AGROFORESTRY EDUCATION AND PROFESSIONAL LEVEL LINKS IN PENINSULAR MALAYSIA

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Abstract: Past studies showed that agroforestry plays an important part in balancing and managing natural resources. However, agroforestry practices are not conspicuous in Malaysia, and most of the projects are also shat of success, and one of the main reasons being the lack of knowledge. A study was made to review the competency and education levels of officers working in agro based agencies and also to determine the links between the education and duties of these officers. This study was conducted with the purpose of identifying the perceptions of agroforestry education in Peninsular Malaysia, held by the officers at three level positions. The study was done in seven states in Peninsular Malaysia. A questionnaire was prepared based on a review of the literature and specific courses at various institutions. The questionnaire consisted of 16 items covering several agroforestry aspects of in which the technical competency of the officers was geared. One hundred and fifty-nine officers from agro based agencies participated in the study. Of those surveyed, 63.5% had never had agroforestry education while only 36.5% took a course in agroforestry in their education. The results showed that the level of agroforestry education was statistically significantly different for three group of officers (χ^2 (2, N=159) = 10.367, ρ = .00) at .05 level of significance and that the proportion of variability in the ranked dependent variable accounted for by the status of agroforestry education was .256, indicating a moderate relationship between the group positions of the officers and the status of agroforestry education. The technical competence level of the officers in the agro based agencies in the multidisciplinary subjects was often weak. There was highly demand for intensified agroforestry training through regular in-services courses. Courses should include all categories of staff. Therefore, this study has raised awareness of the status of agroforestry at the professional level in agro based agencies.

KEYWORDS: Agroforestry competency, professional, agro based agencies, education.

Introduction

Agroforestry practices in Malaysia involve agrisilviculture, silvopastural and agrosilvopastural combination with or without forest species, agricultural crops, livestock and aquaculture. In Malaysia, agroforestry and related subjects have been taught at Universiti Putra Malaysia (UPM), Universiti Malaysia Sabah (UMS), Universiti Institute Technology Mara (UiTM) and Universiti Malaysia Sarawak (UniMas) since the seventies. Most of the officers in agrobased agencies graduated from these universities. Commercial agroforestry was first launched in Malaysia in the 1920s, where rubber trees were planted in coffee plantations (Najib Lotfy and Mahmud, 1999; Ahmad Fauzi *et al.,* 2000). However, the success of the agroforestry models used in Malaysia has been decreasing. Therefore, forestry education and R&D as well as extension are important elements to ensure the success of agroforestry projects for long term socio-economic benefits (Awang *et al.,* 2010). Without education in agroforestry as a land use system, it will be very difficult to tap the socio economic benefits, conductivity research and extension agroforestry as a land-use activity is necessary and important to help some small farmers (Singh, 1990). In any new educational program such as an agroforestry course, a real, concerted effort is

needed to evaluate the syllabus. This appraisal can be done by obtaining information from those people involved in the implementation of the program. According to Temu *et al.,* (1995), involving stakeholders especially in governmental and private agencies gives more benefits in terms of quality in the development process in agroforestry curriculum. It becomes more effective in the curriculum development (Rogers and Taylor, 1998). The curriculum should take into account learning and adapting with community needs; this should be done for better future development (Dewey, 1938).

In Malaysia, agroforestry is relatively not a new subject in most universities and colleges where forestry, agriculture and natural resources are taught, having in most cases been included in their curricula since a few years ago. Agroforestry courses have been introduced in institutions of higher learning in Malaysia. For example, Universiti Putra Malaysia (UPM), has a course in agroforestry for undergraduate and post-graduate students and in Universiti Malaysia Sabah (UMS), there is a 3 year program on forest plantation and agroforestry for bachelor degree students. However, Malaysia still faces a significantly lack of expertise in agroforestry among officers in the agro based agencies. Therefore, a study of agroforestry education in Malaysia is pertinent with respect to upgrading its level and effectiveness in the content of socio-economic development.

