

**The Impact of Government Policy on  
Clove Production in Minahasa Regency**

**by**

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## Summary

The PAM analysis of cloves is the first of its kind in Indonesia. Its objectives are two-fold: (1) determine the breakeven point from which the impact of the government's planned clove tax can be evaluated, and (2) determine the efficiency of the clove production system under a variety of farming systems and ecological zones.

Due to an unusually high clove price in 2001 (Rp. 70,000 per kilogram), the government's proposed Rp. 2,000 per kilo price was only 2.8% of the farmer's profits. If the government used these revenues to carry out research on clove production, especially fertilizer application, and created an effective extension service, the tax could lead to greater profits in the future. Farmers, of course, fear that the tax revenues will simply disappear into operational expenses. They also fear that the price of cloves will revert to long-term trends that are half the price registered in 2001.

Divergences between private and social prices in clove production are minimal. International clove prices taken from the c.i.f. price at Bitung port, North Sulawesi Province. Inputs such as fertilizer receive no subsidies in Indonesia. The conclusion for all varieties in all ecological zones is that clove production is an efficient use of agricultural resources in Minahasa Regency.

## **Introduction**

### **Background**

Cloves are an estate crop in Minahasa Regency, North Sulawesi Province that generate a significant economic value both for the clove farmer and the clove industry. The flower of the clove is a raw material in producing cigarettes and a spice for food, while clove oil is used as a raw material in the pharmaceutical industry, food flavoring, and perfume (Wokas, 1979).

The production of cloves in Minahasa Regency decreased after the peak harvest seasons in 1995. In 1995, the clove production was 18,940 tons, while in 1999 it was only 7,191 tons. The decreasing clove production was caused by the poor maintenance of clove plantations before the national clove monopoly (BBPC) was ended (Minahasa Regency Estate Affairs, 2001).

The monopoly price of cloves in 1995 was only Rp. 2,500 per kilogram while the total cost of harvesting was Rp 4,000 per kilogram. Therefore, many clove farmers stopped cultivating their plantations. The price of cloves rose from Rp 7,500 per kilogram in 1998 to Rp 30,000 in 1999 after the role of BPPC was stopped (North Sulawesi Industry and Trade Affairs, 2001).

Due to the increase in price, the provincial government is proposing to collect a profit tax from the clove farmers in Minahasa Regency, North Sulawesi Province. The government wants to tax cloves when the clove prices are unusually high. The clove farmers are against the plan. They do not know how long the high price of cloves will be in effect, and they think that they know better how to spend the earnings from cloves than does the provincial government.

### **Objectives**

The objectives of the study are to measure the effects of current and proposed government policy on the existing technology for producing cloves under different ecological zones, clove farming systems, and clove varieties. The research also investigates the internal rate of return (IRR) on technology that is currently available. The government argues that, by using the profit tax, it can develop improved technology for plantation use. The results of the present research will permit informed judgments about whether the clove farmers are correct in believing that the proposed tax would not be desirable.

## **Research Methods**

### **The Policy Analysis Matrix Approach**

The method of analysis is the Policy Analysis Matrix (PAM). The PAM measures the profitability of existing levels of private (actual) market and social (efficiency) prices (Monke and Pearson, 1989)

The PAM analysis consists of two accounting identities. One measures profitability as the difference between revenues and costs. The other measures the divergences between private and social prices. Based on the budget calculations made for the PAM, the break-even point can be

determined. These budget data can also be expanded to evaluate the effect of using new technology based on the observations drawn from government research programs and farmer experience.

The PAM method has been widely used in academic studies locally and abroad and in policy work sponsored by international agencies and agricultural research centers. However, in North Sulawesi Province, this study based on the PAM is the first one that has been conducted on cloves.

The principal strength of the PAM is that it can be used to measure the economic efficiency of the existing clove plantation system and the divergences caused by distorting policies and market failures on clove production. The main limitation of the method is that the research results will be limited to a base year and must be changed if the main parameters (world prices of inputs and outputs, wage rates, interest rates, farming and processing technology in clove production) change. However, the analysis will easily accommodate changes made in the empirical coefficients.

Because the planting and harvesting of cloves takes place over several years, it is also useful to compute the internal rate of return (IRR) for the investment. The IRR can be used to determine the maximum interest rate that can be paid for capital used in making clove investments. Use of capital at interest rates higher than the IRR will lead to project losses (Gittinger, 1986).

### **Data Collection**

The PAM analysis needs budget data to measure revenues, costs, and profits. The data are the prices and quantities of representative clove farming under different ecological zones, clove farming systems, and clove varieties in Minahasa Regency. There are two ecological zones of clove farming – less than 400 m above sea level, and more than 400 m above sea level. Clove plantations may be a single commodity system or a multiple commodity system with coconuts or maize (corn). There are two clove varieties, Zanzibar and Sikotok (Hadiwijaya, 1983; Wokas, 1979). The input costs are fertilizer, the labor for farming and harvesting, and the cost of buying tools. The outputs are dry clove and dry flower stem (Gumansalangi, 2001).

