Proceedings of Conference on Natural Resources in the Tropics: Development and Commercialization of Tropical Natural Resources

EDITORS

I.B. Ipor

C.S. Tawan

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Conference on Natural Resources in the Tropics: *Development and Commercialization of Tropical Natural Resources*

Editors
I.B. Ipor
C.S. Tawan
P. Bulan
I. Jusuh
B.A. Fasihuddin
Meekiong, K.

Faculty of Resource Science and Technology
Universiti Malaysia Sarawak
Kota Samarahan, Sarawak

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© Isa Ipor, Cheksum Tawan, Petrus Bulan, Ismail Jusoh
Fasihuddin Ahmad and Meekiong Kalu

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Front and back cover: Ant from the family Formicidae on the leaf of Macaranga sp. (Photo credited L.C. Koon)

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MANAGING PLANT RESOURCES AND CONSERVATION OF BIODIVERSITY IN MALAYSIA

A. Latiff

Faculty of Science and Technology, Universiti Kebangsaan Malaysia
43600 Bangi, Malaysia

latiff@pkrisc.cc.ukm.my

ABSTRACT

Conservation of biodiversity is taking centre stage on Malaysian environmental management and policy agenda. The Malaysian citizens are demanding that plant resources be maintained, even if they scarcely know what they mean or how they might be achieved. Malaysia's total land area is about 32.86 million ha and of this forested areas account for about 18.4 million ha. The forest and the marine ecosystems are endowed with one of the richest biodiversity in the world. Efforts to conserve the rich flora and fauna have been carried out in the country since 1940's through the establishment of National Parks, wildlife sanctuaries and protected forests areas. To-day a total of 1.39 million ha (about 7.6%) of the forest of all types have been set aside for the conservation of biodiversity. It is hoped that these protected areas have captured most of the diverse species of plants found in various ecosystems. Plant diversity is represented by about 15,000 species with flowering plants constituting about 80% whilst the diversity of non-flowering plants is represented by more than 5000 species. In the absence of concrete data of biodiversity loss in the country it is difficult to ascertain the lists of endangered or otherwise threatened species. However, efforts to assess and monitor these resources have been initiated through the recently incepted Biodiversity Country Study. Many factors have contributed to biodiversity loss; among them is the rapid socio-economic development of the country that transformed forested lands by logging activities, land openings for agriculture and resettlement and subsequently creating new built-up areas such as urban and industrial areas which are relatively poor in biodiversity. Other factors such as over-harvesting and pollution have also contributed in small part. These activities had led to significant habitat loss, degradation and fragmentation but not to the biodiversity as a whole. To this effect Malaysia has just formulated The National Policy on Biological diversity and the national Biotechnology Policy and some salient features in management would be discussed.

INTRODUCTION

Malaysia is one of the megadiversity countries of the World. In term of the number of species Malaysia is among the World's 12 biodiversity-rich countries and in Asia she is at number four, behind China, India and Indonesia. Like any other developing countries she has undergone and is undergoing tremendous socio-economic development, especially in the last 20 years or so, paving the way for future industrialization by the year 2020. In the process of achieving that ends through the rapid pace of industrial development it is natural to expect continuing habitat transformation and destruction which have taken great and significant toll of our rich biodiversity. Although these losses have not been scientifically assessed and quantified by and large the biologists, ecologists as well as the policy makers in the country had acknowledged the gradual loss is real and should be addresses before it is too late. The irony is that much of the biodiversity in the country has yet to be assessed, evaluated, studied and documented, and hence would definitely impeded our efforts to better utilise them for our own benefits in years to come.

One of the most worrisome issues and challendes that have confronted Malaysians in this decade is the massive transformation of the beautiful natural and rural landscapes that has taken place paving ways for concrete jungles in new towns and cities. These transformations of forested lands and the ever-changing trends in land-use have also brought about changes in the soil, water, vegetation and atmosphere with concomitant loss of natural forests, flora and fauna. The depletion of these pristine ecosystems ultimately bring about some displacements of plants and animals, however, most of the plants and sedentary animals had banished either in fires, submerged by inundated valleys and even obliterated by soil and coastal erosion. The mobile animals would have moved elsewhere.

It is a common knowledge that biodiversity has important economic, social and

technological implications for the developing country such as Malaysia. Among them are the economic benefits and food security that could be derived from the wild plant and animal species; biodiversity also stabilises the landscape and environment through ecological functioning and many species form the biological heritage of the communities. In Malaysia, agriculture, forestry and fisheries sectors have contributed about 13.6% of the national gross domestic product in 1995 and accounted for about 12.1% of the total export earnings. These sectors are going to play more significant roles in contributing to our economy. In 1994 tourism alone contributed about RM 8.3 billion to the national economy and much of tourism industry relies on the diverse and unspoilt natural beauty of the country's landscapes, including the unique species of plants and animals residing in national parks, wildlife reserves and marine parks. In the present RM9, the country is expected to attract and bring more tourists into the country and these ecotourists, in particular, are expected to be attracted by the natural beauty of the country, not by the concrete jungles and traffic jams. The value of biodiversity to science and education does not require any anymore elucidation.

This paper attempts to highlight the richness of Malaysia's biodiversity and discuss the various factors threatening them that require concerted efforts in conservation. It is also hoped to suggest some of the ways in managing the rich forest resources.

SPECIES DIVERSITY

Biodiversity encompasses all species of plants, animals and microorganisms, and the ecosystems of which they are part. It is usually considered at three levels - ecosystem, species and genetic diversity. Species diversity refers to the variety of living organisms on earth, variously estimated to be between 5 to 30 millions or more, of which only about 1.4 millions have been scientifically documented (Wilson, 1988).

In Malaysia the animal diversity received mixed attention from the zoologists; the vertebrates are comparative better documented than the invertebrates. While the estimate number for larger animals and some exotic groups are available, that for some groups of animals in particular the invertebrates is unknown (Table 1). The rich diversity of insects, aquatic invertebrates and marine organisms is poorly documented. This is due to the absence of adequate capacity in the country and the relatively new emphasis given to marine biology. It is quite true that the larger animals such as the elephants, tigers, bears, tapirs, rhinoceroses are of direct importance to human beings than the inconspicuous invertebrates, thus they are better studied. For instance, the birds and monkeys are trapped for international trades; the snakes are studied because of the danger posed by them; the butterflies were studied because they are beautiful and the curated specimens are saleable and the fishes are studied because they form an important food source. However, those that are not directly useful to human beings such as those involved in food-web and food-chains like the planktons are quite neglected. The capacity for insect studies is genuinely lacking and this pose a critical issue in our understanding of insects' role in reproductive biology of plants and survival of plant species.