According to Lassoie (1990), agroforestry is a newly discovered area for research and application. Compared to most fields of study, agroforestry is directly relevant to a wide variety of professionals since technical and professional education can benefit from the research and development of agroforestry activities. Many university graduates often find work in research or educational institutions or take on managerial positions in agro based agencies. Therefore, links between agro based agencies and education are important in conducting agroforestry activities. The aim of this study was to explore these links. The study involved 15 agencies (government and private sector) in Peninsular Malaysia so as to; (1) develop and test a tool for studying the

education level of officers in agro based agencies and its linkages to their competence according to their positions in the agencies in Peninsular Malaysia; (2) identify the knowledge gaps in agroforestry among the professional staff in the agrobased agencies.

Appendix A:
List of the Participating Agrobased

Name of Agency

- Forest Research Institute Malaysia (FRIM)
- Agriculture Department
- Farmers' Organization Authority Malaysia (LPP)
- Forest Department
- Federal Land Development Authority (FELDA)
- Rubber Industry Smallholders Development Authority (RISDA)
- Federal Agricultural Marketing Authority (FAMA)
- Malaysian Agricultural Research and Development Institute (MARDI)
- Smallholders Estate Sdn. Bhd. (ESPEK)
- Felcra Plantation Services Sdn. Bhd. (FPSSB)
- MALAYSIAN BERHAD ("KLK")
- Ladang KLK Batu Lintang
- LKPP Corporation Sdn. Bhd.
- Ladang Lepar Baru Sdn. Bhd.
- Bifa Farms

Materials and Method

Study Area

The study area was conducted in seven states of Peninsular Malaysia covering four regions, i.e. (1) northern part, in the states of Kedah and Perak; (2) western part, in the state of Selangor; (3) southern part, in the states of Johor and Malacca and; (4) eastern part, in the states of Kelantan and Pahang. The agencies selected for the study were based on their being; 1) Malaysian agrobased agencies/forestry; 2) directly/indirectly involved in agricultural/forestry and agroforestry activities such as agrisilviculture, silvopastural and agrosilvopastural, and 3) involved with farmers and animal husbandry/agriculture

including forestry activities for many years. For example, the Department of Agriculture and Farmer's Organization Authority (LPP), they have farmers who integrate their crops such as mango with rubber trees.

Research Design

The research design used quantitative analysis and descriptive used research. In the descriptive research the majority of the variables used were adapted from literature and previous studies (e.g. Forest Plantation and Agroforestry Programme at Universiti Malaysia Sabah, Abdul (1982), Darnhofer (1982), Asare (1990), MacDicken and Lantican (1990) and, SEANAFE news, March (2007)). A proportionate stratified sampling of the research was conducted by selecting respondents based on their posts or positions in their respective government agencies and organization. The research involved the survey method and meeting individual respondents. The respondents were interviewed by using the questionnaires form. The agroforestry education and professional level links of each group of officers were then described in terms of the scores obtained from the questionnaires, followed by statistical analysis to determine differences in status of agroforestry education for each of the three levels of officers.

Research Instrument

Questionnaires were prepared in two versions – English and Malay. One set of questionnaire with close and open-ended questions was used. Some modifications were made to the existing measure to suit the agroforestry curricula. The respondents according to their professional level were asked to rate their competence in 16 agroforestry areas using a 5-point Likert-type scale, ranging from 1 (very low) to 5 (very high). This would give a measure of the knowledge gaps in agroforestry among three groups of officers in the agencies (top level officers, managerial officers and field officers) in agroforestry areas. The questions were also targeted at evaluating (1) the level of agroforestry education of the respondents and (2) the relation between their agroforestry education and current jobs. The respondents needed to answer in addition "fill in the box provided" questions. Demographic variables (which included gender, age, level of education, duration of services and level of position) were also provided as additional information about the respondents.

Data Collection

The survey was administered over a period of five months from November 2010 to March 2011. The sampling was conducted at the agro based agencies, involving 36 top level officers, 60 managerial officers and 63 field officers. No time frame was given in order to allow the respondents to recall their past memories. Only properly completed questionnaires were analysed for the study. A total of 220 questionnaires were distributed to 15 agencies in all seven states. The numbers of completed forms collected were 28 from Pahang, 28 from Kelantan, 20 from Johor, 13 from Malacca, 26 from Selangor, 22 from Kedah and 22 from Perak. These numbers were more than the required numbers of sample size (estimating that not all or 100% of the questionnaires were completed). Out of 220 officers surveyed, 159 completed the survey instrument, reaching an overall response rate of 72.27%.

