

**IMPACT OF AGRICULTURAL POLICY ON SOYBEAN  
PRODUCTION IN WEST NUSA TENGGARA PROVINCE**

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## SUMMARY

Soybean, as a main secondary crop, has attracted much attention from the government of West Nusa Tenggara. Soybean products have played a very important role as a source of food for people in this province. The main users for this commodity are soybean sauce firms and factories for *tahu* and *tempe* (very popular traditional foods). The Board of Central Statistics reported that, in the year 2000, the potential land appropriate for soybean in West Nusa Tenggara was about 248,061 hectares, consisting of wetland and upland. Only half (123,124 hectares) was utilized for planting soybean.

Despite a substantial amount of suitable land, soybean production is well below domestic demand. For the country as a whole, consumption is approximately 2.5 million tons while production is only 1 million tons. In the past, there have been substantial tariffs on soybeans, at one point reaching 25 percent. These tariffs have been phased out in recent years and were eliminated in 2003. Representatives of soybean producers have argued that, in the interest of national food security, tariffs should be restored. This study examines the private incentives for farmers to grow soybeans and the extent to which the West Nusa Tenggara Province has a comparative advantage in soybean production.

The PAM methodology used to analyze soybean profitability shows positive profits at both private and social prices. This means that farmers have an incentive to grow soybeans under the current (no tariff) policy regime. Positive social profits indicate that soybeans also have a comparative advantage in West Nusa farming systems. Under these conditions there is no reason to distort prices in an effort to increase land devoted to soybeans. Government intervention should focus on improved extension services and better research programs that would lead to more productive soybean varieties.

## 1. INTRODUCTION

### 1.1. Background

As a main secondary crop, soybean has attracted much attention from the government of West Nusa Tenggara. Soybean products have played a very important role as a source of food for people in this province. The main users for this commodity are soybean sauce firms and factories for *tahu* and *tempe* (very popular traditional foods). The Board of Central Statistics reported that in the year 2000 the potential land appropriate for soybean in West Nusa Tenggara was about 248,061 hectares, consisting of wetland and upland. But only half (123,124 hectares) was utilized for planting soybean.

The government has tried to promote soybean production by introducing a variety of programs including INSUS (special intensification program), OPSUS (special operational program), and GEMA PALAGUNG (self attaining movement for paddy, soybean, and maize). These interventions did little to increase area harvested and production. Instead, between 1996 and 2000, area harvested dropped 49 percent (648,814 hectare) and production also went down 45 percent (61,385 ton) as farmers switched to other secondary crops. The central government removed the import tariff and opened the domestic market for foreign production. But Brazil and Argentina, which account for 25 % of world exports of whole soybeans and USA (with 60 % of world exports) still rely on government support such as research, market information, market access, quality control, producer price support, subsidies, and tax breaks.

Because of insufficient production, West Nusa Tenggara Province, like Indonesia in general, could not satisfy its domestic demand from its domestic production. The province and country were net importers of soybean. Domestic production only contributes 1 million tons a year while consumption is about 2.5 million tons. Therefore, the country has to import 1.5 million tons to fill the gap.

The soybean market structure is relatively complex. It involves village collectors, village cooperatives, and area wholesale traders at the district level, provincial wholesale traders and inter-island traders at the inter-regional level, and private importers at the national trade level.

### 1.2. Research Objectives

This research evaluated the impacts of government policy on the profitability of wetland and dryland soybean in West Nusa Tenggara Province. It also examined the competitiveness and efficiency of those systems.

