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The mixing ratio in the Indonesian dairy industry

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Abstract

The Indonesian dairy industry has been viewed by the Indonesian government as an industry that has the potential to improve the welfare of low income and landless farmers through providing them with an additional source of farm income. As well, the government sees the industry as a vehicle for providing opportunities for employment in rural areas. From an economy wide viewpoint, its development is viewed as a way Indonesia might save foreign exchange since a large share of its dairy requirements have to be imported. A variety of measures have been used to assist the industry. This paper investigates one of the measures, the BUSEP scheme or mixing ratio regulation which requires domestic processors to use Indonesian produced milk before imported milk. © 1999 Elsevier Science B.V. All rights reserved.

Keywords: Indonesia; Dairy; BUSEP; Mixing ratio

1. Introduction

Since the late 1970s the Indonesian government has pursued explicit policies designed to develop the Indonesian dairy industry. The policies have included import licensing, tariffs and an import ratio requiring domestic processors to absorb all domestic production before they are permitted to import milk. The various policy measures have been successful in developing a domestic industry based on smallholder farms and organised into cooperative structures that is large relative to its size two decades ago. However, the intervention has resulted in widespread inefficiencies within the industry. These inefficiencies have been largely tolerated because the industry is seen as meeting a social objective of providing employment in rural areas and improving the economic situation of low income and often landless farmers. The purpose of this paper is to provide a set of estimates of these inefficiencies since information of this type is useful in forming judgements as to the social and economic desirability of such policies.

2. The industry

Dairy farming was introduced to Indonesia by the Dutch in the late part of the last century to meet the need for milk by the Dutch community. The early holdings were large, with 100–300 head of dairy cattle (Soewardi, 1986), and most of the farms were on the main island of Java. Gradually, small farms around the large estates began to keep cattle. Vegetables on these

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farms provided by-products for feed, while the animals provided manure for the vegetables.

An unfavourable climate and poor management and milk marketing knowledge combined to slow the industry's development from Java, where the industry is still concentrated, to other islands. The government imported large numbers of cattle in the 1960s and 1970s in an attempt to stimulate the industry, and it also allowed the establishment of joint ventures with foreign companies. However, even with these measures, production continued to be stalled by technical and marketing problems.

A major boost to domestic milk production occurred in the 1980s when the government introduced regulations requiring local processors to use domestic raw milk in processing. Since then, there has been a sharp rise in dairy cow numbers (from 176 000 in 1985 to 330 000 in 1994), in total production (from 192×10^6 to 389×10^6 l) and in farm numbers (64 000 to 103 000) (Direktorat Jenderal Peternakan personal communications 1997). Imports of almost 90 000 cattle, mainly from Australia and New Zealand, between 1979 and 1994 made a large contribution to the increase in dairy cow numbers (Riethmuller, 1997). The average farm has between three and four cows. Although milk yields are low by developed country standards being in the range of 3–5 l per day, they are higher than in the past. This is because of genetic improvements caused by artificial insemination programs, and other improvements to on-farm management.

The small scale of most dairy farms contrasts with the milk processing sector which is made up of large companies operating under the Foreign Investment Scheme. Before the government introduced the regulation requiring the use of locally produced milk (see the Section 3), firms were mainly involved in reconstituting raw materials purchased on international markets. In recent years, processing firms have introduced capacity to handle more fresh milk for the drinking milk market.

3. Policy arrangements

There are four major government regulations that have been designed specifically for the Indonesian dairy industry. These are an import ratio, import tariffs, import licensing and restrictions on investment in the dairy industry. These policies have been justified on the grounds that they protect domestic milk producers and have aided in the development of the local dairy industry. The policies are designed to achieve the government's objectives of providing employment in rural areas, supplementing farmer incomes and achieving a greater degree of self sufficiency in dairy products.

