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Should We Still to Traditional Methods of Forestry Planning? If Not, Why Not? How Should We Improve It?

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သစ်တောစီမံကိန်းများရေးဆွဲရာတွင်သမရိုးကျစီမံကိန်းရေးဆွဲ နည်းလမ်းများကိုဆက်လက်ဆောင်ရွက်သင့်/မသင့်နှင့် မသင့်ပါက မည်ကဲ့သို့ ပြုပြင်ပြောင်းလွဲမှုများလိုအပ်မည်နည်း

ဦးစောဝင်း [B.Sc. (For.) (Rgn.), Grad. Dip. Sc. (For.) (ANU)]
လက်ထောက်ညွှန်ကြားရေးမှူး
သစ်တောသုတေသနဌာန

စာတမ်းအကျဉ်းချုပ်

မြန်မာနိုင်ငံသည် သစ်တောသယံဇာတများ ပေါကြွယ်ဝသည့် နိုင်ငံတနိုင်ငံဖြစ်ပြီး နိုင်ငံစီးပွားတိုးတတ်ရေးကဏ္ဍတွင် အရေးပါသည့်ကဏ္ဍမှ ရပ်တည်လျက်ရှိပါသည်။ မြန်မာသစ်တောများကို နှစ်ပေါင်း (၁၀၀)ကျော်မျှစနစ်တကျ စီမံအုပ်ချုပ်လုပ်ကိုင်ခဲ့ပြီးဖြစ်ပါသည်။ နိုင်ငံ၏သယံဇာတများကို အချိန်မှီတိုင်းတာပြီးစီးပွားရေးအရ အကျိုးသက်ရောက်မှုကို သုံးသပ်ဝေဖန် ဆန်းစစ်ခြင်းအားဖြင့် သာလျှင်တိုးတတ်မှုရရှိနိုင်သည်ဟု အရှေ့တောင်အာရှနိုင်ငံအသီးသီးက လက်ခံထားကြပြီဖြစ်ပါသည်။ ထိုသို့အချိန်မှီလေ့လာဆန်းစစ်ရာတွင် ဂြိုလ်တုမှပေးပို့သော အချက်အလက်များနှင့် (GIS) နည်းပညာကို အသုံးပြုခြင်းအားဖြင့် နိုင်ငံတခု၏ သဘာဝအရင်းအမြစ်များ တိုးတတ်ဖွံ့ဖြိုးရေးလုပ်ငန်းများကို ပိုမိုပီပြင်အောင် ဆောင်ရွက်နိုင်မည်ဖြစ်ပါသည်။ အထူးသဖြင့် မျက်မှောက်ကာလကဲ့သို့ အရှေ့တောင်အာရှမှ သစ်တောများအခြေနေအမျိုးမျိုးကြောင့် ပျက်စီးပြုန်းတီးမှုမှာ ကြောက်ခမန်းလိလိဖြစ်ပေါ် နေသဖြင့် အဆိုပါသစ်တောသယံဇာတများကို ထိထိရောက်ရောက် အုပ်ချုပ်သွားနိုင်ရေးမှာ နိုင်ငံအတော်များများအတွက် ဦးစားပေးဆောင်ရွက်ရမည့် အခြေအနေဖြစ်ပေါ်နေပါသည်။ မြန်မာနိုင်ငံတွင် သစ်တောစီမံကိန်းများ အရှိန်အဟုန်ဖြင့် ပြန်လည်ရေးဆွဲရန် ကြိုးပမ်းနေချိန်ဖြစ်သဖြင့် သမရိုးကျနည်းလမ်းများအား ခောတ်မှီနည်းလမ်းများ အသုံးပြုခြင်းအားဖြင့် အချက်အလက်မှန်ကန်တိကျပြီး ပိုမိုအကျိုးရှိမည့် စီမံကိန်းများရေးဆွဲရန်အတွက် လိုအပ်ချက်များကိုအကြံပြုထားပါသည်။ □

Should We Still to Traditional Methods of Forestry Planning? If Not, Why Not? How Should We Improve It?