## 2. RESEARCH METHODS

### 2.1. Methodology

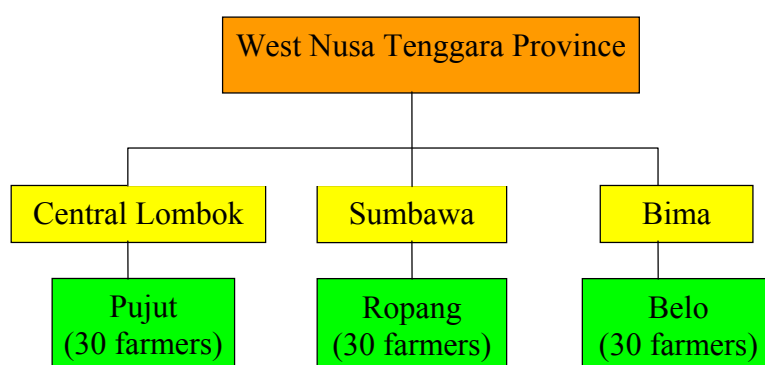
The research was conducted in the three districts of NTB in which most soybean was harvested. The three selected districts were Central Lombok, Sumbawa, and Bima. Together they produced 84% of provincial soybean output in 2000 (Table 1).

**Table 1. Area Harvested and Production of Soybean in West Nusa Tenggara, 2000.**

No	Districts	Area Harvested (hectares)	Production (Tons)
1	West Lombok	6,294	7,986
2	Central Lombok	24,201	27,187
3	East Lombok	772	771
4	Sumbawa	10,830	12,481
5	Dompu	2,758	2,918
6	Bima	20,728	20,680
7	City of Mataram	1,336	1,742
	Total	66,919	73,765

Source: Board of Central Statistic, West Nusa Tenggara (2000)

Interviews were carried out in one sub-district within each selected district. The selected sub-districts were Pujut for Central Lombok, Ropang for Sumbawa, and Belo for Bima. From each sub-district, two villages were selected. From each village, fifteen interviewees were selected by utilizing stratified random sampling based on land size (less than 0.5 ha, from 0.5 to 1.0 ha, and more than 1 ha), technology applied (INSUS and NON INSUS), and area cultivation of soybean (wetland and dryland area). The total sample consisted of 90 soybean farmers, including 45 wetland farmers and 45 dryland farmers (Figure 1).



**Figure 1. Sample Size in each Regency and District in West Nusa Tenggara**

Note: Samples from each site consisted of 15 wetland and 15 dryland farmers.

## 2.2. Data Collection

Data were collected by combining several techniques: interviews with farmers and field extension agents; focus group discussions involving policymakers at the district, district, and provincial levels, end users of soybean such as *tahu and tempe* industries, leaders of farmer groups, and traders at village, district, and provincial levels; and workshops. The interviews aimed at collecting primary information at the farm level, whereas the group discussions were intended to identify problems faced by soybean farmers and opportunities to achieve better level of production. The workshops involved all stakeholders – farmers, agricultural field extension agents, policymakers from the agricultural and trade and industry ministries and the development planning board, members of the houses of representative at district and provincial levels, and researchers from university and other research centers. The workshop evaluated the soybean policy interventions that have been or might be introduced and their likely impact on soybean production, farmer income, and area planted and harvested.

## 2.3. Empirical Information

The required information consisted of: (i) private prices (observed prices) for all inputs and output; (ii) social prices for tradable inputs and outputs; (iii) export and import prices for soybean (f.o.b., c.i.f.); (vi) historical data on planting and harvesting, production, prices at the farm gate and wholesale prices; (vii) official exchange rate, and (viii) trade and macro policies regulating soybean.

## 2.4. The Method of Analysis

The Policy Analysis Matrix (PAM), utilized to analyze the data, is formulated in the following table:

	Revenue	Tradable Input Costs	Domestic Factor Costs	Profit
Private Prices	A	B	C	D
Social Prices	E	F	G	H
Divergences Effect	I	J	K	L

From the above table, seven coefficient ratios were computed as follows:

No.	Coefficient	Formula
1.	Nominal Protection Coefficient Output (NPCO)	$A/E$
2.	Nominal Protection Coefficient Input (NPCI)	$B/F$
3.	Private Cost Ratio (PCR)	$C/(A-B)$
4.	Domestic Resource Cost Ratio (DRC)	$G/(E-F)$
5.	Effective Protection Coefficient (EPC)	$(A-B)/(E-F)$
6.	Profitability Coefficient (PC)	$D/H$
7.	Subsidy Ratio to Producers (SRP)	$L/E$