Table 1: Estimate of animal Species diversity in Peninsular Malaysia

Animal group	Number of species
Mammals	203
Birds	616
Snakes	141
Frogs	93
Lizards	>80
Butterflies	1022
Moths	>5000
Other insects	>20,000
Other invertebrates	>10,000

The flora of Malaysia is extremely rich and a conservative estimate of the seed plants has put it about 12,500 species (Table 2). The flowering plants and in particular the tree species have received comprehensive studies through the Tree Flora of Malaya project (Whitmore, 1972, 1973; Ng, 1978, 1989) and the on-going Tree Flora of Sabah and Sarawak Project (Soepadmo & Wong, 1995). After the completion of the Tree Flora of Malaya, a total of 2830 tree species were documented and of these 746 species or 26.4% of the total are found to be endemic. For Peninsular Malaysia the number of non-tree species which comprise of shrubs, herbs, parasites, epiphytes, saprophytes, climbers and others may be more than that of trees, but their taxonomy and

diversity remain uncertain because there is no similar effort to study their taxonomy like that of tree species. After the publication of the first instalment of the Tree Flora of Sabah and Sarawak which covers 31 small families, it has become apparent that the species diversity and endemism are high.

The non-vascular plants such as ferns and their allies, bryophytes, lichens, algae including fungi received a very mixed response from the taxonomists. While the diversity of ferns and their allies have been enumerated as being 1136 species (Parrish & Latiff, 1997), the number for bryophytes has been estimated as about 2000 species (Manuel, 1981; Mohamad & Tan, 1988), that of lichens, algae and fungi, in particular is far from being known. With the rapid rate of habitat destruction especially on the higher altitude where lichens and bryophytes are more dominant, the picture is rather gloomy.

Table 2: Estimate of plant and fungi Species diversity in Malaysia

group	Number of species
Angiosperms	➢ 12,000
Trees in Peninsular Malaysia	➢ 2,830
Gymnosperms	20
Pteridophytes	1,156
Bryophytes	> 1,000
Mosses	520
Fungi	> 4,000
Lichens	> 3,000
Algae	> 4,000

In Malaysia there is a discrepancy of species inventory works. The most comprehensive inventory of plant species in Peninsular Malaysia was prepared by Ridley (1922-25), but their is no equivalent for the animal species. The reverse is true for Sabah and Sarawak, there is an inventory for mammals (Payne et al., 1985) but there is no comprehensive species list for the plants. As for the plant species the level of endemism in the flora is quite high. Ng et al. (1990) found that out of the total 2830 species of trees in Peninsular Malaysia, a total of 746 species (26.4%) are endemics. In the herbaceous flora, there is a higher level of endemism (87%-96%) among the large genera such as *Sonerila* (Melastomataceae), *Argostemma* (Rubiaceae) and *Didymocarpus* (Gesneriaceae) (Kiew, 1990). Among the tree species, the level of Bornean endemism is about 40-50% and that for Sabah and Sarawak is estimated to be up to 80%. This is possible as some of the high mountains peaks in Borneo are found in Sabah (Mt. Kinabalu) and Sarawak (Mt. Murud).

Other than the on-going Tree Flora of Sabah and Sarawak project, taxonomic studies on non-tree taxa are also carried out. Local floristic studies are also quite extensive (e.g. Latiff, 1982; 1994; Latiff et al., 1995; Mat Salleh et al., 1990). These local floristic studies are conducted with a purpose of inventorying and monitoring the species in various habitats and localities.

ECOSYSTEM DIVERSITY

Ecosystem diversity refers to the variety of habitats, biotic communities and ecological processes and functions in the biosphere. In Malaysia, it is easier to think of the various terrestrial ecosystem ranging from the coastal beach vegetation right up to the montane vegetation on Mt. Kinabalu or Mt. Tahan. The aquatic ecosystems comprise of water bodies such as natural lakes and man-made reservoirs, rivers, wetlands and marines.

The forest types of Peninsular Malaysia was described by Symington (1943) and further elaborated by Wyatt-Smith (1964). Though the classification was developed for Peninsular Malaysia, they are also applicable for Sabah and Sarawak (Table 3).

Table 3: The rainforest types of Malaysia.

Climatic climax forest	Edaphic forest
Lowland dipterocarp forest	Heath forest
Hill dipterocarp forest	Limestone hill forest
Upper dipterocarp forest	Forest over ultramafic outcrops
Montane oak forest	Beach stand forest
Lower ericaceous forest	Mangrove forest
Montane subalpine forest	Brackish water forest
semi-evergreen seasonal forest	Peat swamp forest
	fresh water swamp forest
	Seasonal swamp forest

Out of the total land area, forests account more than 18.4 million ha or about 56% and the dipterocarp forests account for about 86.5% of the total forested areas. The peat swamp forests and the mangrove swamp forest constitute about 10.3% and 3.3%, respectively. In 1992 a total of 110,000 ha, 320,000 and 160,000 ha of mangrove forests have been recorded for Peninsular Malaysia, Sabah and Sarawak, respectively. The percentage of mangrove depletion due to land conversion between 1928 to 1990 ranges between 3.5% for Pahang to 57.3% for Negeri Sembilan. Similar trends are believed to be happening for freshwater and peat swamp forests, limestone hill forest and submontane forests.

GENETIC DIVERSITY

Genetic diversity refers to the infraspecific diversity as measured by the variation wthin genes. The genetic diversity of cultivated plants such as rice, rubber, oil palm and domesticated animals such as goats, cows and buffaloes are adequately studied, whereas that of wild populations are hardly touched. Although there are some isolated studies on the isozyme systems of insects, gingers and even fruit trees, it is felt that this is not enough to realise the importance of genetic diversity of plants and animals in our ecosystems for eventual breeding programmes. The genetic systems and mappings for most of the wild populations of plants and animals are yet to be initiated.

