculture, the additional equipment and supplies for the Tissue Culture laboratory, and the Rubber and Budwood Gardens for the rubber projects in two sites, WMSU and JRMSU Tampilisan.

Table 3. Total Equipment Procured

YEAR I & II Purchased Items	Qty.		DOST-GIA
	Target	Actual	
1. PC Notebooks	2	3	81,510.00 ($1,630)
2. Desktop Computer	4	4	85,100.00 $1,702)
3. Computer Printer	3	3	21,335.00 ($426)
4. Air conditioner (Window Type)	2	3	87,350.00 ($1,747)
5. Refrigerator	2	3	56,670.00 ($1,133)
6. Water Pump	3	3	67,000.00 ($1,340)
7. Audio Mixer	1	1	7,000.00 ($140)
8. Power Amplifier	1	1	9,000.00 ($180)
9. Speaker	1	1	7,500.00 ($150)
10. CamCorder-Video	1	1	34,999.00 ($670)
11. Digital Camera	1	1	9,650.00 ($193)
12. DVD Player	1	1	5,999.00 ($120)
13. LCD Projector	2	2	69,375.00 (1,387)
14. Sala Set	1	1	13,500.00 ($270)
15. Tables and Chairs	1	1	22,670.00 ($453)
16. Autoclave	1	1	48,428.00 ($968)
17. Autoclave/Pressure Cooker	1	2	71,750.00 ($1,435)
18. Monitoring Equipment “Banca”	4	4	126,764.00 ($2,535)
19. Fabricated Economical Kiln	1	1	99,369.00 ($1,987)
20. Photocopying Machine	1	1	40,000.00 ($800)
21. Built-in LCD Screen	1	2	65,550.00 ($1,311)
22. Laminating machine	1	1	4,300.00 ($86)
22. Distilling Apparatus	1	1	60,000.00 ($1,200)
TOTAL EQUIPMENT COST			**P 1,094,819.00 ($21,896)**

Note: 1 USD= 50Php

Table 3 shows the list of equipment provided for the project in all the SUCs. From the list, about four items (PC notebooks, air-conditioner, refrigerator, and pressure cooker) were increased from their original quantity. In this case, permission to add an item was sought from the AFNR–PMO with the justification that the original price quotation of an item was low. One similar additional item is still within its total cost.

Overall, the facilities upgraded were the training room with audio visual facilities, the expansion of the rubber nursery and budwood garden, processing room for the coco-sugar and the seaweed production facilities. Since the upgrading of the rubber nursery, it has served as demonstration site for rubber budding, production and its management. The seaweed production facility has also provided ZSCMST students an avenue to experience seaweed production and improvement of culture techniques using the deep-sea method, the post-harvest and processing facility for students enrolled in the BS Aquaculture, BS Fisheries, BS Marine Biology and BS Marine Technology.

3. Short-Term Trainings for faculty, students and alumni

- **In-service Training**. A total of nine (9) batches of trainings were conducted. This includes the Training of Trainers (TOT) on Entrepreneurship and Technical skills done on-site in each of the respective campuses of the SUCs (refer to Table 4). The first training was done on the first week of August and ended in the first week of October 2009 at JRMSU campuses, Bunguiao Eco Farm Training Center, WMSU San Ramon and ZSCMST Campus. This approach was done in order not to disrupt the classes taught by the individual faculty involved in each of SUCs implementing the modular approach. Figure 3 shows the total Training of Trainers attendance with 74 faculty members involved in the entrepreneurship training. Out of the 74 faculty members, a total of 71 trainers completed a series of training totaling to five for entrepreneurship training and one technical skills training respectively. During the on-site trainings, 100% of the teachers involved in Agriculture and related program received in-service trainings which were also considered a form of professional development for teachers given the nature of the workshop. The workshop approaches were observed very effective in increasing the collaboration among agriculture faculty members as participants of the workshops. Individual faculty were also given the task to submit their Multiplier Effects Proposal cascading the number of classes/ and the courses where the modules were integrated for the enhancements on the following semester.