## **2.5. Assumptions**

The key macroeconomic assumptions are:

1. Nominal Interest Rate is 30 % per annum
2. Inflation Rate in 2002 is 10 % per annum
3. Real Nominal Interest Rate is 20 % per annum or 10 % per season
4. Real Social Interest Rate is 23 % per annum
5. Market Exchange Rate (Rp./US\$) for wetland soybean in July-October 2002 is Rp.8,575/US\$ and for dryland soybean in October 2001-March 2002 is Rp. 9,225/US\$.

## **3. RESEARCH RESULTS AND ANALYSIS**

### **3.1. Description of West Nusa Tenggara Province**

#### **3.1.1. Geographical Condition, Topography, and Climate**

West Nusa Tenggara Province consists of two islands, Lombok and Sumbawa. The province's land area is 20,153.15 km<sup>2</sup>, and it is situated between 115° 46' – 119° 5' East Longitude and 8° 10' – 9° 5' South Latitude. To the south lies the Indian Ocean, to the north is the Flores Sea, to the west is the Lombok Straits, and to the east is the Sape Straits (NTB Dalam Angka, 2001).

The province comprises six regencies and one municipality – the municipality of Mataram, West Lombok regency, Central Lombok regency, East Lombok regency, Sumbawa regency, Dompu regency, and Bima regency. The first four areas are in Lombok Island, and the last three regencies are in Sumbawa Island.

The province is comprised of both flat and mountainous areas and has two active volcanoes – Mount Rinjani (3,775 meters above sea level) located in Lombok Island and Mount Tambora (2,851 meters above sea level) located in Sumbawa Island. Lombok Island is mostly flat, while Sumbawa Island is rolling and mountainous. Among the 14 types of soil, five – Gray Regosol, Brown Regosol, Brown Forest Soil, Mediterranean Brown, and Complicated Dark Gray Grumusol – are dominant.

The climate of West Nusa Tenggara has two seasons. In the rainy season, the lowest temperature is between 21° C – 25° C, and in the dry season the highest temperature is between 30° C – 32° C. The lowest temperature occurs in July, while the highest one is in October. As a tropical region, West Nusa Tenggara has a relatively high humidity, ranging from 89% to 97%.

#### **3.1.2. Population and Work Force**

According to the National Social and Economy Survey in 1999, West Nusa Tenggara had a population of 3,875,311 people, including 1,864,212 men (48%) and 2,011,099 women (52 %). The quality of human resources in West Nusa Tenggara is low; more than two-thirds of the people have never had any formal education or have

finished only basic education (SD and SLTP). Only 31% of the adults have graduated from senior high schools (SLTA) and universities. Nearly three-fourths of the employed people work in agriculture, forestry, plantation, and fisheries.

### **3.1.3. Economy**

In the last five years, the economy of West Nusa Tenggara has grown at a rate of only 2.1 percent. Agriculture accounts for about a quarter of provincial income 40 percent of provincial exports (Basuki and Dipokusumo, 2002).

### **3.1.4. Secondary Crop Farming**

The main secondary crops planted in West Nusa Tenggara are corn, peanuts, and soybean. Wetland planting is done in the second or third planting seasons on rice-field land, and dryland cultivation occurs in the first period (the rainy season). In 2000, soybean, the most important secondary crop in NTB, had a harvest size of 66,919 hectares, production of 73,765 tons, and productivity (output per hectare) of 1,100 kg/hectare. In that same year, the harvest size of corn was 31,984 hectares, the production was 66,563 tons, and productivity was 2,100 kgs/hectare. The harvest size of peanuts in 2000 was 24,605 hectares, production was 27,729 tons, and productivity was 1,100 kg/hectare (West Nusa Tenggara in Figures, 2001).