PLANT BIODIVERSITY LOSSES

In Malaysia the general assumptions of biodiversity loss are never substantiated by any scientific data or evidence. The potential loss is very clear as more and more pristine habitats are transformed. But the actual loss is difficult to come by. If ever there are losses occurring, there is no accurate quantification or account of such losses although one is bound to believe that many species are lost before they are ever described. However, at global level, since the year 1600, an estimate indicates that 724 known species have become extinct (McNeely et al., 1991). Another estimate places the potential loss of 15,000 to 50,000 species per year from the 1990's onwards due to tropical deforestation (Reid & Miller, 1989). The main causes of such loss include habitat loss, degradation and fragmentation; over-exploitation such as by commercial harvesting, logging, fishing and hunting; pollution; introduction of exotic species and climate change. Using such global scenario it is possible to predict the potential loss for Malaysia of 10-50 species per year.

(a) Species loss

To date there is no empirical evidence to show that species have been lost in the Malaysian environment. However, many individuals and populations of certain species have been lost due to habitat change. For instance, many populations of coconuts, *Pandanus tectorius, Spinifex littoralis* and *Cycas edentata* have been lost to coastal erosion in the east coast of Peninsular Malaysia. Many populations of gelam (*Melaleuca cajuputi*) and mangrove species have been lost on both coasts in Peninsular Malaysia due to erosion and land clearing to make ways for beach resorts, forest fires and aquaculture ponds. Similarly many exotic species of orchids, gingers, cycads, aroids have been threatened by habitat loss and over-collecting so much so that their populations in the wild have become inviable for survival.

Ng et al. (1990) had listed a total of 746 endemic species out of 2830 tree species in Peninsular Malaysia. So far there is no study to ascertain the status of these species until that of Ng (1996). In this study a total of 142 species belonging to 35 families were surveyed and their distributions mapped based on herbarium records. It was found that 13 species such as *Talauma peninsularis* (Magnoliaceae) and *Kopsia scortechini* (Apocynaceae) were very rare, only represented by a single collection; 8 species such as *Chionanthus spiciferus* (Oleaceae) and *Dacryodes multijuga* (Burseraceae) are threatened and 53 species are considered rare. This data is based on the number of collections known in herbaria (Table 4).

Table 4: Status of tree endemic species in Peninsular Malaysia.

No. of collection	No. of species	some Examples
1	29	*Kopsia scortechninii* *Tabernaemontana polyneura* *Ilex grandiflora*
2-5	45	*Canarium coriacea* *Ilex illustris*

		Chisocheton perakensis
		Prainea scandens
		Polyosma fasciculata
		Saurauia mahmudii
6-10	34	*Rhododendron pauciflorum*
		Harmandia kunstleri
		Dacryodes kingii
		Ilex maingayi
		Durio singaporiensis
>10	31	*Hibiscus floccosus*
		Ficus oreophila
		Sarcotheca laxa
		Saurauia pentaphylla

From such as a preliminary study it is quite clear that the populations of Peninsular Malaysian endemic species as represented by the herbarium collections are very small indeed. The next study to be initiated is to do intensive survey in the respective localities. Only then we may be able to predict the extent of species loss.

(b) Habitat loss

In the period of 1981-1990, the annual rate of deforestation of closed and open tropical forests was estimated to be as high as 16.8 million ha (FAO, 1991). Of the forest types, the submontane and montane forest types are the most susceptible to destruction by development. In the past few years a few natural anad artificial activities as listed below were a common feature:

a) beach reclamation to facilitate beach resorts
b) development of marinas, airport on sensitive island habitat
c) levelling of hills and hillocks to make way for hilly housing estates
d) flash-storms that inundated city landscapes
e) illegal loggings

One of the most threatened natural ecosystems is the shallow marine water ecosystems which have been the breeding grounds for a variety of fishes and other marine algae species, particularly the corals. Many coral species are facing danger of being obliterated by constant sedimentation which originated from land-based activities. The algae are sensitive organisms that require optimum water conditions to reproduce, grow and survive. Pollution of riverine habitat and eventually the estuarine also has affected the aquatic biodiversity. Many industries and factories which are situated near the rivers and streams are known to discharge their effluents into the water systems. As the level of pollutants increase many aquatic organisms are adversely affected. And if this process is not checked, over time the diversity would decrease and ultimately loss.

EX SITU CONSERVATION

Ex situ conservation hopes to maintain species and their populations outside their original habitats to facilitate research and conservation. This method of conservation should be adopted as a last attempt to save genetic materials under severe threats. In cases where species produce recalcitrant seeds, plant cells and organs need to be cryopreserved, and when great production through tissue culture is needed, the in vitro method offers the best alternative. However, ex situ conservation of populations for scientific research has offered many successes in many botanical gardens and arboreta. In Malaysia botanical gardens only exist during the colonial periods, after independence the tradition of establishing botanical gardens associated with herbaria did not happen. As such great progress in research has been impeded. Only lately, arboreta and small-scale botanical gardens have been established at Forest Research Institute Malaysia and University of Malaya, respectively. For rescue and recovery operation of species that are bound to be affected by land clearing and inundation, botanical gardens and arboreta offers the most practical method of conserving species.

Some examples of ex situ conservation facilities and potential are given in Table 5. However, it is obvious from the examples that many other important commodity groups are not covered in the similar manner. These surely create an inbalance in the priority on national conservation.

Table 5: Some examples of *ex situ* conservation

Facilities	Species/Populations
Arboreta	medicinal plants, fruit trees, timber species, ornamental plants
Seed banks & Field gene banks	Rice, rubber, oil palm, cocoa, durian, mango, mangosteen, langsat, rambutan,
In vitro gene banks	banana, sweet potato, orchids
Captive breeding centres	cassava, timber species, animal skins
Rehabilitation centres	Sumatran rhonoceros, gaur, sambar deer
Sanctuaries and hatcheries	Orang utan
	Marine turtles, river terrapins

IN SITU CONSERVATION

For example, in Pasoh Forest Reserve, a lowland dipterocarp forest, a total of 820 species in 294 genera and 78 families of trees > 1 cm diameter at breast height were enumerated in a 50-ha plot (Kochummen et al., 1990). In another similar study, but in a twice logged lowland dipterocarp forest of Bangi Forest Reserve, a total of 167 species belonging to 107 genera and 41 families of trees > 5 cm DBH were enumerated (Latiff, 1994).

Table 6: Areas under national parks and wildlife sanctuaries in 1989 (million ha).