Figure 1: Locations of Kelantan, Pahang, Johor, Malacca, Selangor, Perak and Kedah in Peninsular Malaysia (Source: WWF Malaysia, 1998).

Data Analysis

The data analysis was conducted in four simple stages, i.e.; descriptive analysis, Kruskal-Wallis, Mann-Whitney and chi-square. These were performed to find out the knowledge gaps and the levels of education in agroforestry among the professional staffs in the agro based agencies, to propose changes in curricula and teaching to address the needs and also to determine the links between the education and duties of these officers.
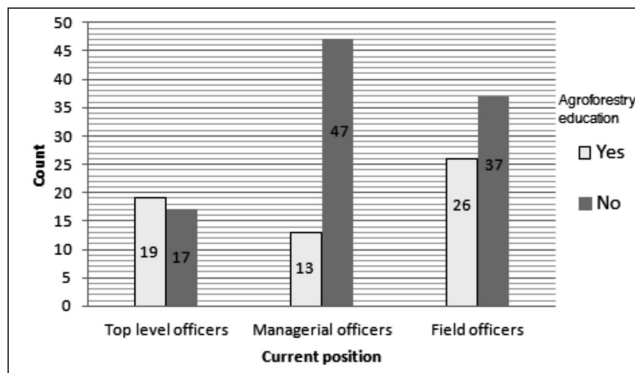

Figure 2: Status of Agroforestry Education among Agro-Based Agencies Officers in Peninsular Malaysia.

Results and Discussion

Educational Background and Job Characteristics

A total of 159 officers had responded to the questionnaires distributed (category A) in the randomly selected agro based agencies in the governmental and private sector. There were 22 positions occupied by the respondents in their department which were grouped in three sections, namely top-level officers, managerial officers and field officers. The majority of respondents were field officers comprising farm managers, forest keepers, forest officers, forest rangers, agricultural officers and land planning officers (39.6%). The managerial level officers occupied nine positions as managers, senior managers, assistant managers, unit/division heads, research officers, administrative officers, economic affairs officers, officers advice and accounting officers (37.7%). The minority of respondents came from the top level officers in seven top posts as directors, deputy directors, chief assistant directors, assistant directors, senior executives, general managers and branch heads (22.6%). Length of service of ≤ 10 years was shown by 59.12% of the respondents (the largest), that of 11-20 years by 10.06%, of 21-30 years by 20.13% and of > 30 years by 10.69% of the respondents.

Agroforestry Education at Professional Level

At a glance, the overall pattern of agroforestry education at professional level among the three groups of officers appears to be rather similar

(Figure 2). The lack of formal education in agroforestry among the officers was striking when the needs were considered. Of those surveyed in this study, the largest number of officers with agroforestry education were field officers at 26 compared with top level officers at 19, while at lowest number of officers with agroforestry education came from managerial officers at 13. Indirectly, managerial officers also showed the highest number of officers without agroforestry education, i.e. 47 compared with the other groups, namely 37 for field officers and 17 for top level officers. However, overall 63.5% of the respondents did not have any agroforestry course in their studies, while only 36.5% took a course in agroforestry in their education. This showed that the majority of the respondents from the sample size did not have any formal agroforestry education. This is because, according to the perception of respondents, the agroforestry education was not applied commercially into the curriculum of higher education in Malaysia.

A Kruskal-Wallis test was conducted to evaluate differences among the three groups of officers (top level officers, managerial officers and field officers) on median change in level of agroforestry education. The test, corrected for tied ranks, was significant χ^2 (2, N=159) = 10.367, ρ = .006. Follow-up tests were conducted to evaluate pairwise differences among the three groups, controlling for Type 1 error across tests using the Bonferroni approach (Table 1).

Table 1:   Kruskal-Wallis and Mann-Whitney Tests for the Three Professional Groups on Agroforestry Education.

	Mann-Whitney U	Df	χ^2	ρ
Officers' positions		2	10.367	.006*
Group (i) Group (j)				
Top level officers – Managerial officers	744.000			.002*
Managerial officers – Field officers	1003.500			.271
Field officers – Top level officers	1519.500			.020*

Note: *significantly different at α < .05

Table 2:   Chi-square Test for the Relationship between Officers' Positions and Their Status of Agroforestry Education.