#### 3.1.4.1 Harvest Area, Production, and Price of Soybean

The harvested area of soybean in NTB has fluctuated widely. Soybean area grew between 1991 and 1996 and then declined rapidly between 1997 and 2001 (Table 2). These changes in harvest area have created matching declines in soybean production because soybean yields changed little during the decade. Soybean output in 2001, 70,984 tons, was only slightly more than half of the peak level production reached in the mid-1990s.

**Table 2. Harvest Area, Production, and Prices of Soybeans and Mungbeans in West Nusa Tenggara Province, 1991-2001**

Year	Soybean			Mungbean	
	Harvest area (hectares)	Production (tons)	Price at Producer level (Rp./100kgs)	Harvest area (hectares)	Price at Producer Level (Rp/100kgs)
1991	112,443	119,215	83,692	-	
1992	121,423	121,176	79,273	-	
1993	129,929	132,752	90,061	-	
1994	131,967	130,284	93,350	-	
1995	134,557	136,773	81,960	-	
1996	131,733	135,156	91,128	28,063	150,282
1997*	116,420	120,538	100,385	26,146	166,965



1998*	118,480	124,273	233,182	33,820	285,933
1999*	113,935	117,471	211,662	26,241	311,134
2000	66,919	73,765	186,190	31,074	367,350
2001	68,169	70,984	188,409	34,095	471,529

Source: West Nusa Tenggara in Figures, 2001

Note: \*) period of monetary crisis

During the economic crisis (1997-1999), the domestic prices of tradable commodities increased sharply as the value of Indonesia's currency, the Rupiah, depreciated against the US dollar. For reasons that are not well understood, the price of mungbeans rose substantially more than the price of soybean (Table 2). Accordingly, some soybean farmers switched from soybean to mungbeans.

#### 3.1.4.2 Technology of Soybean Cultivation

- Description of the technology of soybean cultivation can be grouped into five stages – seeds provision, preparation and land treatment, planting, maintenance, and harvest and post-harvest.
- Seed Provision. Soybean farmers in West Nusa Tenggara plant the Willis Variety seed. The sources of seeds are nearby seed stores around the farm area. The channel of distribution is known as JABAL (Jalur Benih Antar Lapang). The production on dryland area in the rainy season is used as the source of seeds for the planting season on rice-field land. In turn, the soybean production on rice-field land provides seeds for the planting on dryland area in the rainy season.
- Preparation and Land Treatment. In this stage, farmers need to clean the planting area from weeds and the leftover of the preceding rice plants. In the dry-land area, bushes and weeds are burnt or sprayed by herbicide.
- Planting. In Lombok Island, people sow seeds by dibbling, whereas in Sumbawa Island farmers scatter the seeds. The distance between each dibble is 20 cm X 20 cm. Scattering the seeds is done after mixing the seeds with sand.
- Maintenance. This stage consists of fertilizing, irrigation, and pest control. Fertilizing on rice-field areas uses urea-based fertilizer at the beginning. After 20 days, the green manure (Gandasil D) is given and another manure (Gandasil B) after the next 15 days. Irrigation is done twice – first at the time of planting and second at the blooming time. Only 18 % of the wetland farmers use pesticides. On dry-land areas, one quarter of the farmers use urea and another fourth use green manure. There is no irrigation, and nearly two-thirds of the farmers use chemical pesticides.
- Harvest and Post-harvest. Harvesting is done by cutting the stems of the soybean plants. The drying of soybean planted on rice-field land is different

from that grown in the dryland area. Wetland soybeans are dried on a piece of tarpaulin or on an area outside the rice-field area. Dryland soybeans are dried where they are planted. In Lombok Island, men-laborers do the husking. But in Sumbawa Island, animals are also utilized.