Region/State	National Parks	Wildlife Sanctuaries	Total
Pen. Malaysia	0.43	0.31	0.74
Sabah	0.25	0.14	0.39
Sarawak	0.08	0.18	0.26
Total	0.76	0.63	1.39

Since its inception in 1950, a total of 125 pockets of Virgin Jungle Reserves (VJR) covering a total of 110,624 ha of virgin forests had been established. These VJRs which range in size from as small as 3 ha to 1600 ha represent various types of forests were established to serve as permanent nature reserves and natural arboreta. In Peninsular Malaysia and Sabah, 77 and 48 VJRs covering an area of 22,325 ha and 88,299 ha were established. However, most of them now have become forest islands, fragmented by agricultural development and their survival is uncertain.

PROTECTED FORESTS

In accordance with the National Forest Policy 1978 and the National Forest Act 1984, a total of 12.73 million ha of forests have been designated as Permanent Forest estate. Out of this a total of 9.99 million ha (78.5%) are Productive Forest for timber production in perpetuity and a total of 2.74 million ha (21.5%) are Protective Forest for the protection of watersheds and environment (Table 6) and a total of 1.39 million ha (50.5%) of Protective Forest have been se aside for biodiversity conservation (Table 7). This includes a network of national parks, nature reserves and wildlife sanctuaries.

Table 7: Permanent Forest Estate in Malaysia in 1989 (million ha)

Region/State	Protective Forest		Productive Forest		Total			% of total land area
	V	L	V	L	V	L	V+L	
Pen. Malaysia	1.90	-	0.44	2.40	2.34	2.40	4.74	36
Sabah	0.35	-	0.75	2.25	1.10	2.25	3.35	45.5
Sarawak	0.49	-	2.71	1.44	3.20	1.44	4.64	37.6
Total	2.74	-	3.90	6.09	6.64	6.09	12.73	38.7

Note: V = Virgin, L = Logged

An example of such conservation effort of a park is given by Taman Negara (National Park) in Peninsular Malaysia which straddles in three different states. The park with an area of 4343 sq. km consists of various ecosystems except those associated with swamps and coast. It has been entrusted to protect and conserve more than 3000 species of flowering plants, 200 species of pteridophytes and many animal species (Latiff, 1995; Mohd. Khan 1971). A total of 22 endemic tree species are also found in Taman Negara.

GENETIC RESOURCES OF AGRICULTURAL CROPS

The National Agricultural Policy 1984 sets out intensive guidelines for food production and industrial crop production. While both productions depend on the introduced crop species the potential of indigenous food crop species remain important for both the local breeding programmes and maintaining the genetic germplasm. To-day about 5.1 million ha of lands are under agro-ecosystems. While the large agricultural and forest estates do not harbour much biodiversity, the small holdings and mixed village orchards do. Many land races of crop plants and relatives of cultivated fruit tree species are still to be found in semi-domestication. The introduced crops such as rubber, oil palm and cocoa now require broadening of genetic base but the indigenous crops require preliminary studies and in situ and ex situ conservation. The biodiversity of crops and their conservation are discussed by Zakri (1986) and Zakri et al. (1989).

POLICY AND LEGISLATIONS

It is a common knowledge that protection of the environment is the central issue in the preservation and conservation of biodiversity. It is widely accepted that Malaysia has enough laws and regulations to protect its environment, but there is no single legislation which relates to biodiversity conservation and management (Table 8). Much of the present legislations are sector-based, for instance, the Fishery Act 1985 deals with the conservation and management of fisheries resource alone; the Protection of Wild Life Act 1972 deals with the protection of wildlife and the National Forestry Act 1984 deals with the management and utilisation of forests alone.

However, what is more pertinent is not the number laws and regulations but the mechanism of strict implementation and enforcement of such legislations to achieve the required expectations. In order for the legislations to be more effective, not only the government agencies should adhere to them but also the public must participate actively to ensure its accountability. In Malaysia, the usual reasons for the failure to enforce any laws and regulations is the adequate number of law-enforcing officers. The problem of the inadequate number of skill and trained officials have become a perennial issue both in the federal, state and local government levels. In this context the communities, and in particular the indigenous communities who are directly associated with the protected areas should be aware that they are not only the users of the resources but also the custodian of the biodiversity.

Table 8: Partial list of legislation relevant to biodiversity

Legislative authority	Legislation
Federal	Environment Quality Act 1974
	Fisheries Act 1985
	Pesticides Act 1974
	Plant Quarantine Act 1976
	Customs (Prohibition of exports) 1993
Peninsular Malaysia	water Enactment 1920
	King George V Enactment 1938/39
	Aboriginal Peoples Act 1960
	Land Conservation Act 1960
	National Land Code 1965
	Protection of Wildlife Act 1972
	National Parks Act 1980
	National Forestry Act 1984
Sabah	Parks Enactment 1984
	Forest Enactment 1992
	Fauna Conservation Ordinance 1963
	National Parks Ordinance 1956
	Wildlife Protection Ordinance 1958
	Forest Ordinance 1954
Sarawak	Natural Resources Ordinance 1949
	Natural Resources & Environment Ordinance 1993
	Public Parks and Greens Ordinance 1993

The most distinct feature of the legislative framework relating to biodiversity is that under the Federal Constitution, the authority to legislate for matters relevant to biodiversity does not fall under one single authority. Most responsibilities relating to biodiversity conservation are shared between the Federal and State authorities; some others do fall under the responsibility of one authority alone, be it the Federal or State authority. This is specified by the Federal Constitution under the Federal, Concurrent and State List of the Ninth Schedule. Thus there are some matters, for example,

protection of wild animals and wild birds and the National Parks fall under the legislative authority of both the Federal and State governments. There are other matters, for example, forests and agriculture, fall under the legislative authority of the respective state alone.

To-day as a direct response to the Rio Summit, in particular the Convention on Biodiversity, Malaysia has formulated her National Biodiversity Policy. The vision of the policy is simply to transform the country into a centre of excellence in conservation, research and utilisation of tropical biodiversity by the year 2020. In order to achieve this end the country must conserve her biodiversity to ensure that its components are utilised in a sustainable manner for the continued progress and socio-economic development of the country in particular, and the world in general. The policy has outlined 11 principles and 14 strategies for effective management of her biodiversity. Among the more important strategies and action plans are to improve the scientific knowledge, to strengthen the institutional frameworks, to integrate biodiversity considerations into sectoral socio-economic planning, to enhance public awareness, to strengthen research capacities and to promote international cooperation and collaboration. It is hoped that the National Policy on Biodiversity will be officially launched on the World Biodiversity Day, 29th December 1996.