Group	Percentage within current position		χ^2	Sig- χ^2
Officers' positions	With	Without	10.432^a	.005*
Top level officers	52.8	47.2		
Managerial officers	21.7	78.3		
Field officers	41.3	58.7		
Symmetric measures				
Phi = .256				.005*
Cramer's V = .256				.005*

Note: * significantly different at α < .05 (chi-square test)

The results of these tests indicated a significant difference between the top level officers group and the managerial officers group. In other words, the top level officers group had a statistically significant higher level of agroforestry education than the managerial officers group (ρ = .002). However, there was no significant difference between the managerial officers group and the field officers group (ρ = .271) in their level of agroforestry education. The tests also indicate a significant difference between the field officers' group and the top level officers' group at a level of .05. The status of agroforestry education among the field officers group was greater than for the top level officers group (ρ = .020). Therefore, it can be further concluded that the managerial officers group showed lower significant level of agroforestry education compared with the top level officers group and field officers group.

The following sections will discuss the relationships of agroforestry education among the three groups of officers (top level, managerial and field officers) in terms of the two dimensions of education status (with and without). From Table 2, the value of chi-square was (χ^2 (2) = 10.432, ρ < .05). More than half of the top level officers (52.8%) and many of the field officers (41.3%) had agroforestry education while only less than one fourth (21.7%) of the managerial officers had agroforestry education. The officers positions had a moderate relationship (V = .256) with the status of agroforestry education. This shows that the officers' position's in their agencies reflect in some way the status of agroforestry education they had undergone.

Relevance of Agroforestry Education

Table 3 shows the degree of relevance of agroforestry education in its two dimensions (theory and practical) as to whether the education was related, there were minor gaps, major gaps or not relevance in the current job of the officers.

In Peninsular Malaysia, the officers in the agro based agencies pointed out that the time allocated for agroforestry education when given had been too little, with only theory being stressed and major gaps in the practical aspects. Although most respondents from this sample had never had education in agroforestry (Table 2), they were holding jobs related to agroforestry, whether directly or indirectly.

Table 3: Perceptions of the Officers in the Agro-Based Agencies on the Relevance of Theory and Practices of Agroforestry in Their Current Jobs.

Variable	Top level officers	Managerial officers	Field officers	Total
Theory in current job				
Relevant	2.52	1.89	5.66	10.06
Minor gap	10.69	14.47	15.72	40.88
Major gap	6.92	16.35	13.84	37.11
Not relevant	2.52	3.14	3.14	8.81
Practice in current job				
Relevant	1.89	2.52	6.29	10.69
Minor gap	10.06	11.32	11.95	33.33
Major gap	6.92	18.24	17.61	42.77
Not relevant	2.52	3.77	3.77	10.06

The results in Table 3 indicate that in the dimension of theory, must respondents felt a minor gap between their agroforestry education and their employment in each position as follows: top level officers group (10.69%), managerial officers group (14.47%) and, field officers group (15.72%).

In the same dimension of theory, those having the perception of a major gap in the relevance of the agroforestry education were distributed as follows; top level officers (6.92%), managerial officers (16.35%) and field officers (13.84%). However, from the overall percentages only 10.06% felt agroforestry education theory was relevant in their work while even less (8.81%) saw no relevance at all. In the letter former 'Relevant' group, 2.52% were top level officers, 1.89% managerial officers and 5.66% field officers. Overall, among the officers, the majority who applied more agroforestry education theory in their work were field officers. Those who saw no relevance of agroforestry education theory in their work were represented by top level officers at (2.52%), managerial officers at (3.14%) and field officers at (3.14%).

From Table 3, in agroforestry education practice in their work only 10.69% of the officers felt at was relevant while 10.06% saw no relevant at all. The respondents' percentage a minor gap in relevance of agroforestry education practices were top level officers (10.06%), managerial officers (11.32%) and field officers (11.95%). Those who saw a major gap in relevance was top level officers (6.92%), managerial officers (18.24%) and field officers (17.61%). In the 'Relevant' group were top level officers (1.89%), managerial officers (2.52%) and field officers (6.29%). The table shows that field officers were the most who applied agroforestry education practices in their work. Those officers who perceived no relevance of agroforestry education practices in their work were top level officers (2.52%), managerial officers (3.77%) and field officers (3.77%).