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Abstract

Myanmar is a country endowed with natural forests which are quite significant for the economic development of the country. Myanmar forests have been managed successfully on a sustained yield basis for more than a century using traditional planning methods. As timely assessments and evaluation of the resource potential of a country is an essential pre-requisite for national development, most of the countries in south east Asia are now seeking new technologies, such as digital satellite data and Geographical information system (GIS), in order to improve their resource evaluations programs. This is particularly true in tropical regions where forest resources are depleting at ever-increasing rates. For these reasons, up-to-date information and continual monitoring of the forest resource are currently very pressing issues in such countries. Myanmar is currently busily engaged in drawing up new forest plans based on information gathered form the National Forestry Survey, using ground sampling data. Improvement will be made through post stratification with the aid of aerial photographs. This proposal is an attempt to facilitate planning methodology with the use of advance technology mentioned above, if and when such facilities become available in Myanmar, in order to arrive at site specific information for effective and rational planning of Myanmar forests.

Contents

1. Introduction

Planning in forestry is a process by which forest resources are examined, utilized and administered in accordance with community perceptions and requirements. This practice is as old as the practice of forestry itself which dates back at least two or there centuries. The need for planning stems from the realization of the degradation of the forests resource through the indiscriminate cutting and exploitation of timber and fulewood, particularly during the times of human settlement. The inability to satisfy human needs for timber helps us appreciate the necessary to husband the resource and ensure proper planning and management aimed at achieving continual health, growth and perpetuation of the resource.

The experiences gained through centuries of managing forest resources led to the development of management systems, evolving from the very simple traditional yield table approaches to the more complicated mathematical formula approach for yield prediction and finally the present day use of computer-based models. The latter involve applying mathematical programming techniques with the ultimate goal of arriving at site-specific quantitative decisions for forest planners.

Though the approach and techniques have changed through development states over time, the basic elements of forest planning remain unchanged, i.e.;

1. The need to establish information on the extent of the basic resource.
2. The growth potential of the resource (yield prediction) and the potential to expand the resource itself;
3. The demand placed on the resource over time;
4. A projection of study over time that will compromise between satisfying demand and conserving the resource, and
5. Derived from (4) a set of management prescription that will permit the harvesting of the resource and if possible, its subsequent regeneration.

2. Forest Planning Process In Myanmar

Myanmar is a country with a centrally planned economy in which plans are usually drawn up in a hierarchical manner, i.e., National plans, State/Division plans and Township plans at the lowest level. Originally forest plans were based on forest divisions, but forest boundaries have changed recently to be line with the administrative divisions of the country, in order to integrate planning. Such alterations in planning boundaries coupled with arrears in updating the majority of the previous plans due to lack of current data, have led to situations where there is ample opportunity for improvements in methods for developing management plans to suit current day needs.

Management plans currently in use are becoming merely repositories of historical data. Most of the data used in the revision of plans is based on taken many years ago and repeated more or less word by word. In some cases data from a particular area are lacking and data from adjoining areas have to be extrapolated to get the complete coverage. Traditionally, management plans are drawn up from the complete enumeration of teak and other merchantable hardwoods. This practice is very expensive and due to the lack of coverage of smaller size classes in the growing stock, it has proved to be inadequate for efficient management planning (Kyaw, 1978).

To overcome these shortfalls, the national forest survey was conducted from 1981 to 1986 and the follow-up management inventory carried out quite recently (Forest Dept., Myanmar, pers. comm.). the data provided by field enumeration from such surveys were stratified using information provided from recent aerial photographs, before the data were processed for stand and stock tables. Forest type maps were also compiled from these photographs and there will be updated with information available from satellite images. Satellite imagery at a scale of 1:250,000 will be applied for the compilation of present landuse patterns for the project area of the National Forest Survey and Inventory project. This will be supplemented by 1:50,000 scale photo coverage of the rest of the country, for providing information for the whole country on the existing forest landuse pattern. Subsequent updating of these landuse maps will be carried out with newly acquired satellite imagery using overlay methods (Sutter, 1986). The development of forest management planning in Myanmar is diagrammatically shown in Fig.1.

3. Proposed Planing Methodology Applying Digital Satellite Data and Gis

Planning itself is a very broad concept which could be broken down into strategic, tactical and operational planning stages. Strategic planning is designed for broad policy decisions, the tactical for drawing up management plans and the operational plans for logging and harvesting. It is worth considering how digital satellite technology will integrate into the present planning environment if and when digital image processing facilities become available in Myanmar.