Of the existing national policies and regulations, the national Forest Policy 1978 is one of the important one in ensuring the survival of ecosystems and species. However, the National Forest Policy 1978 is only applicable in Peninsular Malaysia, whereas the National Forestry Act 1984, as a federal legislation is deemed to apply nationwide only provides the classification of the forests. As land is the state matter, gazettement and degazettement of forest reserves are within the power of the various state governments. In the past there were instances whereby the states degazetted some of the protected forests without prior consultation with the Federal government. However, there are other Federal legislations which are supposed to complement and support the above policies. These include Land Conservation Act 1960, Protection of Wildlife Act 1972, National Park Act 1980 and Environmental Quality Act 1974.

BIODIVERSITY COUNTRY STUDY

As a precursor to the formulation of the National Policy on Biological Diversity, the country study on biological diversity was carried out with the aim of assessing the state-of-the art of biodiversity. It was organised into four parts; the first part addresses the socio-economic factors affecting biodiversity, the second part addresses the valuation and current expenditure of biodiversity, the third part addresses the biological data gathering and finally the current capacity.

The socio-economic sub-study focused on the land rights and tenure, a spatial assessment of demographics, the country economic structure and growth and the implication of various international conventions and agreements. It is envisaged that as the country moves towards industrialisation in the next 30 years or so, resource consumption, infrastructural development and release of waste materials would threaten biodiversity, especially that of aquatic ecosystem. The extent of atmospheric and water pollution which manifest in the form of acid rains, temperature rise, river health would pose great threats to the associated biodiversity. However, an introduction of high technology would minimise the impacts and threats, which would otherwise be posed by small and medium industries.

The biodiversity evaluation sub-study exposed our inadequacy and in many cases lack of knowledge on the values of ecological functions, various species of flora and fauna and environmental health in general. Except for the important commodity like timber species which had received much attention, those of non-timbers which are not marketed lack basic data on their values.

A survey of the biodiversity data in the country showed great disparity between those of plant species diversity on one side and the animal and microbial diversity on the other. This disparity is correlated with the research and human resource capacity in the country. Apparently there are more botanists than zoologists and microbiologists put together who have been carrying out research on various aspects of biodiversity. The number of ecologists who should evaluate the ecological services, the various compositions of ecosystems and synecology also is small for Malaysia.

BIODIVERSITY CONSERVATION AND MALAYSIAN KNOWLEDGE BASE

In spite of our achievements in inventorying the vast biodiversity there is a greater need to strengthen the infrastructures associated with our knowledge base on biodiversity. Such infrastructures include herbaria, museums, culture collections, gene banks and taxonomic laboratories. There is also an urgent need for long-term studies on demographic, genetic and environmental variation of indigenous species; on the functional aspects of ecosystem and the ecological processes therein. The unavailability of data is another example of our inadequacy of knowledge-base (Table 9).

Table 9: Species richness and endemism of vertebrates in Malaysia.

Vertebrate group	Total no. of species	No. of endemics
Mammals	264	14
Birds	501	4
Reptiles	268	no data
Amphibians	158	39

In order to bring our knowledge to the public at large there is a need to evaluate the economic significance of biodiversity. It is imperative for the scientists to inform the public that many species could bring great economic potential returns if exploited sustainably. Where we are comparatively weak, especially in the diversity of insects and marine organisms, there is an opportunity to undertake and intensify resource inventories and systematic studies through local capacity enhancement and international or regional cooperation. Where species are known to be threatened by natural phenomena or human activities, there is a need to develop the methodologies and techniques for recovery and rehabilitation of such species to avoid an eventual loss or extinction. An example towards this effort is given by the attention to the World's largest flowers, the raffesias (Mat salleh & Latiff, 1990; Wong & Latiff, 1995).

BIODIVERSITY CONSERVATION PARTNERSHIP

Malaysia ratified the Convention on Biological Diversity in June 1994 which set the platform of committments under the treaty and reaffirms the sovereign rights of States over their biodiversity and the responsibility to conserve and utilise the resources in a sustainable manner. As Malaysia is already a party to the Convention of International Trade in Endangered species of wild fauna and flora (CITES) and also a member of the International Union of Conservation of nature and natural resources (IUCN), as well other international networks, the responsibility is even more. Subsequently Malaysia ratified the United Nations Framework on Climate Change and RAMSAR Convention on Wetlands of International importance especially as waterfowl habitats which set its commitment to monitor and carry out research on the impact of climate change and wetland utilisation on biodiversity.

Of late a new partnership between biodiversity, biotechnology and pharmacy surfaced through some international initiatives and activities called bioprospecting. With the rapid development of modern technology, the interest in traditional medicine and nature as a source of pharmaceuticals was low. But this scenario has changed dramatically. To-day many huge programmes for natural compound screening are under-way; these have been initiated by international organisation, scientific institution and giant transnational pharmaceutical companies. Only through an equitable partnership between parties that biodiversity could be utilised in a sustainable manner for generations to come.

It is the thesis of the writer that in order to better manages the rich plant resources and address conservation in the country, the following criteria must be met and addressed.

a) There must be a commitment and the political will by the government as envisaged in the RM9. Both the federal and state government must implement the National Biodiversity Policy 1998
b) The Ministry of Natural Resources and the Environment and the Ministry of Science, Innovation and Technology must work together to ensure that policies are addressed in their undertaking
c) The Ministry of Higher Learning must ensure that universities train adequate

AGRICULTURE LAND MANAGEMENT: THE SUCCESS AND FAILURE OF INSTITUTIONAL EFFORTS BY THE GOVERNMENT

Ismail Omar and Azima Abdul Manaf

Department of Land Administration and Development, Faculty of Engineering and Geoinformation Science, Universiti Teknologi Malaysia, 81310 Skudai, Johor

ismail@fksg.utm.my

ABSTRACT

This paper reviews the efforts undertaken by the government to improve idle agriculture land in Malaysia.. Data was collected based on interviews with affected landowners in Negeri Sembilan as the case study areas. The data was analysed using qualitative analysis to show the causes of idle lands within the effort undertaken by the government. The findings show that there are various efforts by the government to improve idle land and there are also various causes to the success of the government efforts to improve idle agricultural lands. The causes are the factors that influence the supply of idle agriculture land available for development in the case study areas. Hence, ways and means to smoothen the supply of land for development are inevitably important to make more potential land available for agriculture development and hence increase agriculture productivity.

