



MIID/Cornell University LIFT Project

***REVIEW OF HORTICULTURE AND AGRONOMY CURRICULA AT
MYANMAR STATE AGRICULTURE INSTITUTES AND YEZIN UNIVERSITY***

by
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The goal of our consultancy was to consider the curriculum currently being used at the 14 SAIs in Myanmar and recommend changes that we feel would result in graduates with the required competencies to serve in all states across the country - in government service, private industry, education, NGOs and agricultural production. In particular, we were asked to consider this question from the point of view of Chin State to determine if the curriculum serves the needs of those who will eventually work there.

We obtained second and third year books for the SAIs, a list of courses from the horticulture department at Yezin, and detailed course content for many of the courses from the agronomy and horticulture departments at Yezin through Dr. Khin Mar Cho. We obtained first year books from the principal at Lungpi SAI. We also interviewed the principal and vice-principal there. In addition, we interviewed several graduates of Yezin and SAIs to learn about their academic experience. We did not have an opportunity to talk with faculty at Yezin so recognize that some of our conclusions and recommendations may be uninformed or inappropriate. For example, there appeared to be redundancy among certain courses but we are unsure if these apparently redundant courses are intended for different sets of students. Finally, we read the review by Thomas Rost, Aye Khaing and Min Aung 1.5 years ago of the Department of Plant Breeding.

We approached the curriculum review of the SAIs in three stages. The first step was to review the overall curriculum of the three-year SAI programs and consider whether the flow of the courses is appropriate, and if any critical courses are missing from what we perceive to be needed for well-rounded graduates. The second step was to reflect on many of the specific courses and identify changes that we feel would be appropriate to make. Some of these are minor and others are more significant. We also reviewed the course material from Yezin and compared this with the SAI curriculum. A third step was to consider the pedagogy at the SAIs and make recommendation based on the information that we gathered. This last step was the most difficult because information was inferred from graduates of SAIs and from the Department of Plant Breeding review, rather than direct observation.

For the most part, we were pleased with the curriculum at the SAIs. The courses were well-planned and we feel that a graduate of this three-year program will be very well prepared to enter employment in agriculture or transfer to Yezin, assuming that they learn all of the information in the curriculum books. While there are some emerging gaps in the curriculum, and the examples used are mostly from lowland agriculture, overall we were pleased with what we saw.

SAI CURRICULUM

1. The flow of courses seems reasonable, but to make the curriculum more relevant, we recommend that an additional course be added in year 3 that teaches how the various subjects taught previously are integrated into farming systems to meet nutritional needs. The current curriculum does not offer an integrative course and focuses exclusively on food production without regard to meeting human nutritional needs. We recognize that students transferring to Yezin will receive some exposure to this, but we feel that those whose education terminates after three years ought to have some nutritional content as part of their education, as well as exposure to integrated farming systems. This can be accomplished in one course.
2. The current curriculum almost exclusively focuses on lowland agriculture, yet several SAIs are in upland areas. In addition, the manuals contain a mixture of theory and concepts, and lab

practical exercises. We recommend that that lab and practical components be removed from the teaching books and that these be exclusively focused on theories and concepts. Then, separate lab exercises and practical experiences can be developed and put in different manuals relevant for the various local areas in which the SAIs are located. For example, a lab exercise for woody plant propagation in Shan State might involve mangoes whereas in Chin State it would involve apples. While this would require additional work at each SAI, it would significantly improve the utility of a degree from a SAI and increase student interest in the topic. Currently a degree from a SAI has less utility for a graduate employed in mountain areas. Entrance exams for Yezin could still be uniformly administered since the focus would be on theory and concepts rather than specific crop production practices of a particular area.

3. The examples used throughout the curriculum should include more cool season crops such as apple, pear, grapes, custard apple, strawberry, avocado, broccoli, potato and nut crops.
4. A course on water management/irrigation should be included as part of every agriculture student's education. Water excess and shortages are a regular occurrence in Myanmar and understanding how to manage it is essential for sustaining agriculture. It deserves a separate course.
5. A course on pesticide and fertilizer management should be included since many graduates are hired by companies that deal with these products or make recommendations about them.
6. Information on forest management is required at some point to understand shifting agriculture in the mountains and advise farmers on good practices.

SAI COURSES

We have many recommendations for modifying the individual courses – most of these recommendations will not require a major revision of the course, just minor modifications.

Agronomy – Year 1

1. Suggest avoiding the use of specific brand names for pesticides since these may go out-of-date as manufacturers change products. Preference would be to use the modes of action rather than brand names.

Horticulture – Year 1

1. Expand the section on “The Importance of Horticulture.” Since this is an entire major at many universities, there should be more description of the role that horticulture plays in nutrition, health and well-being, along with potential economic impacts.
2. Suggest including more detail on temperature optima for the various vegetable crops.
3. Suggest adding peas, watermelon, squash, potato and mustard greens to the list of vegetables.