Most of the officers had the perception of gaps (minor and major) in the relevance of theory and practice of agroforestry education in their work. Thus it was necessary to have direct relevance of this education in the agroforestry sector. This is shown from the literature that agroforestry is yet to be recognized as a field of specialization in many schools, and there were no specific government or private jobs in agroforestry (Rudebjer and Castillo, 1999). In Malaysia too, agroforestry as a profession does not exist, especially in Peninsular Malaysia. Forestry and agriculture, however, have seen specialization although agroforestry systems have been around for centuries without being noticed. There is still a need for agroforestry education in the duties of these officers. As we know that, the officers must undertake a variety of duties in their daily work with consumers or farmers including in the areas of education and the use of agroforestry whereby they generally showed moderate technical competencies (Table 4).

Table 4: Competency Levels of the Officers in Agroforestry Areas.

Competency in agroforestry knowledge	Mean			
	Top level officers	Managerial officers	Field officers	Overall mean
Explaining, implementing and organizing integrated plantation management	3.22	3.02	3.27	3.17
Explaining, compiling and identifying the principles of farm management	3.42	3.25	3.59	3.42
Explaining, compiling and identifying the principles of crop production and management	3.06	3.22	3.46	3.25
Identifying, integrating and organizing the agroforestry system and concept	3.25	2.83	3.03	3.04
Understanding and identifying genetics and plant breeding	2.69	2.72	2.87	2.76
Understanding, arranging and diversifying agroforestry techniques	2.83	2.60	2.70	2.71
Identifying and classifying soil and climatic resources	3.11	2.92	3.22	3.08
Applying, implementing and calibrating freshwater fisheries management	2.58	2.57	2.33	2.49
Understanding ,identifying and diversifying industrial crops	3.33	3.17	3.22	3.24
Describing and identifying livestock and poultry breeding	2.75	2.75	2.51	2.67
Applying and assisting human management and extension	3.61	3.33	3.59	3.51
Explaining, reporting and diversifying forest plantation and agriculture in the tropics	3.17	2.97	3.08	3.07
Applying, revising and constructing agroforestry economics and finance	2.86	2.87	2.87	2.87
Understanding and identifying agroforestry marketing policies	2.89	2.92	2.65	2.82
Understanding, revising and organizing farm product marketing	3.03	3.33	3.10	3.15
Understanding, compiling and identifying the laws and policies for land use	3.14	2.92	3.17	3.08

Identifying the Technical Competencies in Agroforestry of the Professional staff in the Agro based Agencies

A five-point scale (1= very low, 2= low, 3= moderate, 4= high, 5= very high) was used to evaluate the competency of the officers in knowledge of agroforestry in for 16 sustainable agroforestry areas as commonly conducted for the plantation sector. The descriptive test was conducted to determine the underlying structure of the 16 variables reflecting the various aspects of the agroforestry area. These studies were important in measuring the level of technical competency of the officers in determine the

importance of the agroforestry courses. The means for each of the statement to gauge the officers' technical competence levels are in Table 4.

The overall competency means for the three groups of officers were above midpoint (3.0) on a five-point scale in ten of the agroforestry areas. These included "Explaining, implementing and organizing the integrated plantation management", "Explaining, compiling and identifying the principles of farm management", "Explaining, compiling and identifying the principles of crop production and management", "Identifying, integrating and organizing the agroforestry system and concept", "Identifying and classifying soil and climatic resources", "Understanding, identifying and diversifying industrial crops", "Applying and assisting human management and extension", "Explaining, reporting and diversifying forest plantation and agriculture in the tropics", "Understanding, revising and organizing farm product marketing" and "Understanding, compiling and identifying laws and policies for land use." The level of technical competency of the officers in these ten sustainable agroforestry areas was moderate. This may be due to the lack of theoretical and practical emphasis in the courses taken by the officers in their educational either before or after service.