Keywords: Idle lands, effort by the government, causes, agriculture development.

OVERVIEW

Once again, Malaysia is awakened by the early morning recall from the government to revisit the agriculture sector. The agriculture sector has been a wee bit quiet for sometimes since the government has been talking too much about industrial sector. As we realized the importance of agriculture product and to reduced the billions dollars of imported agriculture product, the existing agriculture idle land and lacking in agriculture productivity is about to be revisited. Data from the Ministry of Agriculture and Agri Product shows that about 12,180 hectares of agriculture lands were left idled in Peninsular Malaysia or equivalent to 35 percent of 34,360 hectares of the whole agriculture lands in the country. For sure, the figures indicate the low level of agriculture production and lack of earning to the farmers in the country. The rural poverty is alarming.

The big question mark is, what caused agriculture idle land? The identification of the causes of agriculture idle lands enabling the way out to solve the problems professionally. Have we pay enough efforts to eliminate the agriculture idle lands in the country? Have we resorted to the efficiency of our agriculture agencies by utilizing rules, ideas and resources in eradicating the agriculture idle lands? What are the problems faced by the government in squeezing the Ministry of Agriculture Incorporated (IMOA Inc.), Jabatan Pertanian, MARDI, FAMA, Bank Pertanian, Lembaga Pertubuhan Peladang, Jabatan Pengairan dan Saliran, Jabatan Perikanan and Jabatan Perkhidmatan Haiwan in guiding,controlling, planning and performing to improve the agriculture idle lands ?

It must be borne in mind that under the Land Code 1965, Section 129 (4) (c) stipulated that any vacant land of over 3 year without any effort for improvement will be taken over and seized by the government. What level of performance and implementation we are talking about in relations to this written provision of the land laws? Despite government's effort to seriously settling the problem of agriculture idle land, the problems are still intact and even worst. This makes the study to investigate the causes that contributes to the agriculture idle land is important and worth looking for. The scope of the study, however, is limited to the causes of agriculture idle lands from the institutional economics analysis viewpoint. The causes will be identified from formal and informal institutions that affect the production of agriculture land from the way in which landowners' decisions in the case study areas of Kampong Talang, Kuala Pilah, Negeri Sembilan.

Literature: Institutions and institutional economics

Institutionalism considers rules or institutions embedded within legal, economic and social system agent's decisions (Mair and Miller, 1992). Institutions range from formal rules within social, economic and political systems to informal custom and traditions, which govern human social interaction (North, 1996; van der Krabben, 1995). This means institutional economic is concerned with the collective behavior of people so that their behavior and decisions could be modified collectively (Graaskamp, 1992). Institutionalism considers formal and informal rules or institutions, which govern agent's decision and action through agency relations in a society (Mair and Miller, 1992; North 1996).

In general, there are formal and informal rules or institutions or constrain which influence human behavior and economic activities (Hudgson 1998; North 1996; Scott 1995). According to North (1996), the difference between formal and informal constrains is important in a complex society with technological change and formal legal, political and economic system. In fact, formal constrain may reduce the amount information available, lower the need for monitoring and hence reduce costs to allow smoother exchange among and across human interaction in a society. In addition formal written rules may re-enacted or modified or emended to eliminate, enhance or replace formal and/or informal constrains (North 1996).

According to North (1996), formal rules include political rules, economy rules and contract. The hierarchy of such rules, from constitutions, to statue and common law, to specific by law and finally to individual contract defines constrains, from general rules to particular specification. Political rules interact with economic rules which define economic policy and they specify a bundle of property right over the use and right to derive income from property within contract that enable the exchange to occur in human interaction. These implications of formal rules, however, may influence informal rules of human tradition, custom and value about land. Conversely, these informal rules may be considered to establish formal rules in the society.

Eggertsson (1990) contends that contractual (institutional) constrains may restrict the rearrangement of property right. He asserts that property rights are defined in such a way as to include formal laws and regulations and informal rules of ideology and social norm. These formal and informal rules of social norm, ideology and agency characteristic may in turn adversely affect agency interaction and agent's attitudes or participating in the land.

Formal Rules: The effort by agencies to redevelop agriculture land

A part of formal rules, it was a legal law coming out from the evolution of Malaysia Plans. It was rasional because the exchange of institution will tell us how the process on legally especially on formal institution trough time will influence idle land. From this situation, we try to highlight the scenario of institution exchange on Malaysia Plans started 1950 until 2005 (which means from Malaya Plan to Malaysia Eight Plan).

From Malaysia Plans evolution, the exchange of Malaysia Plan will show in detail how the effort undertaken by government to improve agriculture land toward the end are not successful to improve idle land agriculture. Therefore, the attempted will be give to exchanging, those looking out to the process of planning exchanging. There are very important, because exchanging was coming out from the effort of human to reach their vision follow by planning which notice on each Malaysia Plan.

To discuss the scenario of institution exchanging, the discussion will be given into 3 phases. Started with phase before Malaysia Plan, Phase before Agriculture Policies (1984) and Phase After Agriculture Policies (1984). Separation into 3 phases rational to enable review the institution exchange to assess how far institution rules (either formal or informal) existing constrain to redevelopment idle agriculture.

Phase Before Malaysia Plan (1950-an until 1965)

Phase after independent started at the end of colonist within 1955 until 1957; it was a transition year before independent. Impermanent government before independent will introduce first Economic Plan Development on 1956 until 1960 which main focus for the agriculture sector. Introducing Economic Plan Development in 1956 it was a starting point for the government to expand and advanced in the agriculture sector. It was clear, when Agriculture Policies introduced by colonist in 1905 propose to amendment in 1955.

Although Agriculture Policies are amendment in 1955, but it still not exchange the function of Agriculture Department. The functions Agriculture are;

> "...Study the aspect of physiology, pathology and botany on potential agriculture for Tanah Melayu, introduced and trying new crop using seed and giving advised and information about agriculture and botany..."
>
> (Maimunah Ismail, 1999)

From these functions, if the Agriculture Department can do something perfect, so for sure it can give more contribution for development of agriculture. However, for the early Agriculture Department focus more on development of plantation sector. Additionally, Agriculture Department has many constrain to redevelop agriculture. The constrain are not enough officer and problem with communication and another problem they didn't have clear order with rules to redevelopment agriculture sector.