As stated earlier, the recent development of GIS technology has been a breakthrough in merging digital satellite data with information provided from maps and related statistics for effective planning. A digital database could be developed by digitizing available topographic maps. Existing topographic maps have 50-foot contour intervals, which could be line-digitized using GIS systems available on microcomputers (e.g., REDAS, ESRI's pc-Arc/Info, ect.), which are generally micro-versions of larger mini-systems.

Information concerning forest district boundaries could be conveniently stored in digital format using one of the systems mentioned above. Likewise, ancillary information such as soil types, erosion potential, rainfall, geology, etc. could be stored in digital format with the use of an appropriate GIS environment.

The next step will be the computer classification of digital satellite data (e.g., MSS, TM, SPOT) using interactive image processing systems running on microcomputer/PC based systems such as microBRAIN, A-IMAGE, etc. The computer classified man (forest typing) is in a digital format which allows various manipulations if needed. An image processing system like microBRAIN has software which can produce derived information from topographic (elevation) data such as slope, aspect, insolation. Such forms of data could be used as additional data channels for improving the classification.

Data from field enumeration can be compiled and processed to produce stock and stand tables which are stored in digital format as the forest resource database. With the help of a geographic information system (GIS), the disparate data types such as forest district boundaries, soil, forest types and tabular data, etc, can be integrated to produce maps from information stored in the system. Using this approach, management activities, inventories, etc, are referenced to a common geographic base which is comprised of a set of data plans. Integration of such data plans in

manipulative and analytical procedures can provide the resource manager with the information required for land management decisions.

Possible amalgamation of the digital image processing of satellite images and GIS technology with the present planning process could be carried out as shown in Fig. 2 if and when these technologies are made available in Myanmar.

