AGRICULTURE IN A TURBULENT WORLD ECONOMY

PROCEEDINGS
OF THE
NINETEENTH
INTERNATIONAL CONFERENCE
OF AGRICULTURAL ECONOMISTS

Held at Málaga, Spain
26 August–4 September 1985

Edited by
Allen Maunder, Institute of Agricultural Economics, University of Oxford, England
and
Ulf Renborg, Department of Economics and Statistics, Swedish University of Agricultural Sciences, Uppsala

INTERNATIONAL ASSOCIATION OF AGRICULTURAL ECONOMISTS

INSTITUTE OF AGRICULTURAL ECONOMICS
UNIVERSITY OF OXFORD

1986

Gower

NIK HASHIM MUSTAPHA*

Pressure on the Malaysian Fisheries Arising from Current Modernisation Programmes and Management Conditions

Fisheries resource constitutes a sizeable portion of food and nutritional needs of the Malaysian population. The resource also provides income and employment to fishermen and others involved in the industry. Because of its importance and common property nature fish supply is anticipated to be adversely affected. A number of factors contribute to this effect: (i) current and future trends in the domestic supply of and the demand for fish, (ii) the ecological condition affecting the living environment of the fisheries, and (iii) the effectiveness of maritime enforcement of its exclusive economic zone (EEZ) to prevent loss of fisheries. For instance, increased fish prices coupled with the improvement of technology can lead to increased production through intensification of fishing effort. The problem arises only if increased production acts to depress stocks as this is related to the future food supply, fishermen's income and employment. This paper attempts to investigate the supply side of the Malaysian fisheries, that is, to project levels of effort, catch and fish stocks as the result of allowing the fisheries to be managed under open-access and limited-entry policies.

General problems facing the Malaysian fisheries will be discussed and a specific problem related to the future management of the resource will be chosen for the analysis.

DEVELOPMENT AND MODERNISATION PROGRAMMES.

The development of the fishing industry has always been emphasised as the ultimate goal of the national fishery programme. This programme has two parts; (i) to upgrade the productivity of the small-scale capture; and (ii) to create mechanised large-scale offshore fishing operations.

Development programmes implemented by the government in recent years include mechanisation of small-scale fishermen, extension and training, and institutional improvement in pricing and marketing facilities. Attention and effort are given to developing the poverty-stricken fishing

*The author wishes to acknowledge the invaluable assistance and suggestions given by Prof. Walter R. Buctcher of the Department of Agricultural Economics, Washington State University.

areas. For instance, a subsidy scheme was launched for the construction of new fishing vessels, purchase of vessels' engines, improvement of existing vessels, replacement of gear, conversion of old to new fishing vessels and for the purchase of modern fishing equipment (Fisheries Division 1976). In addition, the Fisheries Division of the Ministry of Agriculture is responsible for providing training for fishermen (Third Malaysia Plan 1976–80, 1976). Modern and intensive fishing techniques, like trawlers, are encouraged.

Development efforts in the fishing industry have generally ignored overfishing and stock depletion problems that accompany the management of most fisheries.

Indications of overexploitation of the demersal and semi-pelagic species of the West Coast have been reported by several authors (Lawson 1974; Pathansali 1976; Yap 1977 and 1978). A recent study reported that the fishery situation in the East Coast area of Kelantan showed indication of overexploitation based on a low level of the Maximum Sustainable Yield (Azmi et al., 1981). This finding is contrary to the commonly held belief that an abundant supply of fish resource exists in this region because of a broader fishing jurisdication. Careful consideration of overfishing is therefore, relevant for a number of reasons: (1) Malaysian fisheries are open-access resources and hence will tend to be overfished if not subjected to stringent regulations; (2) government development programmes geared towards fishermen's economic wellbeing may inflict pressure on the resource use; and (3) development and modernisation efforts disregard the biological and optical economic management of the fisheries.