Table 4. Duration and Type of Training

Type of Training	No. of Trainers	No. of days	Total hours duration *	Venue
1. Entrepreneurship	2	5	40	JRMSU KatipunanZaNorte
2. Coco-sugar Processing	2	3	24	JRMSU TampilisanZaNorte
3. Rubber Budwood/ Nursery Production	2	3	24	JRMSU TampilisanZaNorte
4. Entrepreneurship	2	5	40	JRMSU TampilisanZaNorte
5. Entrepreneurship	2	5	40	Bunguiao, Zambo. City
6. Tissue Culture	2	3	24	San Ramon, Zambo. City
7. Coco-sugar Processing	2	3	24	San Ramon, Zambo. City
8. Deep Sea Seaweeds Farming	2	3	24	Rio Hondo, Zambo. City
9. Entrepreneurship	3	5	40	San Ramon, Zambo. City
TOTAL		35 days	232 hours	

** No. of days x 8 hours per day*

As the curricular enhancements were first introduced to the Regional Trainers in all SUCs, the modules were well received. The teachers were taught to use the Multiplier Effects (ME) Templates to plot in which subject/courses will provide quantifiable deliverables using this scheme.

Faculty Trainers across ZAMPEN who attended the Training of Trainers (TOT) were tasked to submit a Multiplier Effects Template. This was used to forecast and plot which subjects/courses would be incorporated in the AFNR modules, the methods used in teaching, time frame and other significant information regarding the subjects content to be able to forecast if the deliverables were actually met. The ME templates provided relevance and broadened the scope of the curriculum using the modules. During the implementation of the modular enhancements, curricular changes were not reflected in the title of the courses, however, over time substantive changes in the content were observed in what is being taught in the AFNR courses.

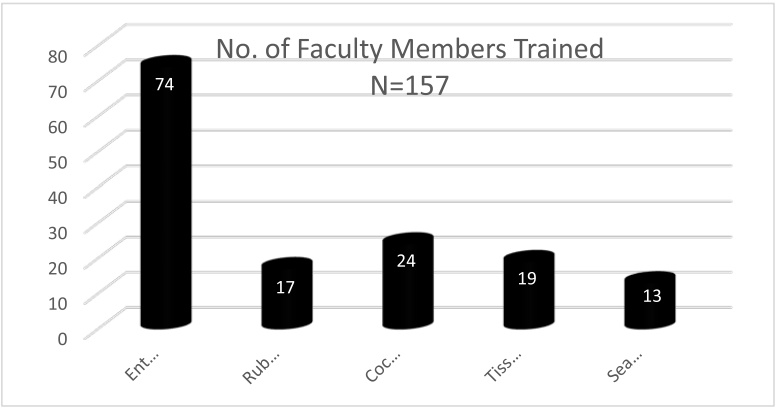

Figure 3. Total Number of Faculty Members Trained

About three (3) faculties were trained on Coco-sugar Processing. Training was conducted from April 21 to 24, 2009 at the local PCA-ZRC San Ramon on Coco-sugar processing Coco honey and jelly. The immersion of the faculty was an avenue to hone their technical skills in the various steps and procedure for coco-sugar processing and other value added products. The other related trainings done included two (2) faculties sent to UPLB to attend a two-week intensive training on Tissue Culture from May 17-23 and July 12-18, 2009 at Biotech Laboratory, UP Los Baños Laguna. Training on Multiplier's Training for Seaweed production was attended by one faculty from ZSCMST from May 6-9, 2009 at Garden Orchid Hotel, Zamboanga City.

- **Alumni and Student Trainings.** During the implementation of the curricular enhancements, students were trained in the entrepreneurial as well as in the four technical skills to include Rubber Budding, Tissue Culture, and Coco-sugar processing for those enrolled in the Agriculture education. For students enrolled in the marine sciences, both the entrepreneurial as well as the deep seaweed production were given. Students during the curricular enhancements were also asked to submit their group project proposal, feasibility study following the procedures on the learning modules provided per topic.