To implement agriculture policies in early 1950-an, officer of agriculture planning have two problems. The problems are what type of technology farmer and what type of technology should can accept they give to the farmer. However this question is not an easy process because it touches about human feel and psychology of farmer. However, the first Economic Plan Development (1956 until 1960) is failure to settle down the issue interconnected with Malay land ownership.

Hence, Malaya Second Planning Development (RPE II) was launched in the year 1961 until 1965. It was an important era because for the first time agriculture development in Tanah Melayu was followed by national aspiration. The objective of Agriculture Policies performed until 1965 were:

a) To increase product and quality of agriculture, especially for the main food
b) To balanced the sources of agriculture with using by maximum and varieties crop
c) To strengthen marketing system and credit service
d) To build up cooperative and another institutions social for improve the status socio-economy farmer
e) To provocatively agriculture effort and research by transfers technology

That mean until 1965, it was clear that policies agriculture was has a big authority from increasing output to the admin program until worker development. From the policies, agriculture development was undertaken by smooth within this phase. Although, economy report give a good sign but the duration time showed agriculture sector were interconnected with polarization economy call dualistic. These situations made the government to legislate the policies of development.

Phase before Agriculture Policies 1984

Phase before Agriculture Policies introduced started in 1966 until 1985, which include first Malaysia Plan (1966-1970), Second Malaysia Plan (1971-1975), Third Malaysia Plan (1976-1980) and Forth Malaysia Plan (1981-1985). First Malaysia Plan was an additional part of RPE and RPE 11, where agriculture was still the main focus for the government. After the 13 May 1969 event in Kuala Lumpur, government introduced New Policies Economy (DEB) in the Malaysia Second Plan (1970-1975), with introducing development strategies (Mohd Shukri, 1992). Hence, from the early 1970-an, DEB based development strategies on objective and strategies. The administration of these strategies were clear when the government set up various agencies for redevelops community economy. For example Federal Land Development Authority (FELDA) and FELCRA were set up to reach the strategies of DEB.

From the formal institution, FELDA was set up under the Development Land Ordinance Bil: 20 (1956) and be established in July 1956 and the New Plan Resettlement get full grant from the government. The function of FELDA was to promote and assist the investigation, formulation and carrying out of project for the development and settlement of land in the Federation. From this function, FELDA gave more implication for the land development in the Peninsular Malaysia. The policies of FELDA are:

a) To reduce unemployment and unemployed at the rural
b) As a tool to settle the problem of landowner
c) To create new community which are develop, progressive from economy and social

With the expansion of its function and policies, new community created by FELDA has a interconnected with FELDA strategies in social development (Shamsul Amri, 1979). If we look at the FELDA function, nothing changed since it was born. But a part from admin infraction structure, strategies and enforcement policies it was exchanging following time. From the opinion of Shamsul Amri, he said FELDA successful to eradicate unemployment and unemployed. However, FELDA still have problem from the part of micro, it was from social implication when the farmer burden on with debt and it make they feel nervous and not save. In a way they were worried about the landowner, because if farmer still unfinished debt with FELDA, the land is not their own.

FELCRA was another land development after FELDA. FELCRA established under formal rules under Parliament Act No 22, 1966, which enforced at first April 1966 and amended trough parliament act No A637 enforcement on 18 September 1986. FELCRA function is under role at Section 4 (1) Act A637 are;

> "...Consolidation and rehabilitation and to develop land as agreed or requested by the state government or on its own, consolidate, rehabilitate and develop land on request from the land owners..." and the strategies of FELCRA are:

a) To ascertain a strong returns on its output for the developed estates.
b) To increase the quality of living for its participants and for its staff.
c) To improve the productivity levels with intelligence and up-to-date technological management.
d) To enlarge technology and land management
e) To upgrade value-added economy

To make sure project under FELCRA are successful, all the participating have to fulfill all the condition. The conditions were:

a) Landowner should sign agreement form
b) Landowner agree FELCRA give them capital and they should pay back
c) Agree to make a payment by output
d) Competitor should have their own land and if land are multiple landowner, suppose to get other agree

With the function of FELCRA, most of the efforts of FELCRA are focus on rehabilitation and to develop individual idle land. Since FELCRA started their effort in 1967 until Jun 1989, there was 225,867 hectare already redeveloped all over the country. The operation and management of each mini-estate was carried out by FELCRA, trough a committee specifically set up for this purpose. It is clear that, with the establishment and operation on these project FELCRA can do something to reduced the increasing of idle land. But the problem is not easy to get agreement from landowner and to reduce the negative attitude of them.

Phase after Agriculture Policies (DPN 1984)

Phase after Agriculture Policies (1984), including Fifth Malaysia Plan (1986-1990), Six Malaysia Plan (1991-1995), Seven Malaysia Plan (1996-2000) and Eight Malaysia Plan (2001-2005). Within this phase, Agriculture Policies 1984 (DPN 1984) were take part to make sure agriculture sector moving on. Together with government aspiration, implementation of DPN (1984) since Fifth Malaysia Plan focused more on commercialized production of food, develop technology on production, to increased size of land, attempt economy size and management efficiency on development commodity sector.

Therefore the government every Five Year Development Plan have always suggested focusing on *in-situ* development which attempt to develop idle land or already land. This package approach also encourages establishing agency like FELCRA, RISDA, LPP and so on. For example FELCRA was the most important agency to eradiate idle land and RISDA is the other agency play a role to eradiate problem of smallholder land in rural.

RISDA (Rubber Industry of Smallholders Development Authority) was established by Act RISDA 85/1972. The mini estate concept calls for collective development of contiguous block of smallholder land of up to a few hundred acres in size and may include pockets of vacant or abandoned land. The mini estate approach in the amalgamated holding to RISDA. Therefore, RISDA is required to initiate conscious effort right from the beginning to organize these smallholders and to capitalize on their collective strength to secure both economies of scale and the effective transfer of technology.

It is clear that, with the establishment and operation of these Smallhoder Committee, RISDA will be able to facilitate the early transfer of estate type management practices directly to the smallholders. The mini-estate approach is very much an extension on the replanting programmed from the logistics or implementation point of view. These collective approach, however, also encourages activities that may not be feasible at the individual replanting level.