ENVIRONMENTAL CONDITIONS AFFECTING FISHERIES RESOURCE

Deteriorating environmental conditions affecting fisheries have been reported in several studies. For instance, in 1976 Jothy (in Ruddle 1982) reported the effect on industrial waste of fisheries which included the destruction of oyster beds from sawmills, boat yards and iron foundries. Rapid increase in oil palm production in past years added a significant number of oil palm refineries in the major producing areas. The discharge of their wastes into rivers and eventually the sea, polluted some of the Malaysian water resource systems.

The South China Sea has received increased attention in the oil industry's search based on its proximity to existing off-shore oil production. Oil production in Peninsular Malaysia began in 1974 with an initial production of 80,900 barrels per day. By 1979 the daily oil production had reached 282,000 barrels (Economic Report 1980). Since then increasing exploration activities were undertaken to discover new off-shore hydrocarbon fields along the East Coast of West Malaysia. The latest information reported that PETRONAS had discovered 52 gas and oil wells in its exploration activities between 1977 to 1982 (*Daily News*

15 January 1984). It is expected that extensive off-shore extraction and the construction of processing, storage and transportation facilities are likely to threaten vulnerable ecosystems which support the marine fisheries.

ENFORCEMENT OF THE MALAYSIAN EXLUSIVE ECONOMIC ZONE

Malaysia claimed her exclusive economic zone (EEZ) on 25 April 1980 which resulted in 200 nautical miles territorial gains of the South China Sea adjacent to the East Coast (Ibrahim 1982). Thus, the right of ownership to EEZ is defined for economic, administrative and political purposes. From the economic viewpoint this territorial gain has somehow affected the national fishery policy especially pertaining to policy and development of some 138,700 square miles within the EEZ. The immediate problem faced by Malaysia is to identify the EEZ's resource potential.

The Ministry of Agriculture reported that throughout 1982–3 a total of 73 foreign fishing vessels were caught violating Malaysian fishing grounds (*Daily News*, 17 June 1984). Such occurrences not only inflict losses on the Malaysian fisheries but also threaten the security of small fishermen. For security purposes enforcement is desirable.

ECONOMIC ANALYSIS OF THE MANAGEMENT PROBLEM

A comparative analysis of the Malaysian fisheries using 1969–81 data was undertaken to investigate resource use under the open-access, steady-state and the dynamic conditions. The analysis used several equations to simulate levels of fishing effort, catch, stock and economic rent. This section attempts to investigate what will happen to resource supply if fisheries are left to be managed under open access in comparison to the alternative limited-entry optimal management. Thus under these policy alternatives, food supply, income and employment of fishermen in general are discussed.

Analytical procedures

The following equations are used in the analysis of the Malaysian fisheries.

π_t	$= PQ_t - cE_t$	(economic rent equation)	(1)
$E_t^{\#}$	$= [(pk X_t^b)/c]^{1/1-a}$	(open-access equilibrium effort equation)	(2.1)
$E_t^{\bullet}$	$= [(pak X_t^b)/c]^{1/1-a}$	(steady-state optimal effort equation)	(2.2)
$E(t)$	$= [p\text{-}u(t+1)\, ak\, X(t)^b/c]^{1/1-a}$	(dynamic optimal effort equation)	(2.3)
Q_t	$= kE_t^a X_t^b$	(production/harvest function)	(3.0)
X_{t+1}	$= \Theta X_t - Q_t$	(stock-growth equation)	(4.0)

Where π_t is the economic rent in dollars in time t, Q_t is the total harvest in tons in time t, E_t is the total effort in vessels horsepower in time t, X_t is total stock of fish in tons in time t (the symbols #, • and (t) are used to differentiate variables attributed to open-access equilibrium, steady-state and dynamic optimisations respectively), p is unit price of catch in $ per ton, c is unit cost of effort in $ per vessels' horsepower, u(t+1) is the scarcity rent value in $ of the *in situ* fisheries resource. a, b, and Θ are parameters of the estimated equations and k is a constant term of the production function.

