NEW ZEALAND CASE STUDY

TECHNICAL REPORT

Introduction

At its 68th Session, the Committee for Fisheries agreed to a continuation of the New Zealand case study via the development of an integrated model of trade in selected commodities and fishing services in the New Zealand EEZ.

This is a progress report of the technical aspects of the model used in the case study. Any data presented is intended to be illustrative only. The chief focus is on the structure of the model, and methodological issues.

A separate overview report addresses the higher level conceptual and practical issues which arose during the development of the model.

Purpose

On the basis of a model of how fishing access is allocated for the hoki fishery in the New Zealand EEZ, this report has a number of aims:

- to demonstrate the interlinkages between economic assistance to fisheries products and assistance to fisheries services;
- to explore the effects of such economic assistance, including trade barriers, on the profitability of different economic activities, and so the effects on trade and production patterns;
- to suggest the data requirements for the general analysis of economic assistance in fishing over many countries and species;
- to suggest how the model might be extended to more general cases, including multiple EEZs, and the use of different access allocation mechanisms.

Scope

As outlined in earlier papers and in subsequent discussions in the Expert Group, the New Zealand case study is intended to have a limited scope.

- It will not examine, in any detail, the direct assistance measures which may apply to fishing services.

- Only two species will be examined -- hoki and squid. In fact, in this progress report, only hoki will be examined.

- The values of the parameters in the model are indicative or hypothetical only, and are not intended to provide definitive quantitative results.

- It will concentrate on the activity of harvesting in the EEZ, as opposed to downstream processing of fish.

Model structure and equations

The model structure is described by several basic features:

- The question of who harvests and processes fish from the New Zealand EEZ is modelled as the allocation of fishing quota between competing economic activities -- in effect, competing markets.

- Multiple economic activities, with their own markets for quota, are distinguished on the basis of the subsequent use of the fish caught. Specifically, economic activities (and therefore quota markets) are distinguished by the harvester, the nature of the first tradable product, and the destination market. See Table 1.

- Each market has a demand curve for more fishing quota, which is directly related to the associated harvesting, processing and market chain, and is described by the following linear equation:

$$QuotaP = ProdP - (IntInputs + Rents + VA) + (e * VA'/Q') * Q$$

<-------- y-axis intercept-> <slope>

where:

QuotaP	Quota Price
ProdP	Price of Final Product
IntInputs	Intermediate inputs, e.g. fuel and provisions
Rents	Resource rents or licence fees
VA	Value Added, i.e. return to capital and labour
e	Elasticity of supply of services with respect to the return to value added
VA'	the return to value added in the base period
Q	Quota demanded at the associated Quota price
Q'	Quota taken up in the base period

All measures are in green weight tons, and all price, cost and value-added measures include assistance, whether positive or negative.

- The free market allocation of quota sets the same price of quota for each market, such that the TAC is just allocated between the markets. This corresponds to the situation where quota holders arbitrage between markets to ensure that the price of quota is equalised at the margin.

Initialisation

Initial values may be derived from the following identity:

ProdP-(IntInput+Rent+QuotaP) = Value Added

If the other values are known, one of the values may be calculated as the residual -- generally either value added, or the quota price. On the basis of this data, initial demand curves can be established for each market.

Changes in assistance

Assistance measures come in two types. First, there are assistance measures which define the position of the demand curve. These assistance measures include tariffs on the final product, input assistance, and assistance directly to labour and capital. Secondly, there are assistance measures to do with the allocation of quota between markets, e.g. administrative rules that no more than a certain amount of quota may be allocated to a particular market. Both types of assistance affect quota allocation.

For the first type of assistance, changes are modelled with reference to the initial demand curves. Increases and decreases in assistance correspond to upward or downward movements of the demand curves. The "free trade" regime is found by making changes which negate current levels of assistance. Estimates of current assistance are therefore needed to arrive at the "free-trade" regime. These price wedges should be expressed as a monetary value with respect to an international reference price and the following variables:

- the product in the final market;
- the intermediate inputs used;
- resource rentals (the reference price should be the lowest resource rental applied).

Note in the case of the model for hoki, wedges for intermediate inputs, such as fuel, were omitted for simplicity. The model also allows for the estimation of direct assistance to value added factors, although the case study does not focus on this type of assistance either.

With changes in assistance, the demand curves move, forcing the model to find a new equilibrium price, and a new allocation of quota between markets in order to clear the TAC. Accordingly, the model shows the allocation effects caused by any given assistance regime.

The second type of assistance is modelled by allowing for different rules for allocating quota between markets. As discussed earlier, such rules might involve a restriction on the amount of quota that can be allocated to a market (a non-tariff barrier), or by specifying a higher price for quota in particular markets (a tariff-type barrier). This type of assistance was not required to be modelled for the hoki case.

Effective rates of assistance

It is useful to bring the two types of assistance together in a single measure. To do this, all forms of assistance are removed except for direct assistance to value added. The direct assistance to value added which is required to bring about the assisted quota allocation is then calculated. The allocation rule is that of the free market. The sum of this direct assistance with value-added is assisted value added.

The ERA measure is simply the percentage deviation of assisted value added from unassisted value added. Markets which have a greater amount of quota than under a free market have positive assistance, while those with less quota will register as having negative assistance. Because of the TAC limit, negative and positive ERAs will cancel on average.