Agricultural Botany – Year 2

1. The section on physiology should include information on flower induction, photoperiod, vernalization and chilling requirements. These concepts are particularly important for colder areas of Myanmar.
2. The section on plant classification should begin with an introduction to evolution and the chronology in which the various plant families evolved. Included here should be phylogenetic trees that show how the various plant families relate to each other. If students have an evolutionary framework, then they will better understand why plant families are important.
3. The families Rosaceae and Liliaceae should be included.
4. Descriptions of the various plant families should be consistent. Currently there is considerable variability in the descriptions. Also, it is heavily oriented toward India. Customization for Myanmar should be attempted.
5. The genetics section includes several animal examples (e.g. guinea pigs) to demonstrate inheritance patterns. Plant examples should be substituted as there are many to choose from.
6. The example of human skin color inheritance (page 85) should be eliminated as the use of these descriptive terms is no longer appropriate.
7. The genetics section should include a description of GMOs, genetic editing and PCR analyses (and their newer equivalents). We know that most graduates will never use these techniques, but a graduate from an SAI should know what they are.

Horticulture - Year 2

1. There is an over-emphasis on planting design. Exposure to modern orchard systems would be more appropriate here. For example, most modern orchards are planted using dwarf trees in high density systems.
2. The pruning section is woefully inadequate, and the example used is roses – not tree fruits. A good source that explains simple pruning techniques for many different fruit trees can be found at:
https://ecommons.cornell.edu/bitstream/handle/1813/67/Cornell_Guide_to_Growing_Fruit.pdf
3. The section on bagging should be moved to the course on pest management.
4. In the section on black pepper there is a photo of *Capsicum*, not *Piper*.
5. In the section on pyrethrum there is a photo of ornamental chrysanthemum, not the pyrethrum plant.
6. Each of the crop sections should have consistency in content. Currently the content is very uneven.

Horticulture – Year 3

1. The section on tissue culture should be included earlier with the section on plant propagation.
2. Methods of propagation should be included for each of the crop groups.
3. Including information on color might not be relevant. Either eliminate it or expand to include color complementarity and how it is used in landscape and floral design.

4. Information on turfgrass is insufficient. Either eliminate or expand. How can grass be used and managed in the alleyway of perennial crops? What are the benefits of a grass cover for any space?
5. Discuss refrigeration and controlled atmosphere storage in the postharvest section. Although this may not be practiced, it is important that graduates understand the technology and concepts behind it, and why fruits and vegetables can be imported to Myanmar from distant locations.
6. A good resource for postharvest information is found here:
<https://ecommons.cornell.edu/bitstream/handle/1813/42885/organic-stored-fruit-veg-NYSIPM.pdf>

Agronomy – Year 2

1. Too much emphasis on how to make hybrid rice. Graduates are unlikely to go directly into breeding of rice. If they want to be a rice breeder they should go to Yezin and take a course on plant breeding.

Agronomy – Year 3

1. Need to link experimental design section with analysis. Current section stops short of analyses. Including, for example, Σ makes little sense without using it for analyses.
2. The general concepts of organic farming should be explained rather than promoting a specific Japanese method. The differences among the four methods presented are subtle, so just describe the methods that are universally accepted.
3. Redundancy exists with the seed science section in this book and the seed science material in Ag Botany – Year 1. Suggest removing it from Agronomy-Year 3 since this material would have already been covered.

Ag Extension – Year 3

1. A brief history of extension should be included at the beginning to provide context.
2. Consider moving “Surveying” to an earlier section of the manual since it should come early in any extension process and it part of information gathering.
3. More detail on farmer field school approaches should be included since this appears to be a successful model in Myanmar.

CURRICULUM AT YEZIN

It was unclear if students attending Yezin University in years 1 – 3 receive similar training and coursework as those at the SAIs since we did not have the complete curriculum of list of courses that a student would take in the various majors. Students transferring to Yezin from an SAI should not be put at a disadvantage by having different training, so attempts should be made to ensure that years 1 – 3 are similar between Yezin and the SAIs.

We assume that students who attend Yezin in years 1 – 3 are exposed to similar course material as students from the SAIs.

Theory – 3rd year – There is an enormous amount of redundancy between this course and others in the SAI curriculum (and we assume other first and second year courses at Yezin). It is unclear what the course objectives are since it includes some flower morphology, taxonomy, physiology and production system information, with a heavy emphasis on onion production and floriculture. This course seems appropriate only for students who have not had a course in horticulture before. There did not appear to be an equivalent course in the SAI curriculum. We recommend that this course be evaluated for its utility and have a clearly defined role in the overall curriculum.