Specifications of condition that must hold under open-access equilibrium, steady-state and dynamic optical limited entry are identified. Under the open-access fishing, effort will be expanded until the marginal cost of production equals average revenue of catch because an individual fisherman will compare his marginal cost with the average return of other fishermen in the industry. As long as fishermen expect average returns greater than cost of effort they will continue to increase fishing effort. If they do not fish, their shares will be captured by other fishermen. As effort expands to the open-access equilibrium, economic rent diminishes. The open-access condition becomes $p = c/APPe$, where c/APPe is the average cost of effort.

Management under the steady-state limited-entry optimization is assumed to maximise the economic rent. The government or its agency can be regarded as the controlling manager that aims at maximum profit from fishing undertakings. This analytical procedure yields the temporal limited entry condition as $p = c/(\partial Q_t/\partial E_t)$ where $c/(\partial Q_t/\partial E_t$ is the marginal cost of effort. Unlike the static optimisation the dynamic limited-entry considers optimisation over time. The management objective is to maximise the present value of the economic rent subject to the stock-growth equation. Transforming into the Hamiltonian expression and using the discrete optimal control maximum principles, the intertemporal optimal condition for effort is $p = \mu(t+1) + (\partial Q(t)/\partial E(t))$, where $\mu(t+1)$ is the scarcity rent for the *in situ* fisheries resource and $c/\partial Q(t)/\partial E(t))$ is the marginal cost of production.

If the initial stock level is known, open-access equilibrium and limited-entry optimal efforts at time $t = 1$ can be estimated from (2.1), (2.2) and (2.3) respectively. Simulations proceed by substituting fishing effort and stock at time $t=1$ into (3.0) to obtain the initial level of catch and finally into (4.0) to obtain the next year $t+1$ stock. Projections of stock, effort, catch and the leftover stock can then be performed for $t=1,2 \ldots, n$ number of years by the interactive process.

Results and discussion

Four Malaysian Fisheries Stocks were identified for the analysis. But only one of the four identified stocks was statistically accepted after data were fitted to OLS technique to obtain estimates of harvest and stock-growth equations. Thus fisheries stock adjacent to the coastal areas of Perlis, Kedah, Penang, Perak and Selangor was chosen for simulation and projection.

Simulation results using open-access condition at varying cost-price ratios are shown in Table 1. For a decreasing return to scale production function the open-access fishing effort, catch and left-over stock eventually decline over time. A smaller effort would result in lesser catch and a larger leftover stock. Hence, a less extensive effort application can preserve fisheries resource for a relatively longer period of time than the extensive effort.

Effort-catch price ratios undoubtedly influence the open-access levels of fishing efforts, catch and leftover stock. The stock fails less rapidly for relatively higher effort-catch price ratios and vice versa. It therefore follows that taxation imposed on the fishermen operating in the industry would have the same effect of increasing effort-catch price ratio. As noted a 20 per cent tax on catch produces equivalent effect on price ratio as a 25 per cent tax on fishing effort. On the other hand, any subsidy programme that acts to reduce cost of effort relative to the price of catch will have an adverse effect on resource utilisation. Such a policy programme would have increased pressure on fisheries and hasten depletion of the potential fishing stocks. Usually, benefits derived from subsidy programmes are taxed back as a source of additional revenues to the government. In this instance the effect on effort-catch price ratio arising from subsidies and taxes might be somewhat balanced if properly planned.

Alternative management simulations of the limited-entry steady-state and the intertemporal optimisation are shown in Tables 2 and 3 respectively.

On comparison one can easily observe that the limited-entry optimisations allow for the maximisation of economic rent as contrast to zero rent under the open-access condition. Moreover, if the fisheries authority were in a position to exercise control over the resource, it is likely that effort could be limited to the optimal level. Limited-entry situation would exert less pressure on resource use compared to the open-access fishing operation. Food supply from fisheries resource can be preserved for a longer period of time although at the beginning of the planning horizon lower catches are observed. Additional gains may be realised by the fishermen in terms of higher prices because of the reduction in supply.