In 1983 the so-called 'Three Ministers Decree' aimed at developing a domestic dairy industry was issued. The objective of the decree was to oblige milk processors to purchase all domestically produced milk at 'reasonable prices'. As part of the decree, the milk import ratio (introduced in 1977) was formalised. This allows processors to import milk products in proportion to the amount of local milk purchased. Mixing regulations (or home content schemes similar to this one) have been used as well in the Thai dairy industry.

The import ratio is set every six months in a series of meetings between representatives of various sectors of the industry. As a first step in the process the manufacturers meet to estimate market demand and local production figures for processed dairy products. From these estimates they arrive at a figure for the quantity of milk that needs to be imported. Secondly, the manufacturers and representatives of GKSI (Gabungan Koperasi Susu Indonesia) meet to discuss GKSI's estimates of domestic production. The GKSI (1993) is a secondary cooperative made up of the chairpersons of the farmer level cooperatives. Finally, a co-ordinating team meets to formalise the negotiated import ratio. Obtaining details of the mechanics of the scheme is difficult. However, it seems that the production capacity of the processors, and future expected demand are important considerations in setting the import volume. Not all manufacturers are permitted to import milk – this right is restricted to the seven companies that are members of a manufacturers association. They do this through licences allocated to them by the government. These licences may be sold, giving processors that are not permitted to import (there were five companies in this position in 1994) the opportunity to import milk. According to industry sources, trading in the certificates can be quite active. The price is close to the difference between the imported price and the domestic price.

Although local milk is far more expensive than imported product, the manufacturers are willing to

Table 1
Mixing ratio values, 1982–1996

Year	Semester	Mixing ratio	
		Domestic milk	Imported milk
1982	1	1	8
1982	2	1	7
1983	1	1	6
1983	2	1	5
1984	1	1	3.5
1984	2	1	3.5
1985	1	1	2
1985	2	1	2
1986	1	1	3.5
1986	2	1	3.5
1987	1	1	2
1987	2	1	2
1988	1	1	1.7
1988	2	1	0.7
1989	1	1	0.7
1989	2	1	0.7
1990	1	1	0.53
1990	2	1	0.75
1991	1	1	1
1991	2	1	2
1992	1	1	2
1992	2	1	2
1993	1	1	1.25
1993	2	1	1.6
1994	1	1	1.6
1994	2		2
1995	1	1	2.125
1995	2	1	2.9
1996	1	1	2.4

Source: GKSI (personal communication 1997).

purchase as much local milk as they can since this enables them to reap large profits from processing the imported milk products. Due to increased domestic milk production the import ratio has declined from 1 : 20 at its introduction (this meant that processing companies could import the equivalent of 20 l of milk for every 1 l of domestic production absorbed) to 1 : 2.4 in 1996 (Table 1). Firms intending to expand capacity have apparently adopted different strategies. Details of these are difficult to obtain. In the case of Indomilk (this is one of the major processing companies), it has advanced loans to farmers through an affiliated bank. These loans are for cattle purchases. Increased numbers of domestic cattle for the farmers supplying Indomilk means that Indomilk can then import more milk under the ratio system.

The downside to the ratio system is that it has prevented the efficient operation of the Indonesian dairy industry. The reason for this is that domestic processors are protected from import competition while domestic milk producers are not forced to respond to international prices. As a result domestic prices are very high and some of the production practices do not appear to be efficient. In an attempt to estimate the welfare cost of these policies, a partial equilibrium approach based on the methodology of Tsakok (1990) and Houck (1986) was followed. The analysis reported here is subject to two important qualifications. First, it is a partial equilibrium analysis, and so ignores the effect of the policy on other sectors. Second, only one policy is being investigated. No account is taken of other government measures used in the industry.

4. Partial equilibrium effect of mixing regulation

Fig. 1 illustrates the effect of the mixing regulation on the dairy industry on milk prices, milk production and milk imports. The derivation of this figure follows Houck (1986).