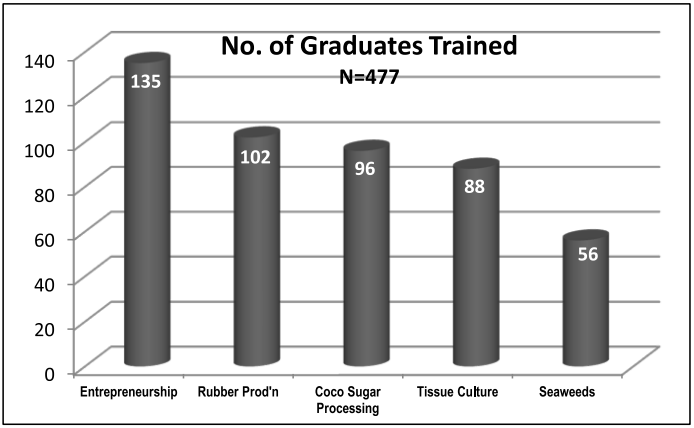

Figure 4. Total Number of Unemployed Graduates Trained

To reach out a maximum number of unemployed graduates, announcement via radio broadcast, words of mouth and fliers posted along bus stations, market places, and business establishments were done.

Figure 4 presents the total of 477 trained unemployed graduates across the four SUCs for the technical and entrepreneurial trainings offered. 135 unemployed graduates were trained in entrepreneurship and 342 graduates were trained in technical skills courses. A larger number of alumni have been trained in Technical Skills, specifically on Rubber Nursery and Budwood Production.

From the in-campus trainings, the SUCs had observed a change of attitude among graduates who were provided 10 days free trainings specifically on entrepreneurship and technical skills. The students revealed that their learning experiences reflected a shift of emphasis on entrepreneurial ventures and hands-on trainings on tissue culture techniques and coco-sugar processing.

During the trainings, the graduates raised issues on farm techniques on seaweed production, profitability, and trade and project employment. These offered added challenges and opportunities for SUC providers thought provoking ideas on ways or strategies on marketing, product processing and packaging. Secondly, the issue on the conduct of follows ups for the trainees who had finished their training specifically on the application of new knowledge and technologies in rubber budding, rubber seed production, seaweeds processing and marketing. The issues also included starting a coco-sugar processing asa timely substitute for unemployed graduates whose parents had background on seaweed, coconut and banana farming.

From the observed change of attitude among graduates, this observation corroborates the studies done by Martin, Rajasekaran, and Vold, (1989) who reported factors related to ways through which individual responds to a curriculum change. The national study of high school agriculture teachers on the studies of (Martin *et al.,* 1989) also revealed that teachers' changed attitude toward the importance of teaching science content is related to age, experience and the educational level of the teacher. Moreover, these observations from AFNR experience support the above authors. Based on the open-ended questions given during the training evaluation, the findings revealed that both teachers' and students' desire to apply the learning modules, share their ideas about the new skills they have acquired and experienced, and get more interested on how to market and work on the product development.