Results of the intertemporal optimisation are presented in Table 3. The intertemporal simulations recognise the year-to-year linkages between effort, stock and catch. Changes in stock level as the results of changes in effort and catch affect the scarcity rent value of the *in situ* resource. Thus, depressed stock resulting from increased effort application and fisheries extraction would directly increase the value of the *in situ* stock and therefore raise the future scarcity rent value. Given this situation the management usually revalues decisions in favour of future economic benefits. The fisheries resource will be captured less now and will be kept for future use. Intertemporal results showed that effort, catch and stock

TABLE 1 *Open-access levels of effort, catch, stock, total revenue, total cost and economic rent at varying catch/effort price ratios predicted for the periods 1979, 1983 and 1988, West Coast Peninsular Malaysia.*

	Open-Access ('000)					
	Effort (hp)	Catch (ton)	Stock (ton)	Total revenue($)	Total cost($)	Economic rent($)
1. *Price = $3,500/ton; cost = $1,500/hp*						
t = 1 (1979)	767	329	1,565	1,150,450	1,150,450	0
t = 5 (1983)	552	236	739	827,580	827,580	0
t = 10 (1988)[a]	145	62	40	217,400	217,400	0
2. *Price = $3,000/ton; cost = $1,500/hp*						
t = 1 (1979)	559	280	1,565	839,010	839,010	0
t = 5 (1983)	441	221	929	661,870	661,870	0
t = 10 (1988)	243	122	251	364,580	364,580	0
3. *Price = $3,000/ton; cost = $1,800/hp*[b]						
t = 1 (1979)	385	231	1,565	693,100	693,100	0
t = 5 (1983)	329	198	1,108	592,550	592,550	0
t = 10 (1988)	240	144	555	432,320	432,320	0
4. *Price = $2,400/ton; cost = $1,500/hp*[c]						
t = 1 (1979)	354	221	1,565	531,260	531,260	0
t = 5 (1983)	307	192	1,146	461,020	461,020	0
t = 10 (1988)	233	146	625	349,910	349,910	0

[a]Infeasible since catch is greater than stock.
[b]20% tax on effort.
[c]20% tax on catch.

TABLE 2 *Temporal limited-entry levels of effort, catch, stock, total cost and economic rent at varying catch/effort price ratios for the periods 1979, 1983 and 1988, West Coast Peninsular Malaysia.*

Simulation	Temporal Limited Entry ('000)					
	Effort (hp)	Catch (ton)	Stock (ton)	Total revenue($)	Total cost	Economic rent($)
1. *Price = $3,500/ton; cost = $1,000/hp*						
t = 1 (1979)	446	249	1,565	871,890	446,140	425,750
t = 5 (1983)	371	207	1,041	724,260	370,560	353,700
t = 10 (1988)	248	139	432	485,180	248,260	236,920
2. *Price = $3,500/ton; cost = $1,300/hp*						
t = 1 (1979)	261	189	1,565	662,310	338,900	323,410
t = 5 (1983)	237	172	1,271	602,570	308,330	294,240
t = 10 (1988)	201	146	881	510,030	260,980	249,050
3. *Price = $3,500/ton; cost = $1,500/hp*						
t = 1 (1979)	195	163	1,565	570,080	291,710	278,370
t = 5 (1983)	183	154	1,377	537,920	275,250	262,670
t = 10 (1988)	167	140	1,116	488,780	250,100	238,680
4. *Price = $2,400/ton; cost = $1,500/hp*						
t = 1 (1979)	90	109	1,565	263,257	134,706	128,551
t = 5 (1983)	91	111	1,599	265,917	136,067	129,850
t = 10 (1988)	92	113	1,653	269,891	138,101	131,790

TABLE 3 *Intertemporal levels of effort, catch, stock and economic rent under changing scarcity rent and quantity demanded for the period 1979, 1983 and 1988, West Coast Peninsular Malaysia.*