AGY – 4102: Field Crops Physiology – How is this different from the physiology introduced to students in Agricultural Botany – Year 2? Does Field Crops Physiology cover the same material as the second year course, but at a higher level, or does it introduce new topics? This course should be coordinated with the botany course to avoid redundancy and to ensure a smooth transition between the two. Also, topics like source-sink relationships and assimilate partitioning should include examples from fruit crops since this course appears to be the only place in the curriculum where these topics are addressed.

AGY – 4105: Agricultural Extension Approaches and Methods – This course is really a communications course and should have the word “Communication” in the title. The content is applicable beyond extension and the course title should reflect this. Perhaps “Communication to Diverse Audiences” would better reflect the course content. Also, with advancing technology, this course may want to someday include a section on web site design or how to give a recorded presentation that can be made available over the internet.

AGY-311 Biometry - It is unclear where SAI transfer students learn to analyze data. AGY – 4202: Research Techniques in Agriculture only has a small section on data analysis, and students from the SAIs do not take Biometry (AGY-311: Biometrics) since this is only offered at Yezin. Do SAI transfer students take AGY-311: Biometrics? They should. Perhaps this course should be offered at the 4000 level so transfer students can take it.

AGY-5102 Agricultural Regions of Myanmar – Although offered in the Agronomy Department, horticulture students would benefit from this course as well, particularly if horticultural examples are included. It is unclear if horticulture students take this particular course.

HSC-211,311, 321,4110, 4111, 4115, 4210, 4209 – Horticulture-Year 1 at the SAIs addresses plant propagation very well. We assume that students at Yezin take an equivalent course (HSC-221). However, there are seven additional courses that address some aspect of propagation at YAU. We believe that this curriculum overemphasizes plant propagation. We suggest that plant tissue culture (HSC-4210) and seed production (HSC-4115) be combined with HSC-4209 Nursery Management and Production since

each involves plant propagation –perhaps into a full year course that includes all aspects of propagation. Furthermore, we recommend eliminating HSC-321 since it appears that the subject matter is repeated in HSC-4209. Regardless, nursery management should be a 4th year course so SAI transfer students can take it. By combining HSC-321 with 4209, transfer students from the SAIs will be exposed to the same course as YAU students and not be left behind. We want to emphasize that the course content of HSC 321 is exceptionally good – our recommendation is intended to properly place it in the curriculum. Seed production in vegetable crops is of minor importance and not relevant for fruit crops, so it should not be a stand-alone course. Requiring students to take more than a year (two semesters) of plant propagation-related courses means that they cannot take other important courses that are essential for a good education.

HSC-4114 Horticultural Crop Production – It is unclear how this course provides new information beyond what is offered in years 1 – 3. It appears to be redundant. Similarly, **HSC-5102 Organic and Sustainable Horticultural Crop Production** also may be redundant with earlier material. Perhaps HSC-4114 could be eliminated since much of the material would have already been covered in earlier courses, or folded into **HSC-5102 Organic and Sustainable Horticultural Crop Production**. The goal of agriculture is to be sustainable, so separating conventional agriculture from sustainable agriculture is not a good message. Furthermore, many organic methods are not necessarily sustainable. One course that compares methods of production (both organic and conventional) using the perspective of sustainability would be very useful.

HSC-4204 Food Science – More emphasis should be placed on the value of eating a variety of foods, especially those of various colors. Students should learn that a diet heavy in rice can lead to malnutrition. Also, dieticians no longer consider the “acidity” or “alkalinity” of foods to be relevant for the diet – it is not scientifically credible and is not taught at other universities. Blood pH remains between pH 7.35 and 7.45 regardless of the diet. Replace this section with information about the value of a balanced diet. Emphasize the relationship between nutrition and agriculture. We were surprised that students who recently took the Food Science course said human nutrition was not addressed in this course. Better coordination is needed with **HSC 4113 Postharvest Physiology and Technology**. Some information, such the constituents of food in HSC 4113, would be better placed in HSC 4204.

HSC-4211 Molecular Marker Technology – It is unusual for a university to offer a course on a specific technique like this. Better would be to offer a course on plant breeding that includes various methods for accelerating selection, such as marker-assisted selection. It would seem that students should have exposure to basic plant breeding prior to learning about molecular markers and prior to taking **HSC-4112 Basic Molecular Biology**. It does not appear that plant breeding is a component of the curriculum, but this is necessarily to properly understand the role of molecular markers.

Forestry management – Students should be exposed to the basics of forest management, especially if a goal is to reduce shifting cultivation in the mountains. Students advising mountain villages need to know about this topic to provide good advice. A partnership with the School of Forestry should be explored.

General Observation - Several courses taught in Agronomy would benefit horticulture students since equivalent courses may not exist in Horticulture. We are unsure if horticulture students take these agronomy courses. Agronomy instructors could contribute to the overall competency of agriculture students by including some horticulture content in such courses (e.g. Field Crop Physiology, Postharvest Technology, Agricultural Regions of Myanmar, etc.).