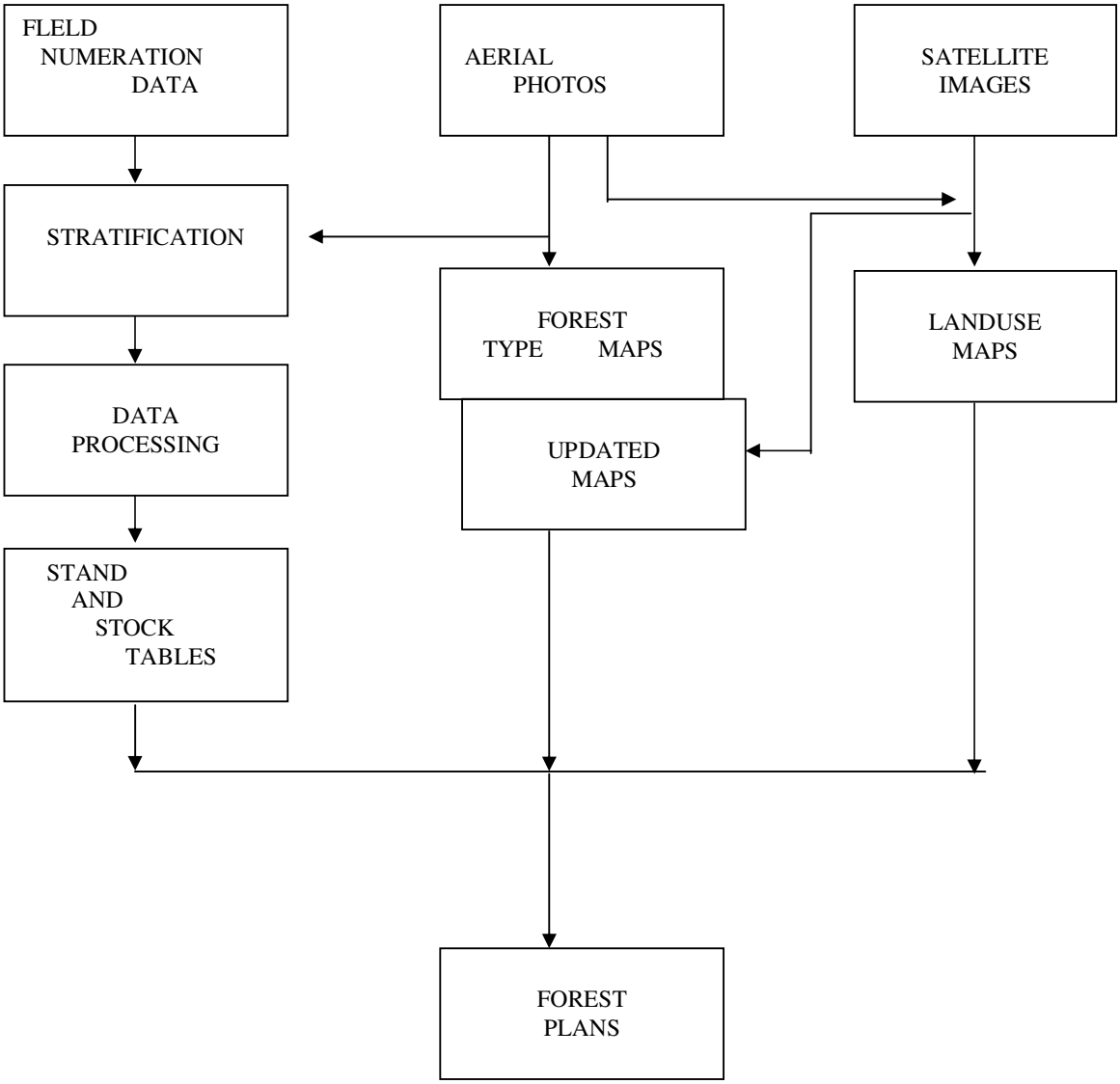

Fig 1. Existing Forest Planning Approach in Myanmar.

4. Implications of Integrating Digital Satellite Data and Gis Technology in Myanmar Forestry

Participants involved in transferring remote sensing technology to developing countries have identified three major issues of critical importance for the successful development of this technology;

1. Organizational development;
2. System inputs; and
3. Infrastructure constraints.

4.1 Organizational development

Major constraints of an organizational nature are that organizations with access to the technology frequently fail to share with those who could use it, and those who could use the technology fail to communicate their needs to those who have it. Forester (1988) in reviewing remote sensing technology transfer in South East Asia, strongly supported the contention that collaboration among various government agencies who have considerable overlap with regard to remote sensing training and facilities, was very poor.

Close co-ordination among the various agencies in Myanmar engaged in remote sensing activities will be required and should be possible. The staff from the remote sensing sections of the Forest Research Institute and National Forest Survey and Inventory project are responsible for the use of remote sensing technology for resource studies. The Planning Division of the Forest Department, which devise forest management plans, serve as end-users for these resource studies. As such, these organizations should work hand in hand for effective utilization of the new technology in the development of management plans.