Simulation	Price[a] ($/ton)	Scarcity Rent ($/ton)	Intertemporal Limited Entry ('000)					
			Effort (hp)	Catch (ton)	Stock (ton)	Total revenue($)	Total cost($)	Economic rent($)
1. *Cost = $1,500/hp*								
t = 1 (1979)	3,500	676	124	126	1,565	452,893	186,048	266,845
t = 5 (1983)	3,500	741	116	124	1,521	435,112	174,180	260,932
t = 10 (1988)	3,500	870	103	116	1,480	406,221	154,073	252,148
2. *Cost = $1,500/hp*								
t = 1 (1979)	3,927	676	166	150	1,565	589,343	248,567	340,776
t = 5 (1983)	4,006	741	160	144	1,429	578,264	239,620	338,644
t = 10 (1988)	4,140	870	149	135	1,235	557,518	222,869	334,649
3. *Cost = $1,500/hp*								
t = 1 (1979)	3,927	700	162	149	1,565	583,468	243,748	339,720
t = 5 (1983)	4,006	799	153	142	1,438	566,928	229,921	337,007
t = 10 (1988)	4,140	1,006	136	129	1,269	535,101	203,296	331,805

[a]Changes in the price level are caused by the change in quantity demanded which is estimated from the demand function $P_{(t)} = 1{,}629{,}598.23\ Q_{(t)} - 0.5119$

would be quite stable throughout the period studied. Depletion of the fisheries resource is marginally felt with considerable benefits in terms of economic rents. In such a case food supply is assured and employment to the fishermen will persist for a longer period of time.

CONCLUSIONS

Proper management of the Malaysian fisheries is essential to ensure sufficient domestic supply of fish to its growing population. Projections based on the existing open-access management policy do not guarantee a lasting supply of fish as this tends to deplete current stocks faster than the alternative steady-state and dynamic optimisations. Not only the fisheries resource would deplete but additional problems in the forms of income and employment would follow the depression of stocks. The study also illustrates the possibility that fisheries would be more extensively captured by following a subsidy instead of a taxation programme.

To ensure a longer period of domestic fish supply alternative management policies of temporal and intertemporal optimisations were found appropriate. The temporal analysis directly limits the fishing effort that can enter the fishing industry to the optimal level. The intertemporal analysis considers the value of the *in situ* resource and weighs benefits between the present time and the future. Results show that economic optimisation policies are preferred to open-access in terms of preserving the fisheries resource.

REFERENCES

Azmi, A., Azni, H. and Mohsin, A. D., 'Assessment of The Demersal Stock off Kelantan, East Coast of Peninsular Malaysia', *Pertanika*, vol. 4, no. 2, pp. 156–9, Universiti Pertanian Malaysia, Serdang, Malaysia, 1981.

Government of Malaysia, *Third Malaysia Plan 1976–80*, Government Printer, Kuala Lumpur, 1976.

Ibrahim, M., 'Impact of the Exclusive Zone on the Malaysian Fisheries', Working paper of the Faculty of Fisheries and Marine Science, Universiti Pertanian Malaysia, Serdang, 1982.

Jahar, Y., 'Some Implications of the Fisheries Subsidy Scheme, Peninsular Malaysia', *Seminar on Development of Fisheries Sector in Malaysia*, Kuala Lumpur 1976.

Lawson, R. M., 'Fisheries Development and Planning in the Indo-Pacific Region – its Objections and Constraints', *Symposium on the Economic and Social Aspects of National Fisheries Planning and Development*. Bangkok, 1974.

Ministry of Finance Malaysia, *Economic Report 1980–81*, National Planning Department, Kuala Lumpur, 1980.

Pathansali, D., 'Assessment of Potential Yields From Coastal Marine Fisheries Resources of Malaysia', *Fisheries Bulletin, No. 15. Ministry of Agriculture*, Malaysia, Kuala Lumpur, 1976.

Ruddle, K., 'Environmental Pollution and Fishery Resource in Southeast Asia Coastal Water', *Man, Land and Sea: Coastal Resource Use and Management in Asia and Pacific*. (ed.) Chandra, H. S. et al., ADC, Bangkok, 1982.