We believe that additional exposure to statistical design and analysis is needed, probably in Year 5 prior to graduation. While **AGY-311 Biometry** addresses statistics, our limited exposure and conversations with YAU graduates suggests that they have a poor understanding of statistical design and analyses. This is a difficult subject, so another higher level course is warranted for the country's best agricultural graduates. This is particularly true for SAI transfer students who may not take **AGY-311 Biometry**.

There appears to be considerable redundancy among courses offered at Yezin – much more so than the SAI curriculum. We recommend that Yezin faculty review their course content, compare it to other courses in horticulture, agronomy and food science, and eliminate redundancies and perhaps shift some course content into a better location. Also, students should be given some choice in what courses they take. Requiring all students to take all courses does not contribute to an interesting college experience and also increases class size unnecessarily.

Lastly, we get the impression from examining the curriculum that horticulture instructors at YAU are teaching in their specialty area but not necessarily teaching all the courses that students will need to achieve their fullest potential. We recommend that YAU carefully review their curriculum to ensure compatibility with the SAI curriculum, eliminate redundancy in subject matter across courses, and ensure that students receive training in all of the essential areas of horticulture and agronomy. Our interviews with recent graduates suggest that courses in **human nutrition, pesticide management and meteorology** would have been very valuable to their future careers. Also, given the predominance of slash-and-burn agriculture in the mountains, a course on agroforestry would be very valuable. Given the proximity of the School of Forestry at Yezin, this should be a possibility. The courses mentioned above do not appear to be available to horticulture or agronomy graduates. Lastly, graduates need to be better prepared to conduct simple replicated experiments since they are often asked to test products or plant material under various conditions.

PEDAGOGY AT SAI AND YEZIN

1. We recognize what a tremendous challenge it must be to have course materials written in English while the spoken and instructional language is Burmese. Most academic publications and web sites are now in English, so to be able to communicate, interact and conduct business with the rest of the world, increased proficiency in written and oral communication in English will be necessary. We found that most graduates do not have a working knowledge of English.
2. Our perception from student interviews is that current instructional approaches are very much teacher-centered particularly in years 1 – 3, rather than student-centered. Most leading universities have now adopted a student-centered model. These methods include: 1) **active learning** in which students solve problems, answer questions, formulate questions of their own, discuss, explain, debate, or brainstorm during class; 2) **cooperative learning** in which students work in teams on problems and projects under conditions that assure both positive interdependence and individual accountability; and 3) **inductive teaching and learning** in which students are first presented with challenges (questions or problems) and learn the course material in the context of addressing the challenges. Learner-centered methods have repeatedly been shown to be superior to the traditional teacher-centered approach to instruction. This is true whether the assessed outcome is short-term mastery, long-term retention, or depth of

understanding of course material. Given that much information is now available through the internet, less emphasis is needed on knowing specific details. Today's students need to know how to use and process the information that is readily available to them in books and over the internet, and be good integrators of the information and communicate well. Instructors become coaches and facilitators rather than exclusively lecturers.

3. Several courses listed learning outcomes and we commend the instructor for listing these. However, learning outcomes should be measurable and express a change in behavior. So a learning outcome such as "Students should be able to understand" are not generally acceptable because "understanding" itself is not a change in behavior. Words like "explain," "demonstrate," "describe," "analyze" or "assess" are acceptable for describing learning outcomes.

Department of Plant Breeding, Physiology and Ecology Review Report, September 2015

A review was conducted by Thomas Rost, Aye Khaing and Min Aung 1.5 years ago for the Dept. of Plant Breeding. We have read this report and believe that it informs our review of the sister departments – horticulture and agronomy. We did not visit Yezin and interview faculty, but some of these recommendations are strongly supported by us based on our observations and interviews. These include:

1. Conduct a regular assessment of needs and curriculum that includes recent graduates to identify expectations of graduates and gaps in training.
2. Re-examine the curriculum to identify ways to create small class interactions and opportunities for inquiry-based learning.
3. Give students freedom to select research projects.
4. Add more specialized courses in later years and not require all students to take all classes, thereby reducing class size and making the educational experience more relevant.
5. Initiate an honors program for those students interested in molecular genetics, and not require all students to take specialized courses (like molecular markers) that are not in their area of interest.
6. Add English exercises in every class and provide more opportunities to speak English.
7. Limit the early morning field work for students.
8. Exams test memorization but not critical thinking. Create exams that force students to solve problems rather than recite facts.

Summary

We were pleased with the cooperation of our partners who freely shared curricular materials with us and with former students who shared their experiences.

With some changes to the curriculum, better coordination among courses, and a more student-centered approach to teaching, Myanmar will be able to offer a college education that is on par with most other countries and that will be relevant for the coming decades.