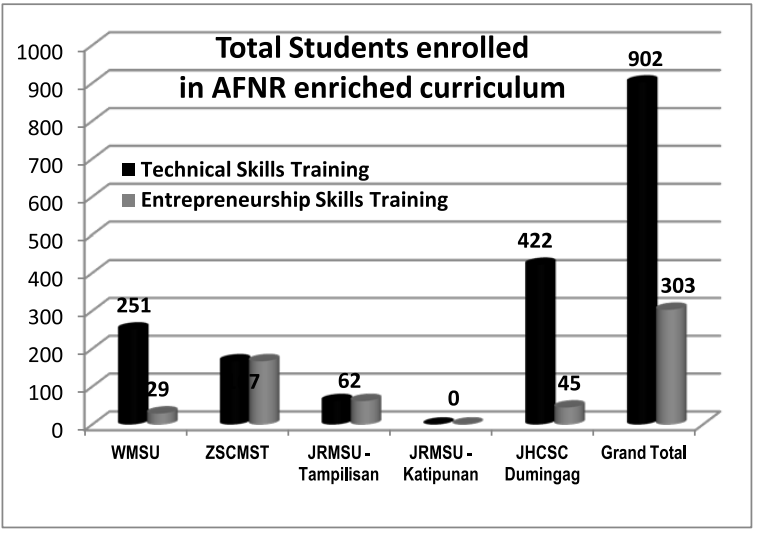

Figure 5. Total students enrolled in AFNR enriched curriculum per SUC

In Figure 5,a total of 902 students were reached out for the technical trainings while 303 received the Entrepreneurship trainings. Among the SUCs, JHCSC had trained 422 students in the technical skills specifically on rubber budding and coco-sugar. JRMSU Katipunan showed no results for either training due to the late implementation period of their AFNR enriched curriculum.

4. Learning Materials Development

During the conceptualization and development of the nine Learning Modules, and one Training Manual, a critical mass of faculty and experts were identified. The module writing workshop was necessary in preparation for the faculty attending the Training of Trainers (TOT).

The Module writing progress through the individual presentation of the individual authors followed by the critiquing process, which was scheduled for three days from April 29-30, 2009. The last day of the workshop finalized the contents of the learning modules and the final suggestions were done by a Development Communication expert, Dr. Felix Librero from UPLB. Each identified specialist/ and experts from partner school in the region were also given copies of the final drafts and were invited as critique on the last day of the workshop based on their work expertise and areas of discipline to critique to improve on the module content and presentation.

- ***Module Preparation Writeshop***. About 12 faculty members attended a module write shop session for the development of the learning modules. The full module development progressed in 6 months, which was initiated through the collection of materials from the Lakbay Aral. The individual authors at the same time also continued stacking reviews of related literature to enrich the content presentation of the modules.

  During the module development, each module underwent a series of re-writing sections and revision based from the individual consultant's reviews. The contents of each topic were written by at least two to three authors. The first draft was initially pilot tested during the conduct of the first and second trainings on various campuses. Suggestions from the consultants who reviewed the modules were incorporated in the final version of the module prior to the application of its copyright. The various courses enhanced using the modules were based on the specific nature of the subject. The modules were also used by student interns and those students doing their practicum.
- ***Development of the Learning Modules.*** In pursuance to the curriculum enhancements using the modular approach, nine modules and one Training Manual were developed. The development of the Learning Modules, was initiated through a workshop among Agriculture/ Fisheries Specialist identifying the important aspects to address the Maximum Learning Competencies (MLC's) of the users. From the nine modules, four were entrepreneurial and five modules were on technical skills.

The development of the modules followed a set of criteria on four emboldened issues: (i) presentation of the **Key Concepts** (2) **Objectives** of the training guide (3) **Activities** to be done (clarity of the procedures and task) ; and (4) FAQ- **Frequently Asked Questions** at the end of the learning task.

The modules were used in the re-orientation of the teaching content, course curricula, and interaction with students. The modules developed were used as new learning resources to enhance the quality of teaching and training including research. Harnessing the student's technical skills as well as the entrepreneurial knowledge was central to achieve the goal of the AFNR project 2.3.

Table 5. List of Modules and Manual Developed

Type	Title	Author(s)
Training Modules	**ENTREPRENEURSHIP MODULES**	
	Module 1: Feasibility Study, Project Proposal & Business Plan	Engr. Danilo Fonollera Prof. Arbaiya Abdula Prof. Florenchita Somblingo
	Module 2: Product Development	Prof. Arbaiya Abdula Prof. Florenchita Somblingo
	Module 3: Marketing Management	Prof. Arbaiya Abdula Prof. Florenchita Somblingo
	Module 4: Accounting for Non-Accountant	Prof. Arbaiya Abdula Prof. Florenchita Somblingo
	TECHNICAL SKILLS MODULES	
	Module 5: Tissue Culture of Abaca & Banana	Dr. Jocelyn Pedroso Prof. Elmer Galo
	Module 6: Coco-Sap Sugar Processing	Dr. Rafael Baguio Prof. Concesa Mangaya-ay
	Module 7: Deep Sea Seaweeds Faming	Prof. Oliver Tito Prof. Rolando Pelinggon
	Module 8: Rubber Nursery Management	Dr. Moises Glenn Tangalin Prof. Pepito Lacbao
	Module 9: Rubber Budwood Production	Dr. Moises Glenn Tangalin Prof. PepitoLacbao
Training Manual	General Guidelines: Empowering AFNR Trainers	Dr. Vivian R. Molina