### Distribution Channel of Soybean Marketing

The distribution channels of soybean marketing in both Lombok and Sumbawa are similar. All farmers sell their production through merchants at the village or sub-district levels. These merchants then sell the commodity to the wholesalers at the regency level. However, the wholesalers in Lombok rarely ship soybeans to another island. They even import soybeans from Java through Surabaya harbor. Hence, the production of soybean in Lombok fulfills only the needs of local producers and the local industry of *tahu and tempe*. In contrast, the wholesalers of Sumbawa regularly ship their soybeans to Java through Badas Harbor and Bima Harbor. Figure 2 shows the distribution channel of soybean marketing in West Nusa Tenggara Province.

### **3.2. The Policy Analysis Matrix**

Soybean cultivation in West Nusa Tenggara Province is a profitable agribusiness (Table 3). This farming activity gives profit of 465,948 Rupiah per ha if planted in wetland and 556,066 Rupiah per hectare on dryland. The productivity, output price, and production cost (tradable and domestic factor) are different in the two soybean systems. In the wetland system, the productivity of soybean is 1,014 kilograms per hectare, the output price is Rp. 1,910 per kilogram, and production cost is 1,507,087 Rupiah per hectare. In contrast, in the dryland system, productivity is only 952 kilograms, the output price is Rp. 2,042 per kilogram, and production cost is 1,429,715 Rupiah per hectare.

**Table 3. Policy Analysis Matrices for Wetland and Dryland Soybean Commodity Systems in West Nusa Tenggara Province, 2002**

	Revenue (Rp/ha)	Tradable Inputs (Rp/ha)	Domestic Factors (Rp/ha)	Profit (Rp/ha)
<b>Wetland</b>				
Private Price	1,936,994	205,695	1,265,351	465,984
Social Price	1,928,818	197,854	1,583,188	147,776
Divergences Effects	8,176	7,841	- 317,873	318,208
<b>Dryland</b>				
Private Price	1,943,984	315,327	1,072,591	556,066
Social Price	1,942,378	296,840	1,254,426	391,111
Divergences Effects	1,606	18,487	- 181,836	164,955

There was a positive output divergence for both wetland and dryland soybean systems because the measured private price of soybean was slightly above the comparable world price. This tiny divergence resulted from small errors in the data, not from a government policy or a market failure.

In the tradable input markets, private prices were somewhat higher than social (efficient) prices. Farmers obtain fertilizers through a credit scheme for farming activities (Kredit Usahatani or KUT). Repayment of this micro credit was carried out through the leaders of farmer groups, and the cost for this transaction was up to 5 % of the fertilizers' value.

Seven indicator ratios can be used to summarize the effects of divergences in the wetland and dryland soybean production systems. The results for both systems are presented in Table 4.

Table 4. Seven Indicators of the Divergences in Soybean Commodity Systems in West Nusa Tenggara, 2002

No	Coefficient	Wet Land	Dry Land
1.	Nominal Protection Coefficient Output (NPCO)	1.00	1.00
2.	Nominal Protection Coefficient Input (NPCI)	1.04	1.06
3.	Private Cost Ratio (PCR)	0.73	0.65
4.	Domestic Resource Cost Ratio (DRC)	0.91	0.76
5.	Effective Protection Coefficient (EPC)	1.00	0.99
6.	Profitability Coefficient (PC)	3.15	1.42
7.	Subsidy Ratio to Producers (SRP)	0.16	0.08

### 3.2.1. Output Transfers

The government of Indonesia did not protect soybeans. Consequently, this commodity moved freely from foreign into domestic markets with zero tariff and unrestricted import quota. As a result, the Nominal Protection Coefficients for Output (NPCO) are one (Table 5).