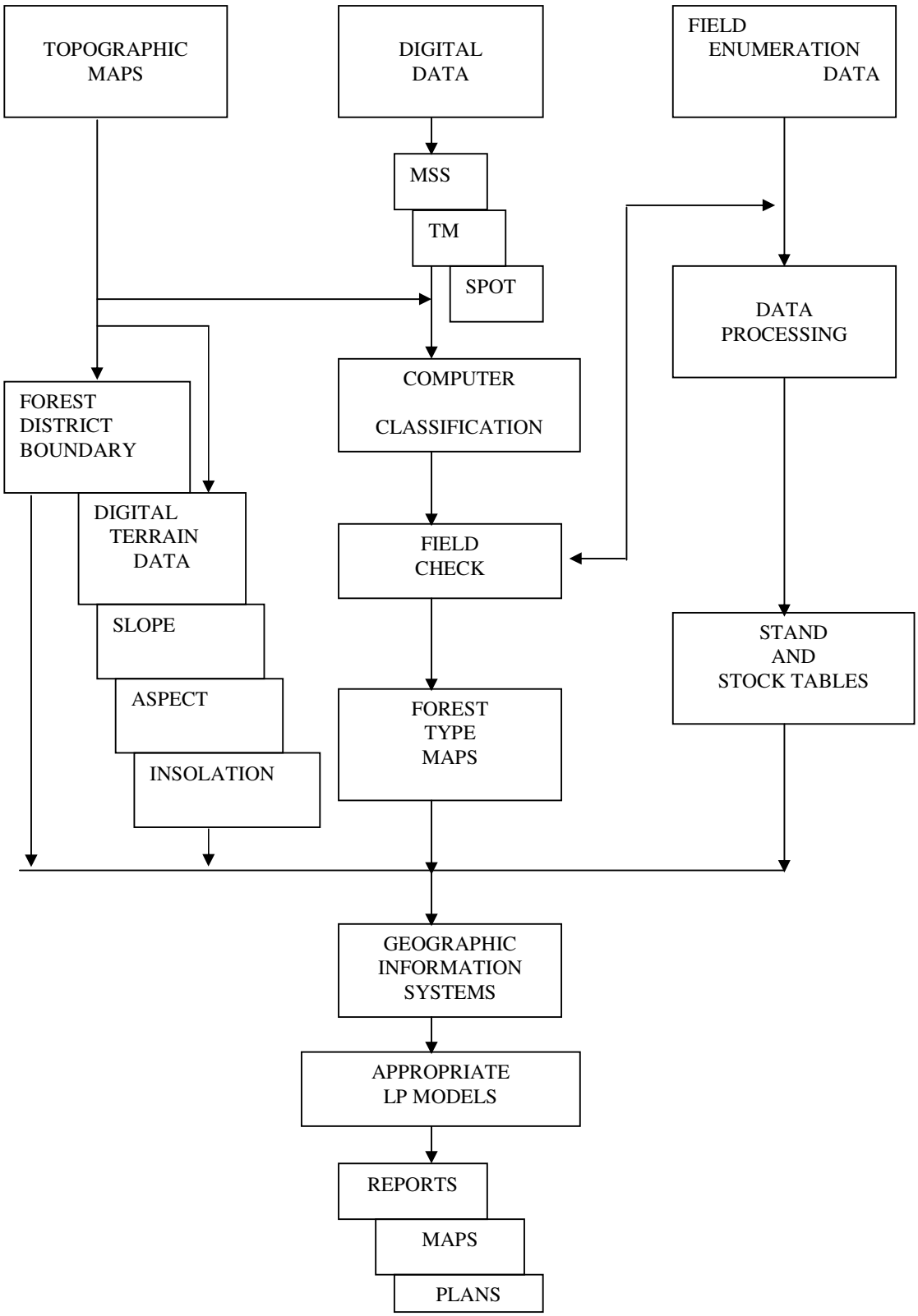

Fig 2. Proposed Forest Planning Methodology for Myanmar.

4.2 System Inputs

One of the most important factors in transferring remote sensing technology to developing countries is the difficulty of obtaining equipment for digital analysis. However, the recent breakthrough in microcomputer technology has brought the costs of digital image processing equipment within the reach of organizations in developing countries. With the development of 16 and 32-bit microprocessors, together with technological advances in low-cost memory, colour graphics display, disc storage and networking capabilities, it is now possible to acquire a relatively low-cost microcomputer based image analysis which is not only powerful enough for large scene analysis, but which can be upgrade and expanded to support additional stations at reasonable costs.

A complete micro BRAIN stand alone at a cost of A$ 30,000 with an additional A$ 2200 for 12 x 12 digitizing tablet and A$ 2900 for an 'Atlas Draw Mapping' package is quite attractive for introducing digital analysis is technology into a country like Myanmar (MPA 1988). The Forest Research Institute is an appropriate place for introducing digital analysis technology into a country like Myanmar (MPA, 1988). The forest Research Institute is an appropriate place for introducing digital image processing technology, so that research studies into applying different sources of remotely sensed data can be conducted. One advantage of selecting this organization is that the computing facility available at the Institute consists of an IBM compatible – CROMENCO SYSTEM 3 microcomputer, with 20 Mb hard disk memory, which could be upgraded to a microBRAIN or other pc-based system. Based on the research results, the operational use of such a system could then be considered.

The integration of digital image processing with GIS heavily involves digitizing of available maps. It is estimated that approximately 80% of the time spent in a GIS application is in digitizing. However, once the map is digitized and put into computerized form, it becomes very convenient to store as well as to extract specific information. This proved to be a distinct advantage over often obscured by a vast amount of irrelevant data (Tirner & Baumer,1989).

The majority of the forestry personnel in Myanmar who have received training overseas in the area of remote sensing are oriented towards aerial photo applications. Training programs would be needed for upgrading those who had prior knowledge of aerial photo techniques. Adequate training programs should also be planned for technicians or users in the field through the assistance of professional staff overseas.