Table 5 presents the title of the modules and the various authors in their field of expertise. Shown below in Figure 6 is the cover for the Training Manual which provides the overall concept on the use of the nine learning resources. The

picture below shows the Training Manual developed to guide trainers on all the modules for the curricular enrichment.

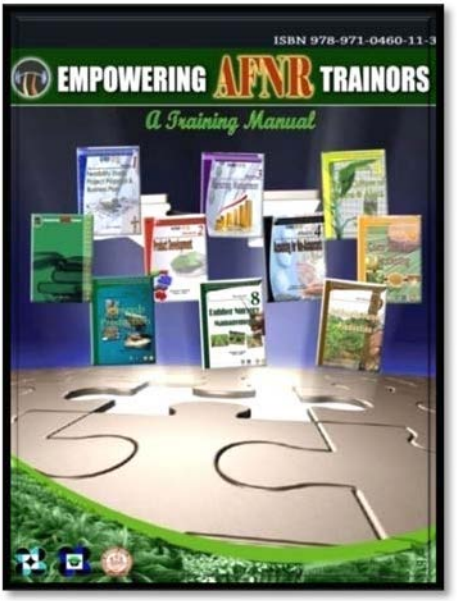

Figure 6. Training Manual/ANFR Modules Cover

5. Institutional Benefits

In pursuance to the implemented curricular enhancement and facilities upgrading, the AFNR project has derived the following benefits:

a. The project has reoriented the 74AFNR faculty mentors from ZAMPEN and invigorated the agriculture, forestry and fishery curriculum with trained human resource and, quality of teaching. The project likewise provided in-service training for the faculty from the Training of Trainers (TOT) workshops, consultancy, public-private sector partnership, industry academia interfaced under the AFNR project.
b. The project has also contributed significant income for the students and better training opportunities with the enhanced facilities and provided better equipment to further improve the student's e-IGP. Further, the trainings have exposed various faculty and other practitioners to new developments in the niche/emerging /cutting edge areas. The durations of the training have even extended local hospitality of each host SUC

conducting the trainings on site and ensured access to their facilities.

c. The AFNR project was well recognized as a timely intervention among SUCS implementer in terms of the change of attitude among trainers and entering first year students enrolling in the AFNR courses. This greatly helped raise the enrolment figures from the dwindling trend of the AFNR courses.
d. The process of introducing strong S&T content and enrichment in the subjects helped AFNR faculty enrich their respective subject areas, expand curriculum content, and the entrepreneurial application and training of students in selected courses. The AFNR provided opportunities to enrich existing course curricula, developed and used new learning resources to emphasize acquisition of students' skills and knowledge on enterprise, product marketing and needed IGP operations among student trainees.
e. The involvement of some sectors as business partners was identified when the products were produced out of the students' training and activities integrated in the entrepreneurial ventures. Future prospects for DTI for the product certification as well as TESDA accreditation on the workshops to be institutionalized using AFNR as the accredited program.
f. The selected SUC implementers developed greater alliance complementing their strength in terms of products developed and marketed like the rubber specific for JRMSU and JH Cerilles campuses, WMSU on Tissue Culture seedlings and Coco-sugar products and ZSCMST on Seaweeds. The faculty visits from either SUCs being AFNR implementer provided an opportunity for more institutional intervention as insights for consideration.
g. The project also contributed indirectly aspects of R& D on the sustainability of some products developed especially on the cost efficiency on the use of the existing laboratory for training or IGP. Likewise, the project's contribution was seen on the actual products like better packaging materials, shelf life, cost efficiency (firewood or fuel) in sugar processing, other forms and appearance, the other forms of retail and marketing strategies.
h. The Project has forged further ties with other government agencies in the operation of the student e-IGPs like jointly promoting academe-private partnership on education and training, service and commercial linkage.

i. The SUC implementers were also identified leaders in different aspects of product development based on their rich experiences. Future R & D collaboration for product development as significant areas for complementation on each other's capabilities as a new strategic area like rubber, seaweeds and biotechnology.