The highest mean score was 3.51 for "Applying and assisting human management and extension". Whereby, most of the officers in the three levels perceived this competency as highest scores on that agroforestry knowledge. It means that the majorities of the respondents were involved in human management and extension activities because of their closeness to small farmers and helping them to increase their agricultural productivity. The other six agroforestry areas or activities all had competency scores less than the midpoint 3.0 on a five-point scale. They were "Understanding and identifying genetics and plant breeding", "Understanding, arranging and diversifying agroforestry techniques",

"Applying, implementing and calibrating the freshwater fisheries management", "Describing and identifying livestock and poultry breeding", "Applying, revising and constructing agroforestry economics and finance", and "Understanding and identifying agroforestry marketing policies". This indicated that, the level of these six technical competences of the officers in the areas of agroforestry was very low. This is because due to lack of knowledge and no in-depth exposure and training for these courses to officers.

The results presented in Table 4 show that most respondents in general had a moderate level of technical competence in the sustainable agroforestry areas with only small differences shown in the level of competency between all three groups of officers. Based on the above findings, the officers in the agrobased agencies faced a lack of knowledge and professional constraint in exercising their duties, especially in those area existing scores the lower than the midpoint 3.0. This was probably due to the lack of exposure to the concept of agroforestry as a profession in Malaysia. In fact, agroforestry profession still does not exist in Malaysia and has become a regional issue for other countries as well. However, this profession is required by the agrobased agencies in Malaysia. According to Lassoie (1990), agroforestry was considered a newly discovered area for research and application. That was more than two decade ago and the situation in Malaysia has little changed. Compared to most fields of study such as forestry, agriculture and environment, agroforestry is directly relevant to a wide range of professionals. Due to the lack of knowledge and pertinent education and also absence of significant research in agroforestry, in order to improve the existing state of agroforestry, professionally educated agroforestry personnel have to be produced (Marwan, 1987), with serious consideration of the links between the agrobased agencies and the education required that as vital in agroforestry activities.

Conclusion

This study offers findings which can explain the linkages between education at professional levels and agroforestry activities, with references to agroforestry in Peninsular Malaysia. From the institutional and agroforestry education perspectives, these findings have a number of implications for academicians and the curriculum maker. First, in developing a new agroforestry curriculum the agroforestry courses should be planned such as to ensure delivery of the appropriate content and appeal to the target groups. Secondly, the importance of competency in acquiring and applying knowledge, the right attitudes and skills must be stressed for agroforestry courses to develop professional agroforestry manpower in the agroforestry sector.

This study also showed that agroforestry education is important for most professional level in agro based agencies, whereby most of the officers had the perception of gaps (minor and major) in the relevance of theory and practice of agroforestry education in their work. Thus it is necessary to have direct relevance of this agroforestry education in Malaysia education's curriculum. This is because, without education of agroforestry, it will dispose agroforestry practices in Malaysia as lack of successful models, difficult to make selection of right species and diversion of resources (Awang *et al.,* 2010). Therefore, the desire for more environmentally responsible agricultural practices and systems has provided an ideal context for developing and implementing agroforestry.

From the findings, the officers' positions had a moderate relationship with the status of agroforestry education. Thus, it showed that the officers' positions in their agencies reflect in some way they had undergone. Therefore, any steps taken to assist in the provision of knowledge and trained personnel will go a long way in promoting agroforestry practices; an important measure is through education. The study suggests that educational institutions should take a closer look at their agroforestry curricula, particularly at how the practical component is carried out. Curricula should focus especially on the technologies required by farmers from the information gathered by extension workers. Education programs should reflect the realities that officers face in their work which by its very nature is multidisciplinary. Officers who have not yet had any agroforestry education, about 50% in this study should be given the opportunity to attend short courses. A strong program for upgrading the agroforestry knowledge of the officers should be given particular priority.

Based on the findings that the technical competency of the officers from the agro based agencies in Peninsular Malaysia is still low in some aspects of agroforestry sector, the input of experts in this sector is in demand. In addition, these officers from the agro based agencies' should be exposed to local training on sustainable agroforestry education so that any gaps in their practical skills and knowledge that may be included in the agroforestry curriculum can be filled. At this point, it is important to adjust and reorient the training needs of the respondents. This is the fastest way to enhance agroforestry competence within the multidisciplinary disciplines. Further, refresher courses should be coordinated with institutional and agencies involved with agroforestry, who should participate and contribute funds and expertise.

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