Yap, C. L., 'Trawling: Its impact on Employment and Resource Use on the West Coast of Peninsular Malaysia', *Small-Scale Fisheries Development: Social Science Contribution*. (ed.) B. Lockwood and K. Ruddle, East-West Center, Hawaii, 1977.

Yap, C. L., 'The Diseconomics of Technological Progress: A Note on Fishery Regulations', *Regional Conference on Technology for Rural Development*, Kuala Lumpur, 1978.

DISCUSSION OPENING – U. K. SRIVASTAVA

The paper by Daniel Bromley discussed three main causes of resource degradation in developing countries – resource-based exports; inept policies regarding resource use at the local level; and side effects of commercial agricultural policies.

The first cause raises the issue of diversification of export structure, i.e., exporting more value added products rather than primary products from developing countries. This solution, of course, needs to be discussed in a somewhat long-term perspective. The discussion should recognise the constraints faced by developing countries relating to appropriate technology and markets of developed countries.

The second cause raises the issue of how to obtain the much needed local participation in implementing policies relating to the natural resource sector. Therefore, the question of appropriate organisational/institutional design is extremely important in formulating and managing agricultural projects.

The third cause raises the issue of the choice of appropriate technology. The policy of commercialisation of agriculture pursued without regard to available human resources is bound to cause side effects. Since it is well known that net transfer of rural population to urban areas which can be sustained by the rate of growth of the industrial sector is very slow, the crucial issue is how to find gainful employment for rural labour in villages without natural resource degradation.

The paper also raised the issue of the rate of use of renewable resources and the nature of capital formation that accompanies the exhaustion of non-renewable resources. But the point is whether we have adequate data to arrive at harvesting rates that do not exceed the sustainable yield rate of renewable resources. The paper rightly emphasises the gap between the biologists' and economists' notion of 'wise use'. While the former are conservative, the latter are liberal. In this context a crucial issue to be discussed is how to develop the critical skills in biological and social sciences relevant to natural resource policy in developing countries.

The second paper by Nik Mustapha emphasises that the development efforts in the fishing industry have generally ignored accompanying overfishing and stock depletion problems. It also points out that the open access policy does not guarantee a lasting sufficient domestic supply of fish over time in Malaysia, because the current stocks deplete faster than the steady-state and dynamic optimisation. The subsidy on boats and gear further accentuates the resource depletion effect. This overall depletion of stocks creates problems of income and employment in the fishing community, which is relatively poor. To avoid fishery and stock depletion problems, the temporal and inter-temporal optimisations, which directly limit the fishing industry to optimal levels, could be an answer.

The findings of the paper are theoretically sound. I would, however, like to add that management policy of temporal and intertemporal optimisations in the fishing industry assume that we have extremely good estimates of resource availability and its growth pattern over time. Without this reliable information it is not possible to limit the fishing effort at optimal level. Unfortunately, this data is not available in many developing countries. For example, this is one of the constraints in limiting the fishing effort in India. If fishing effort is to be limited in the absence of such data, there is a danger of missing the opportunity of increasing the catch and the possibility of augmenting the domestic supply and exports.

Another aspect relates to the fact that the use of aggregate models for a country as a whole could be misleading. For example, although marine catch in India has become stagnant around 1.6 million tonnes and there is pressure to limit the entry of fishing effort in in-shore waters, there are coastal areas where there is a possibility and need for additional fishing effort to exploit both prawn and fishery resources without the fear of resource depletion.[1]

Therefore, keeping the findings of this paper in mind, the issue to be debated is whether fishery scientists and biologists are in a position to generate accurate data on resource potential and sustainable yield without resource depletion. We have also to examine whether the developing countries have the resources and trained manpower to undertake this task.

In the context of resource depletion due to demand pressure in the fishery sector, we have also to examine whether the existing catch in developing countries is processed into edible products to the maximum possible extent. In many developing countries, the lack of infrastructure facilities and fishing practices cause a great deal of spoilage which enhances the demand-supply gap and puts pressure on increasing the supply to meet the needs of a growing population and supplies for export.