Table 5. Output Transfers in Soybean Commodity Systems in West Nusa Tenggara, 2002

	Revenue (Rp/ha)	
	Wet Land	Dry Land
Private Price	1,936,994	1,943,984
Social Price	1,928,818	1,942,378
Effect of Divergences	8,175	1,607
NPCO	1.00	1.00

### 3.2.2. Tradable Input Transfers

Soybean production involves three tradable inputs – seeds, fertilizers, and pesticides. The divergence effect for seeds was zero, while fertilizer and pesticide had positive effects because both of those inputs were taxed (Table 6). The Nominal Protection Coefficients for Tradable Inputs (NPCI), shown in Table 4, were 1.04 for the wetland system and 1.06 for the dryland system.

**Table 6. Tradable Input Transfers in Soybean Commodity Systems in West Nusa Tenggara, 2002**

	Tradable Input (Rp/ha)			Total (Rp/ha)	
	Seed	Fertilizer			Pesticide
		<i>Urea</i>	<i>Gandasil</i>		
<b>Wet Land</b>					
Private Price	177,204	9,534	15,067	3,890	205,695
Social Price	177,204	5,484	12,054	3,112	197,854
Effect Divergences	0	4,050	3,013	778	7,841
<b>Dry Land</b>					
Private Price	226,927	8,351	14,595	65,455	315,327
Social Price	226,927	5,874	11,676	52,364	296,840
Effect Divergences	0	2,477	2,911	13,091	18,487

Because there was no policy affecting output prices and only small taxes on tradable inputs, the Effective Protection Coefficient (EPC) was about one (1.00 for wetland soybean and 0.99 for dryland soybean). In the absence of commodity price policy, the observed value added was equal to the value added that would be produced at efficient prices. The data used to calculate the two EPCs are presented in Table 7.

**Table 7. Value Added in Soybean Commodity Systems in West Nusa Tenggara Province, 2002**

	Revenue (Rp/ha)	Tradable Input Cost (Rp/ha)	Value added (Rp/ha)
<b>Wet Land</b>			
Private Price	1,936,994	205,695	1,731,299
Social Price	1,928,818	197,854	1,730,964
<b>Dry Land</b>			
Private Price	1,943,984	315,327	1,628,657
Social Price	1,942,378	296,840	1,645,538

### 3.2.3. Factor Transfers

Domestic factors include labor, capital, and land. Because no divergences were observed in the markets for labor, the private and social costs of labor are assumed to be identical. The real social cost of capital (11.5% per season) is assumed to be higher than the real private interest rate (10% per season). The resulting divergence effect for

capital is Rp. –10,888 per hectare for wetland soybean and Rp. –12,627 for dryland soybean (Table 8).

**Table 8. Domestic Factor Transfers in Soybean Commodity Systems in West Nusa Tenggara Province, 2002**

	Domestic Factor Cost (Rp/ha)			Total Cost (Rp/ha)
	Labor	Capital	Land	
<b>Wet Land</b>				
Private Price	512,982	71,760	680,609	1,265,351
Social Price	512,982	82,648	987,558	1,583,188
Effect Divergences	0	-10,888	-306,949	-317,837
<b>Dry Land</b>				
Private Price	518,122	83,220	417,249	1,072,591
Social Price	518,122	95,847	640,458	1,254,426
Effect Divergences	0	-12,627	-169,209	-181,836

The social opportunity costs of land planted to soybean are substantially higher than the private land rental rates. The social prices for land are estimated by calculating the social profits of the land planted to the next best alternative crop, mungbean. The social profit of mungbean planted on wetland is 987,558 Rupiah/ha and on dryland is 640,458 Rupiah/ha (Table 8). But the land rental market works imperfectly, reflecting a lack of information.

#### **3.2.4. Net transfer**

The net transfer is indicated by the value of the divergence effects on profit. It also reflects the sum of divergences in output, tradable inputs, and domestic factors. The measured output transfer is trivial. There is a small tax on tradable inputs because farmers pay extra transaction costs in obtaining inputs. Soybean farmers receive a small subsidy because they receive credit at less than the social opportunity cost of capital. But the main transfer is through the imperfect land market. Information is not perfectly available so that rental rate for land is relatively low compared to its efficient level. The net impact of these transfers is positive.