B. POST PROJECT OUTCOMES

A post tracer study as part of the Project 2.3 deliverables was conducted towards the end of the Project 2.3 implementation. The target respondents were the unemployed AFNR participants who took the various trainings in five campuses.

The source of names of the target respondents was from the attendance sheet listing of training participants on different dates and nature of trainings obtained from each SUC Training Coordinators. The participants from each SUCs were randomly selected, taking only at least 20unemployed graduates from the list of111 names. The participants were informed of the post tracer study and were requested to return back to campus for the conduct of the FGD. Frame of error for this study was controlled by cross-checking the names of the students in the master list of participants by SUCs/ title of training /dates of training. Selection error was controlled by checking the list to ensure that there were no duplicate names on the list and to make sure selection of the participants for the FGDs have Case Stories.

A constructed questionnaire consisting of 20 items was developed. The items statements on the questionnaire asked the following questions:

- the relevance of the AFNR trainings and Benefits derived from the training
- How the training will relate to their future prospects/
- Insights and lessons learned/ challenges faced after the trainings
- Strength and weakness of the trainings
- Other future prospects

For the case study the selection of the respondents were based on a criteria as follows (a) AFNR unemployed graduates who received the campus trainings (b) self-employed operating on the AFNR banner commodities (c) or those who have newly undertaken AFNR-S&T-based business start-ups. The results of the post tracer are also presented in the following section.

General Findings of the Tracer Study:

A. Profile of AFNR Trainee-Graduates

1. The AFNR trainee-graduates were relatively young with an average age of 20 years old, single, from rural origin and were from economically poor families. Majority are children of farmers, forestry workers & fishermen.
2. The ZAMPEN AFNR trainings across SUCs were done for a period of ten months from May 2010 - February 2011. A total of 380 graduating students and 80 alumni unemployed graduates were trained. The training schedules were varied per institution depending on various factors such as time, resources and category of participants. Each institution conducted at least three cycles of trainings on entrepreneurial and technical skills on coco-sugar production, banana tissue culture seedling production, rubber nursery management & bud wood production and deep seaweeds production.
3. From the total of 111 respondents involved in the post tracer study, 37 % (41) were trained in coco sugar, 23 % (26) on seaweeds production, 27% (31) on rubber nursery & bud wood production, and only 3 % (4) were trained on tissue culture. Only the students from WMSU College of Agriculture were given this training since other SUCs do not have a Tissue Culture Laboratory.
4. As revealed by the respondents, aside from the AFNR trainings the 44% of the respondents were also given other training opportunities on crop & livestock production & management sponsored by private companies, other government line agencies and non-government organizations.

B. Employment Status

1. While SUCs AFNR trainings prepare and equip students on both technical and entrepreneurial skills for self-employment purposes, a number of graduates have also tried other jobs from other sectors. The 42% of the AFNR trainees after graduation found employment from a wide range of sectors. Most of them (58%) were employed in local private firms, local government units (22%), national government agencies (11%), and non- government organizations (9 %).
2. About 31 % of the AFNR graduates found jobs after graduation, 17 %

found jobs after 6 months, about 17 % were employed after a year with only 10% self- employed.

3. Most graduates who found jobs after graduation worked in different sectors. The nature of their positions varied. The 72%however, were casuals /contractual employees, 6 % were hired as regular employees with permanent items.
4. For the other 52 % unemployed, the 38 % were enrolled in other BS courses in the 3rd and 4th year levels failing to get jobs after finishing the 2-year program in Diploma in Agricultural Technology.
5. The other unemployed graduates cited lack of job opportunities with no civil service eligibility as prime reasons for not getting hired. However, a significant percentage (32 %) of these unemployed graduates is now processing requirements to start up their own business ventures.
6. Of the 10% self-employed graduates, about 60% worked in retails and merchandizing jobs, (30%) engaged in producing/ manufacturing, and the (20%) in service-related jobs (20%). The (60%) self-employed AFNR graduates got their sources of capital from their own families and (40%) made loans from informal lending institutions.
7. Most of the employed graduates (42%) admitted have jobs not related to their degrees earned because of the salary and benefits offered after they graduated. The salary offered was only from Php 3,000 – Php 7,000 monthly, however, it compensated other forms of expenses since the job location was near their residences.