The Forest Research Institute should logically be the nucleus for the development of a Remote Sensing Plan for Forestry Applications in Myanmar. The next step would be the establishment of a National Remote Sensing Centre in Collaboration with other government organizations involved in using remote sensing techniques in resource management and administration.

4.3 Infrastructure Constraints

The actual implementation of the above-mentioned programs rely on policy/decision-makers. Various surveys conducted on the transfer of remote sensing technology in developing countries consistently acknowledged the fact that lack of interest and knowledge about remote sensing technology and applications among government officials lead to lack of support in adopting such technology. Another constraint on the use of advanced remote sensing technology is the heavy reliance of

developing countries on the uncertain future of Earth Observation Satellite systems. However, countries like India and China have launched, or are in the process of launching, their own remote sensing satellites (e.g., IRS-1 the Indian Remote Sensing satellite) which augers well for the development of remote sensing technology in the South East Asian countries (Deekshatulu and Ramanathan, 1985).

5. Cost and Logistical Advantages of Satellite Data

Adoption of digital remote sensing technology will reduce the heavy reliance for inventory stratification on aerial photographs which are comparatively much more costly than satellite produces on a per acre basis. Apart from that, the quality of photographs depends heavily on the competence of the staff of the organization responsible for conducting aerial photographic missions, whereas unmanned-satellite data are largely devoid of human errors. Frequent re-photography for monitoring resource changes in rapidly depleting tropical forests seems very uncertain due to the high cost of photo missions. The adoption of satellite data will greatly enhance the potential for frequent up-dating and monitoring despite cloud cover problems at certain times of the year. Moreover, researchers are developing new software and techniques for monitoring changes in the natural environment. Integrated application of satellite data and GIS technology could provide site-specific information and analytical capabilities through relational databases for effective resource management in the near future.

6. Recommendations

The primary base for the economic development of most developing countries lies in their natural resources. Proper assessment and evaluation of the resource potential of a country is essential for national development. For these reasons most developing countries are now seeking new technologies to improve their resource evaluation programs. This is particularly true in the tropics where forest resources are depleting both quantitative and qualitatively at ever-increasing rates. Up to date information on the current status with possible monitoring of their status are currently very pressing issues in such countries.

With the progress of satellite-based resources information systems from a research scale towards operational use, developed countries with expertise in remote sensing technology have been fostering numerous attempts to promote the use of contemporary remote sensing systems in developing countries. Most of the countries in south east Asian region are now aware of the potential of remote sensing technology in their resources evaluation studies. However, technology transfer varies from country to country depending on its urgency to acquire resource information, financial constraints and ability of trained personnel in that field.

The use of advanced remote sensing techniques, particularly satellite based information is still in its infancy in Myanmar. Visual interpretation using colour composites is the only technique possible at the moment. (Bo, 1991, Tint et al., 1990).

Myanmar is currently busily in drawing up forest plans based on information gathered from the national forest survey. The inventory design is basically a systematic design with its efficiency to be improved by post stratification with the aid of new aerial photographs, which will also be used for the production of forest type maps.

In order to find out whether computer analysis of digital remotely sensed data will be of assistance in drawing up new forest plans in Myanmar, two research studies were conducted one using MSS data from Myanmar covering deciduous teak bearing forests (Win, 1990), and the other using French SPOT data (Win, 1991), covering some teak bearing forests also. Results so far indicated the accuracy of about 50%, for forest type classifications; the resolution of MSS (80 x 60 m) data appears to be sufficient for strategic planning purposes. The 20 m resolution SPOT appears to be too expensive for operational use. However, with the experiences gained form analysing data of TM (30 m resolutions) of North Queensland are, the 30 m resolution seems to be much more appropriate for detailed studies such as drawing up management, plans, where accurate registering and rectification is important. The choice of data depends on the accuracy required, the financial constraints and the objective of the study.

As an initial step towards promoting digital image processing in Myanmar, one possible option is to conduct joint research with institutions which have image processing facilities (e.g. Central Research Institute, CSIRO (Division of Water Resources).

In the mean time, additional training should be planned for the prospective staff of the forest department, who are conversant with these modern technologies, to attend short courses currently offered in neighbourning countries like Thailand and India. Also with the assistance of institutions from development countries (e.g., ANU or CSIRO, Division of Water Resources Australia) workshops and short term training courses could be conducted with present day PC based stand alone work stations.

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