The use of the mixing regulation is captured by Eq. (1).

$$\text{Imported quantity/Domestic supply} = r, \quad \text{where } r \text{ is the mixing ratio} \tag{1}$$

This has the effect of changing the domestic availability of milk from S (the domestic supply curve) to S_+, where S_+ is defined by Eq. (2).

$$S_+ = (1 + r)S \tag{2}$$

The proportion of imported milk is $r/(1 + r)$, the proportion of domestically produced milk is $1/(1 + r)$.

The marginal cost of milk (MC) is assumed to be a weighted average of the import price (P_w) and the domestic (producer) price (P_s). The weights are the proportions of domestically produced and imported milk. The validity of the assumption that the marginal cost is set equal to the weighted average of the two prices can't be confirmed. This may be the case because the government could allow imports into the country if the processors were seen to be setting prices at levels in excess of their marginal costs.

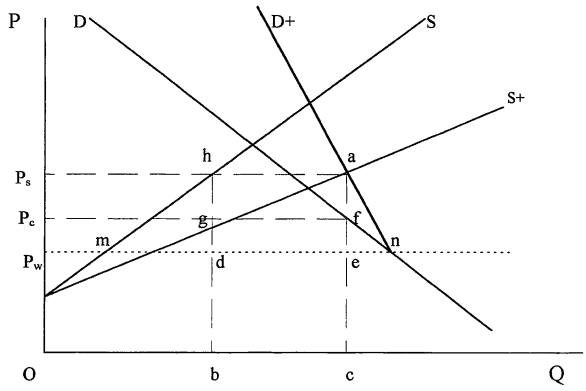

Fig. 1. Policy arrangements in the Indonesian dairy industry.

$$MC = \frac{1}{(1+r)}P_s + \frac{r}{(1+r)}P_w \quad (3)$$

If it is further assumed that the price to consumers (P_c) is equal to this marginal cost then

$$P_c = \frac{1}{(1+r)}P_s + \frac{r}{(1+r)}P_w \quad (4)$$

It follows that

$$P_s = P_c + r(P_c - P_w) \quad (5)$$

Houck (1986) shows it is possible to construct the curve D_+, such that it is the locus of producer prices consistent with each P_c along D, the mixing ratio (r) and, the import price (P_w). D_+ and S_+ intersect to give domestic production Ob, the producer price P_s, and imports bc. The deadweight loss (consumers) is triangle enf while the production efficiency loss is the area hdm.

Estimates of prices elasticities are needed to measure these effects. Estimates of the supply elasticity for domestic milk production could not be found from a search of the literature. As explained earlier, the dairy industry in Indonesia is based upon very small farms, and the operators of these farms exit and enter the industry depending on opportunities elsewhere in their area. The record keeping of most dairy farmers is poor at best and usually non existent. This makes estimation of supply elasticities using farm level data an almost impossible task. In any case, the small size of the industry would hardly warrant the resources likely to be needed for such an undertaking. The range of supply elasticities used in this analysis was 0–1.0, with 0.5 considered the most likely. As for demand elasticities, Oka and Rachman (1991) used cross sectional data to arrive at estimates for the price elasticity of demand for milk ranging from −1.61 (for the poorest urban households) to −0.10 (for all urban households). Therefore, the range selected for the price elasticity of demand was −1.61 to −0.10, with −0.7 considered the most likely. The @Risk package (Palisade, 1996) was used to obtain estimates of the magnitude of the efficiency loss and the consumer deadweight loss. Five hundred simulations were run using the information in Table 2. For both the supply and demand elasticities, a triangular probability distribution was used[1]. Table 2 also shows the results from the analysis using data for 1992.