C. Future Plans

1. Most employed graduates (60%) still planned to seek other employment if given the chance. Higher salaries and benefits were the main reason and the other reason cited was the job's being related to their degree earned. The other 40% preferred self- employment if given the chance to acquire capital for doing business.
2. The respondents preferred self-employment, farming & merchandizing as the most cited type of enterprises. Graduates who owned a parcel of land planned to engage in integrated farming enterprise and at the same time engage in retail/ merchandizing business in their communities. They cited that their capital investment would probably start from Php 30,000 to Php100,000 as beginning capital.

D. Relevance of the AFNR Training

1. The AFNR graduates revealed a very good feedback on the quality and adequacy of the AFNR training services and facilities. Over all, the graduates were "very satisfied" with the different trainings & entrepreneurial skills conducted under the AFNR Enhancing Program conducted from SY 2009-2011.
2. Specifically, the graduates were interested in the various technical skills which were dependent on the availability of resources in their own homes and communities. Graduates from Jose Rizal Memorial State University, Josefina H. Cerilles State College rated the trainings as "very relevant" on rubber management & bud wood nursery, coco sugar, & banana tissue culture. Similarly the graduates from Western Mindanao State University also rated the trainings as "very relevant". For the Zamboanga State College of Marine Sciences &Technology, their graduates rated all the trainings on the skills for deep seaweeds production as "very relevant".
3. Overall, graduates in ZAMPEN SUCs rated the AFNR trainings "very relevant" on the AFNR actual hands-on experience. Almost all have observed change of attitude towards business venture and self-employment.

POLICY RECOMMENDATIONS

Increasing the employability of graduates of agriculture, forestry and fisheries (AFNR) in the ZAMPEN SUCs is a gigantic steps towards the creation of a favorable and conducive scenario coupled with sincere commitment of all actors from the national government, academe and the human resource in the AFNR sector. The national government has to increase annual budget for agriculture education and institute reforms in support for modernizing agriculture. In the academe, this requires investment of modern laboratory and teaching facilities and equipment, continuous training and capacitation of faculty for instruction geared towards student centered approach. State Universities and Colleges must integrate the high Science and Technology content in the curricular programs utilizing modular instructional strategy of all AFNR courses offered in the country. Moreover, students must be equipped with entrepreneurial skills in and out of the campus for better exposure and practicum in preparation for a brighter career entry level after graduation from college.

ACKNOWLEDGMENT

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LITERATURE CITED

Martin, R., Rajasekaran, B., & Vold, L. (1989). A national study to determine the role of bioscience/biotechnology in the study of agriculture as perceived by vocational agriculture instructors. In *Proceedings of the sixteenth annual National Agriculture Education Research Meeting, Orlando, FL*. Retrieved from https://goo.gl/2NU2GA

Narvaez, T. A & Subong, J. 2009.AFNR Human Resource Tracer Study. PCARRD-DOST Terminal Report. Western Mindanao State University, Zamboanga City. Philippines. Retrieved from http://wmsu.edu.ph/dost-pcarrd-wmsu-conduct-afnr-workshop.html

National Research Council. (1988). *Understanding agriculture: New directions for education*. National Academies Press. Retrieved from https://eric.ed.gov/?id=ED338795

Peasley, D. D., & Henderson, J. L. (1992). Agriscience curriculum in Ohio agricultural education: Teacher utilization, attitudes, and knowledge. *Journal of Agricultural Education*, *33*(1), 37-45. Retrieved from https://goo.gl/UhAFCE