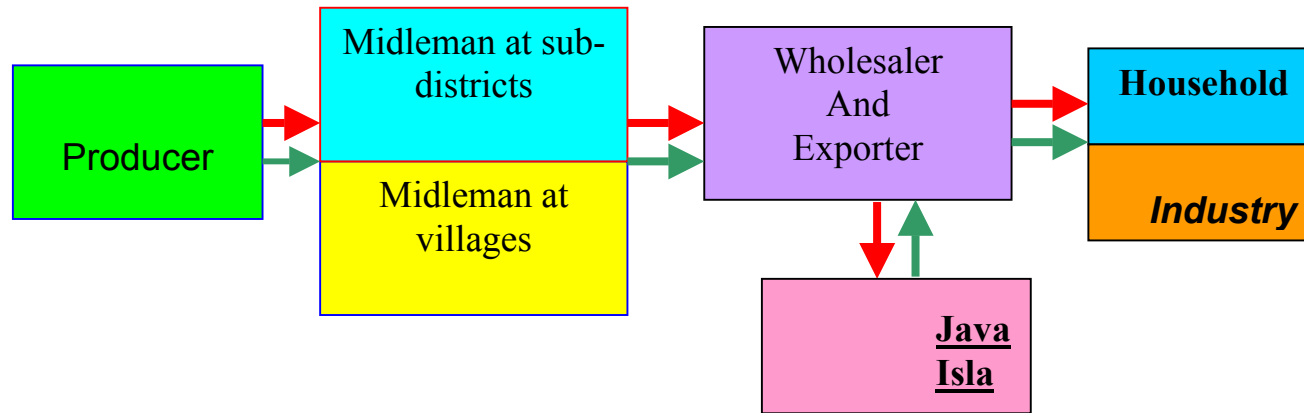
Both systems of soybean farming in West Nusa Tenggara Province also have comparative advantage because their social profits are positive and their domestic resource cost ratios (DRCs) are less than one. The DRC for the wetland system is 0.91, whereas that for the dryland system is 0.76. The dryland soybean system thus is relatively more efficient than the wetland system because its DRC is smaller.

## **4. Conclusions and Policy implications**

The Government of Indonesia has removed the import tariff on soybeans to benefit consumers and food processing industries. But the government has not promoted soybean production with effective policies, such as research and extension services, structural programs to adjust farm size, crop insurance, marketing and promotion programs, and maintenance of infrastructure. Domestic consumers do need protection

in terms of lower food prices. But Indonesia also has to promote agricultural production and to avoid becoming too dependent on foreign markets. Central and local governments need to have the political will to allocate budget to finance supporting activities to promote Indonesia's efficient production of soybeans.

1. Soybean production in West Nusa Tenggara Province is a very profitable agribusiness. The wetland production system earns private profits of Rp. 465,984 per hectare, whereas the dryland system generates private profit of Rp. 556,066 per hectare. Those private profits are above the social profits earned in the system, largely because of imperfections in the land market..
2. The costs of tradable inputs paid by farmers are about 5 percent higher than they should be as reflected by the Nominal Protection Coefficients for Inputs (NPCI). This distortion arises from excessive charges on chemical fertilizer inputs.
3. In the absence of commodity price policy, the observed value added is equal to the value added that would be produced at efficient prices. Hence, the Effective Protection Coefficients for both systems are one. Soybean production in NTB receives no net subsidy and pays no net tax on tradable outputs and inputs.
4. Both the wetland and dryland soybean systems in NTB are efficient (socially profitable) and do not require protection or subsidy to continue production at high levels of private profitability. These efficient systems could be promoted by government investments in rural infrastructure.