NOTE

[1]Srivastava, U. K., Reddy, Dharma, M. and Gupta, V. K., *Management of Marine Fishing Industry*, New Delhi, Oxford and IBH Publishing Co., 1982; Srivastava, U. K. and Reddy, M. Dharma (eds), *Fisheries Development in India – Some Aspects of Policy Management*, New Delhi, Concept Publishing Co., 1983; Kulkarni, G. R. and Srivastava, U. K., *A Systems Framework of Marine Foods Industry in India*, New Delhi, Concept Publishing Co., 1985; Gupta, V. K. *et. al.*, *Marine Fish Marketing in India*, vol. I to VI, Indian Institute of Management, Ahmedabad, 1984.

GENERAL DISCUSSION – RAPPORTEUR: ELISABETTA CROCI-ANGELINI

While showing a general agreement with the authors of the two papers, the discussion was mainly aimed to elaborate on the more interesting points as follows:

The difficulties faced in project implementation were pointed out. Development assistance is too often provided through big projects substituting new products for traditional crops and employing new technologies totally alien with respect to local experience. The lack of human capital and its inability to cope with this situation increases the risk of crop failures. The likelihood of wide discrepancies between the calculated and the actual cost/benefit ratios (i.e. the probability of success of the project) should be taken into account as well as the possible environmental burdens.

While the causes for 'market failure' should be studied more in-depth, a new direction of enquiry was acknowledged in the study of 'institutional failure' as an additional source of externalities. In this respect the ability to avoid ecological disaster in the tropics may well depend upon the attention paid to how peasant farming is organised. For instance, the dependence upon firewood for energy uses (mainly for cooking) is almost complete because the farmers do not have access to other fuels while *de facto* the access to firewood is open, although frequently illegal.

Whether fisheries should have open or somehow regulated access, was related to the Exclusive Economic Zone. Self-limiting rules may not be the solution for small countries unless an agreement is reached with neighbouring countries to limit their exploitation of natural resources as well.

All the above issues stress the role of government. Governments usually know the consequences of their intervention on land and other natural resources. The behaviour therefore can be explained along the following lines: (a) they cannot do otherwise, either because of the constraints they face on the foreign exchange side or because of the impossibility of effectively counteracting private behaviour (e.g. private tree cutting); (b) their own instability leads them to favour short-run policies in order to please the people; (c) they cannot avoid favouring large profit-making agencies controlled by foreign capital, whose philosophy is explicitly oriented towards exploiting existing resources and later move to other countries. A solution to this problem could be found in compelling governments to submit to land and natural resource conservation rules in order to obtain international agencies' intervention and aid (e.g. loans accorded by the IMF).

In reply, Daniel Bromley stated that in his opinion social scientists were observing two crises at present: one was conceptual and stemmed from the simplistic application of welfare economics also in cases of market failure or when independent optimisation may lead to overall damage. The assumption of benevolent government assistance might become a perverse factor and bring about very severe failures. The second one referred to the presumption of development assistance. Much of it had resulted in a quite hard impact on the resource base, so the problem should be reconsidered. A distinction should also be made between government (bureaucracy, explicit state) and institutions (set of uses, habits, legal foundations of society, implicit state) the latter being often missing after the government had broken the social contract. Cost/benefit analysis should be framed into a certain environment including cultural elements; while they should be improved, such analyses are however an unavoidable check in order to avoid more serious mistakes.

As to the problem of fisheries, Nik Mustapha replied that the lack of a reliable database is very serious, however what is really needed is to find out the trends. Fishermen would profit from fleet modernisation rather than subsidy allowances. More disaggregation would certainly improve the model and technical assistance is of the greatest importance for the problem of the Exclusive Economic Zone.

Participants in the discussion included Michel Petit, Kamil I. Hassan, Carlisle Ford Runge, Morag Simpson, Ewa Rabinowicz, John Antle, Patrice Dofonsou and J. Viaene.