General application

The question arises of whether the modelling of quota markets is applicable where there is no quota system, and where quota is allocated on an administrative basis. It would appear that the approach can, indeed, be used in these situations.

- A competitively fished TAC can be viewed as a market allocation of quota at zero price -- in effect an open access fishery operating under a shortened fishing season.

- An administrative allocation can be viewed as setting a higher quota price for some markets than for others. In principle, the willingness to pay for an additional ton of quota can be estimated for an administrative allocation to provide an estimate of the national quota price applying.

By setting the price of quota appropriately in the initialisation of the demand curves, and by using the appropriate quota allocation rule to model changes in assistance, the same methodology can be applied to "non-quota" fisheries markets.

Extensions of the model could proceed in a number of ways. First, the model could be applied to new EEZs on the same basis as the New Zealand case study. Secondly, a model could be added which modelled supply and demand in product markets. This would enable general equilibrium product price changes to be fed back into the EEZ models. This could only be done in the context of a model of assistance in the supplying EEZs. Thirdly, there may be a need to link the supply of fishing services to the opportunity costs faced.

Model data

As discussed previously, the data used is indicative only and is not meant to represent the actual situation. In particular, the price wedge for hoki into the Japanese and Korean markets was set at 10 per cent of the estimated product price. In fact, such a price wedge does not exist, and hoki can enter freely into the Japanese market. This artificial price wedge was put in merely to illustrate, hypothetically, the general relationship between market barriers, and access barriers.

Other data has a closer link to the likely true values, although even here the data is indicative only. Price information is taken from export statistics but no allowance was made for quality differences. The initial quota price of NZ$ 100 per ton is roughly consistent with annual lease prices on the New

Zealand market. Input costs, such as fuel, were assessed at about 40 per cent of total costs, with a lower proportion for surimi vessels to avoid negative value added arising. A survey of actual vessels working in that fishery would be required to achieve a more accurate assessment. The initial allocation of quota is based on catch statistics, and resource rentals are those which actually apply. The elasticity of value-added with respect to output produced was taken as unity for all activities. This was an arbitrary choice, although elasticities related to value-added are likely to be more stable between different activities than product elasticities.

Model run

The model run compares current assistance and quota allocations with a "free-trade" allocation. ERAs were then calculated for each economic activity. Table 1 summarises the results. Some key points to emerge from this hypothetical study were:

- The price of quota actually fell from NZ$ 100 per ton to NZ$ 75 per ton with the removal of hypothetical assistance. This indicates that some of the value of assistance can be captured by a coastal State which has quotas in place.

- Some of the most negatively assisted activities (negative ERAs) were for foreign vessels landing fish in New Zealand, which did not receive hypothetical assistance from landing in their own markets.

- Those activities which had negative assistance increased output (tons harvested) as a result of moving to an unassisted regime. Positively assisted activities decreased their production.

Conclusion

The model shows that given appropriate quantification of parameters it is possible to link many types of assistance by their common effect on the profitability of competing economic activities. In particular, a resource access assistance measure, such as a resource rental differential, can be assessed on the same basis as a hypothetical market barrier for product. Assistance to different economic activities can be shown, in turn, to lead to changes in production patterns, and trade.

Although the model was applied in the context of a quota management system, it could be adapted for other contexts, such as the administrative allocation of access within a competitively fished TAC.

TABLE 1. NEW ZEALAND CASE STUDY - MODEL OF ASSISTANCE FOR HOKI HARVESTING

Initial parameters (NZ$ per green weight ton)

Harvester	Japan	Japan	Japan	Japan	Japan	Japan	Japan	Japan	NZ	NZ	USSR	U
Market	NZ	NZ	NZ	NZ	Japan	Japan	Japan	Japan	NZ	NZ	NZ	U
Product form a)	Proc	Fillet	Surimi	Whole	Proc	Fillet	Surimi	Whole	Whole	Proc	Proc	
Product price	736	649	414	700	736	649	414	700	700	736	736	
Input costs	300	300	200	300	300	300	200	300	300	300	300	
Resource rental	22	22	22	22	22	22	22	22	11	11	22	
Quota price	100	100	100	100	100	100	100	100	100	100	100	
Elasticity VA	1	1	1	1	1	1	1	1	1	1	1	
Value added	314	227	92	278	314	227	92	278	289	325	314	
Tons harvested	5 302	3 470	655	4	9 519	32 914	24 558	51	16 684	1 846	30 073	2
Changes from initial assistance												
Final price wedge b)	0	0	0	0	74	65	41	70	0	0	0	
Resource rental wedge	-11	-11	-11	-11	-11	-11	-11	-11	0	0	-11	
Total change	-11	-11	-11	-11	63	54	30	59	0	0	-11	
Free-trade values (unassisted)												
Quota price	75	75	75	75	75	75	75	75	75	75	75	
Tons harvested	5 917	4 026	914	5	8 391	28 782	23 223	45	18 150	1 990	33 559	2
Unassisted VA	339	252	117	303	339	252	117	303	314	350	339	
Effective rate of assistance												
Assisted VA	-36	-36	-36	-36	38	30	6	35	-25	-25	-36	
Unassisted VA	339	252	117	303	339	252	117	303	314	350	339	
ERA	-10	-14	-30	-12	11	12	5	11	-8	-7	-10	

a) This price wedge is hypothetical only, in fact such a wedge does not exist for hoki in these markets.
b) "Proc" refers to various processed forms, such as "headed and gutted".