Note : Marketing Channel of Soybean at Lombok Island  
 Marketing Channel of Soybean at Sumbawa Island



Figure 2. Soybean Marketing Channels in West Nusa Tenggara

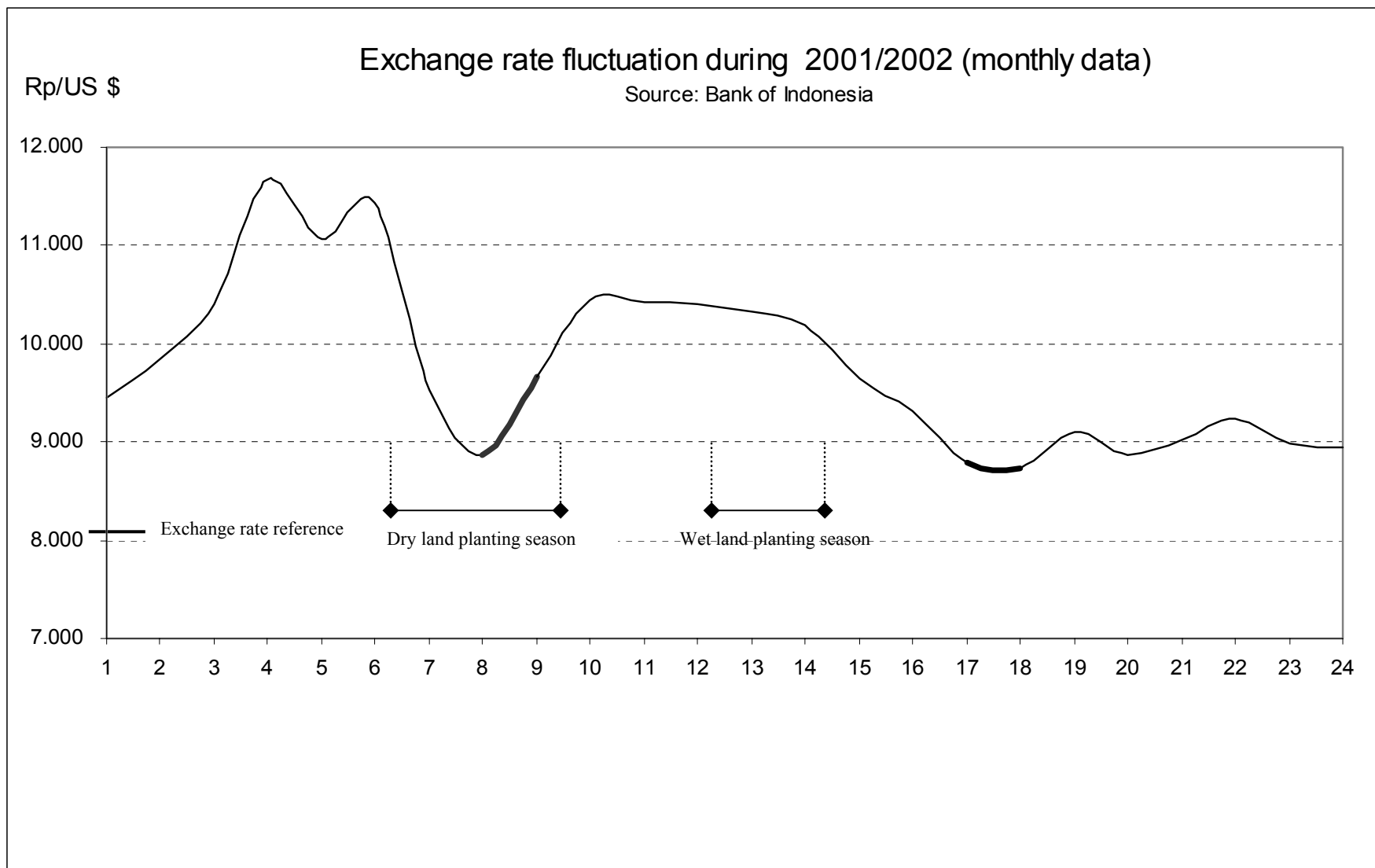




Figure 3. Exchange rate fluctuation during 2001/2002 (monthly data)