The estimates of production efficiency loss and consumer deadweight loss presented in Table 2 are sensitive to the values for the price elasticities of demand and supply. However, the estimates are not particularly large relative to the numbers of farmers who stand to gain from the policy arrangements. Total losses associated with the mixing ratio are estimated to be between A$ 0.751 and A$ 17.49 million annually. There are perhaps as many as 80 000–100 000 dairy farmers, and most of these have at least one or two dependents. The main consumers of dairy products are high income people living in urban areas. These characteristics of the industry may have been a factor that could have influenced the authorities to devise the program.

The estimates presented here involve a number of assumptions. Setting of consumers price equal to marginal cost, implying that firms behave competitively, is a key one. Support for this view comes from there being many processing companies in Indonesia. During interviews with several of these processors, they expressed the view that the industry is competitive. Also, as noted earlier, the government can change the regulations with regard to imports. On the other hand, since the industry has a large number of small

[1]Palisade (1996) recommends use of this function to obtain approximate estimates when actual data are unavailable. The mean of the function is $(a+b+c)/3$ and the variance is $(a^2+b^2+c^2-ab-ac-bc)/18$ where a is the minimum value, b is the most likely and c is the maximum value. Palisade (1996) 248 pp.) contains additional information on the characteristics of this distribution.

Table 2
Production efficiency loss and consumer deadweight loss from mixing regulation, Indonesian dairy industry

Variable	Value	Description
ε_S	(0, 0.5, 1.0)	Elasticity of supply for milk
ε_d	(−1.61, −0.7, −1.0)	Elasticity of demand for milk
P_w	A$ 230/t	World price of milk[a]
P_s	A$ 345/t	Producer price for milk[b]
P_c	A$ 287.50/t	Consumer price for milk[c]
S	329000 t	Milk production[b]
S_+	720000 t	Milk consumption[d]
Efficiency loss (production)	Minimum A$ 0.245 million Mean A$ 4.730 million Maximum A$ 9.381 million	$0.5 \times \varepsilon_S \times (P_s - P_w/P_w)^2 \times S \times P_w$[e]
Consumer deadweight loss	Minimum A$ 0.606 million Mean A$ 4.157 million Maximum A$ 8.117 million	$0.5 \times \varepsilon_d \times (P_c - P_w/P_w)^2 \times S_+ \times P_w$[e]

Sources: [a]Australian Dairy Corporation (1993).
[b]GKSI (1993).
[c]Erwidodo and Fadhil (1993).
[d]BPS (1993).
[e]Tsakok (1990).

fringe producers and less than 10 major producers, an oligopoly model may be a better representation. There are other effects associated with the dairy industry – some good some bad – not included in the analysis. The industry provides employment to others apart from dairy farmers and their families. For example, the industry is based to a large degree on the 'cut and carry' system. This means that the grass is cut by hand and delivered to the animals housed in stalls. This activity sometimes provides employment as well as recycling material that may have no other use. On the other hand, the location of the industry in highland areas on the densely populated island of Java has the potential to create environmental problems associated with waste disposal.

5. Concluding comments

As part of Indonesia's commitment to the Uruguay round of GATT talks, non-tariff barriers on agricultural products will have to be removed and replaced with their tariff equivalent. In the case of the dairy industry this means a phasing out of the import ratio policy by 2003. This will have an effect on all levels of the industry. With a relaxation of import controls and the removal of the obligation for processors to purchase domestically produced milk, the pressure is obviously high for the Indonesian dairy industry to dramatically improve its productivity level. The change in policy will also affect processors as they are forced to compete with low priced imported milk products. Even if the Indonesian government retains it's current high tariff levels the industry will still be faced with a more competitive environment than is currently the case. To deal with this situation the Indonesian government is exploring many options for the domestic industry. These include encouragement of large scale co-operative dairy farms of more than 300 head, increased efficiency at the farm and co-operative levels and the development of a strong domestic market at the village level for fresh milk. An argument based upon economic efficiency would be that the industry is inefficient and should not be allowed to survive. But the question then arises as to what will happen to the farmers and their families who have come to depend upon dairy farming as their livelihood?

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