RISDA focus more on rural community which has many problem on socio-economic. Furthermore, the development of mini estate on idle land has resulted in some limited migration of smallholder into uncultivated and undeveloped areas, creating in the process new communities, which have the potential for further development into rural growth center.

Farmers Organization Authority (FOA) or we call Lembaga Pertubuhan Peladang (LPP) was another agencies which take part to redevelop idle land. FOA as a part a formal institutional was establish under FOA Act 1973 (Act 109). The objective of FOA is to produce commercial farmers who would contribute toward the development of agriculture industrial in the country through the farmer organization movement. Their functions are to promote, stimulate, facilitate and undertake economic and social development organizations and to register, supervise farmer's organizations and allocate funds on matter relating to farmers.

Seven Malaysia Plan (1996 - 2000) policy emphasizes the eradication idle land trough landlord in trust approach. From landlord in trust concept, the government hope the land developer company was be more committed to redevelop idle land trough FOA. Trough this concept, the effort to rehabilitation and redevelopment of idle land will be faster with the objective to increase productivity of land. However, the effort by FOA was retarded due to constrain with the informal sector such as age of landowner, size of land and attitude of landowner. For example, more than half of FOA member are too old to be given support to the idle land program.

Besides Eight Malaysia Plan, the government trough Ministry of Agriculture was attempted for new concept to redevelop the idle land. The new concept focuses on Ministry of Agriculture Incorporated (MOA Inc) which will handle and redevelop idle land. It was the legal rule from the government to give more attention for agencies to redevelop idle land and increased productivity of land. From this concept, all the agencies under Ministry of Agriculture is like a team consultant, lead by Jabatan Pertanian. Other agencies under Ministry of Agriculture and Agro base are Jabatan Pengairan dan Saliran, MARDI, FAMA, Jabatan Perikanan and Jabatan Perkhidmatan Haiwan.

To conduct agriculture transformation by MOA Inc. concept, all the agriculture project need efficiency support services such as human resource, financial resource, latest infrastructure and technology. Therefore all the agencies will provide all the services as a teamwork weither on planning, to execute, stimulate, to monitor until evaluate project. Therefore on MOA Inc Project, once agencies were appointed it has responsibility to coordinate MOA in position and approach on service-oriented and pro-business.

Started in 2001, Agriculture Department execute redevelopment idle land at 12 location with total broadness at 919 hectare with 392 farmer who involve on project *perintis*. Since 2004, Ministry of Agriculture allocated RM13 billion on Pakej Ransangan to redevelop idle land. However, MOA Inc. still have problem with informal sector. For example research by Agriculture Department in Peninsular Malaysia, found they have problem to redevelop idle land when the land have multiple owner. Besides that, research by Ismail and Azima (2005), reported the constrain in informal sector such as not confident owner to the rented, attitude land to the rented and they are not comfortable with contract system when they rented their land.

Analysis on Malaysia Plan including 3 phase shows, government started Second Malaysia Plan just have responsibility to undercover the idle land problem. Beside the effort of government, we can see the existing of informal sector such as attitude and landowner land. From all strategies and act we found that government in certain thing tried to develop agriculture sector forgot about the size, tenure and landowner of land which was a main factor to efficient output. Government gave attention to rehabilitation land, develop new land, consolidate and mini estate for non economy landowner (Table 1)

Table 1: Formal Rules: The effort by agencies to redevelop agriculture land and Informal sector constrain

Phase	Formal	Informal
Phase 1 (1950-1965)	Agriculture Policies 1905, amendment 1955	Dualistic economy (different between rural and urban)
Phase 2 (1966 – 1985)	FELDA (Ordinance Bil: 20 (1956)) FELCRA (Parliament Act No 22 1966, amendment 1986)	Tenure, Landowner and Attitude
Phase 3 (1986 – 2005)	RISDA (Act RISDA 85/1972) LPP (FOA) Act 1973 (ACT 109) MOA Inc. –written law by Ministry of Agriculture and Agro based	Tenure, Landowner and Attitude

The Case Study: Objective, Data and Areas

This part of the paper deals with the nature of empirical study of the research.

a) The Objective

The objective of this paper is to identify formal and informal constraints that contribute to the causes of agriculture idle lands in the case study areas.

b) The case study areas

The case study area chosen is Kampong Kok Talang Ulu, Kuala Pilah, Negeri Sembilan. The case study area is located within Mukim Terachi, Kuala Pilah, Negeri Sembilan. (Refer Appendix A for the location of the case study areas). Kampong Talang was chosen because it has a largest acreage of agriculture idle lands within the neighbourhood of Mukim Terachi. The size of the area is about 121-hectare which is the largest compared to Kampong Gedang (12 hectare), Kampong Padang Lebar (20 hectare), Kampong Ulu Bendul (24 hectare) and Kampong Ulu Parit Seberang (10 hectare) within Mukim Terachi. From observation, Kampong Talang is located in remote layers from the main road (from Mukim Terachi to Kuala Pilah).

c) Data

Data on formal and informal constraints was collected based on interviews with selected landowners cum farmers using questionnaires. Respondents were chosen using stratified samples within the areas of Kampong Kok Talang Ulu, Mukim Terachi, Kuala Pilah, Negeri Sembilan.

Primary data was collected and analysed to investigate the research questions and to achieve the objective of the research. Interviews with the chosen respondents were based on a sample of population selected using a stratified techniques. The main source of information was from the Head of the Kampung who contributed significantly in selecting the respondents. About 21 owners-farmers of agriculture idle land were identified for interview purposes. The sites chosen were Lot 2742 to 2784 (Table 2). From 20 landowners chosen for interview, only nine of them are staying in the area while another eleven landowners who are not staying in the areas. (Refer Table 2 for the population characteristics and the characteristic of the selected landowners is shown in Table 3 and 4). Most of the landowners who are not staying in the areas are living with their sons or daughters in Singapore, Kuala Lumpur. Most of the idle lands had remained idled for about 3 to 10 years.

Most of the lands are designated as *tanah adat*. This means that *Datuk Lembaga* has a power to control and approve any transfer or dealings on *tanah adat*. If the owner would like to sell off or change the registered landowner of the land, *Datuk Lembaga* must present and give his consent to make sure that everything is done according to the rules of *adat*. This rule is seen as the written rule which may constrain *tanah adat* for development purposes.