The budget data were compiled from agricultural census data, academic research reports, government statistics, farm group information, and field surveys. The principal assumptions were that the social value of capital was 15 percent per year (plus the rate of inflation) for investment capital, and the private interest rate was 20 percent per year (plus the rate of inflation) for working capital.

The IRR calculation needed estimates of the kinds of investment required for alternative technologies in clove farming. The data for IRR can be taken from the budget data using the whole lifetime of the clove plantation. The data were used for calculating a rate of return on alternative investments that was compared with the cost of capital.

### **Description of the Research Location**

## Clove Farming Systems in Minahasa Regency

Minahasa Regency is the production center of cloves in North Sulawesi. Its clove area was 35,769 ha in 1999 or 82 percent of total North Sulawesi clove area (North Sulawesi Province Estate Management Affairs, 2001). The clove production in Minahasa Regency tends to fluctuate from year to year due to seasonal variation in flowering. After a high flowering year, the clove flowering for the next year is very low; it then increases from year to year until the next fourth high flowering year (Lontoh, 2002). For example, in 1998, the clove production in Minahasa Regency was 15,132 tons in the high flowering year. Then the next year, 1999, production was only 7,191 tons. In 2000, it was 9,386 tons (Minahasa Regency Estate Management Affairs, 2001).

From 30 sub-districts in Minahasa Regency, the six sub-districts chosen as the clove production center in 2000 were Kombi, Pineleng, Tareran, Tenga, Sonder, and Kakas. Clove production in these sub-districts was 3,000, 1,898, 987, 901, 433, and 200 tons, respectively. These sub-districts, representing different clove varieties, ecological zones, and farming systems, were taken as the clove sampling area.

The Zanzibar variety is planted in both the area less than 400 meters above sea level and the area more than 400 meters above sea level. In lower elevations (in Tareran, Sonder, Tenga, and Pineleng sub-districts), this variety is planted both as a single commodity and as a multiple cropping commodity together with coconuts. For areas more than 400 meters above sea level, the Zanzibar variety is planted only as a single commodity (in Tareran and Sonder sub-districts).

The Sikotok variety is planted in areas more than 400 meters above sea level, both as a single commodity and as a multiple cropping commodity together with corn. Major sub-districts for multiple cropping include Kombi and Kakas sub-districts.

## Government Policy in Minahasa Regency

In 1998, Presidential Decree No. 21 1998 dissolved the clove marketing and buffer stock board (BPPC) and its monopoly as a clove buyer and seller. As a result, the price of clove increased from Rp. 7500 per kilogram in 1998 to Rp. 30.000 in 1999. The price of cloves peaked at Rp70,000/kg in 2001 before falling to less than half that level in 2002 (Table 1).

**Table 1. The price of cloves from 1991 to August 2002 in Manado**

Year	Price (Rp/kg)
1991	5,750
1992	3,700
1993	2,650
1994	2,850
1995	2,550
1996	2,600
1997	4,100
1998	7,500
1999	30,000
2000	35,000
2001	70,000
2002, August	31,500

Source: North Sulawesi Province Trade and Industry Affairs, 2001

Due to the high clove prices, the provincial government proposed the introduction of a profit tax on cloves of Rp. 2000 per kilogram. This money would be used for developing new clove varieties. The farmers opposed the plan because they did not believe that the government would use the money for research that would benefit private operations.

Although the price increase caused clove farmers to replant their clove plantations, new plantations are tending toward multiple cropping. When clove prices are high, the farmers use the extra profit to buy more inputs. They are moving toward intercropping because workers can simultaneously cultivate and fertilize both the clove and the second crop. For the clove production areas less than 400 meters above sea level, they interplant coconut. Corn is interplanted in the clove areas that are more than 400 meters above sea level.

### **The Policy Analysis Matrix Analysis of Clove Production**

The Policy Analysis Matrix is based on farm level clove budgets using both private prices and social prices. Some simplifying assumptions used in calculating the budgets were:

1. The price data of both inputs and outputs are based on the year 2001. (These output prices are exceptionally high and well above average.)
2. The clove trees are 15 years old.
3. The area of clove farming is 1 hectare and contains 180 trees.
4. There is no active land rental market and no alternative crops that might substitute directly for cloves; therefore, profitability is defined as the return to land and management.

#### **The Zanzibar Monoculture PAM (< 400m above sea level)**

Clove farmers plant the popular Zanzibar variety for both monoculture and multiple cropping farming systems. The variety is grown in areas with elevations both less and more than 400 meters above sea level.

#### **Zanzibar Monoculture Budget at Private Prices**

The research results indicate that this kind of clove farming produces the best annual clove output, because the area is near the sea and the Zanzibar variety responds well to the use of fertilizers, especially Urea, SP-36 and KCl. The sub-districts used as the sampling area were Tareran and Sonder.

The budget data are shown in Appendix Table A.1.1. That table consists of three sub-tables – an input-output table, a private prices table, and a private budget table. The private budget table was obtained by the multiplication of the input-output and private prices tables.

#### **Input-output Table**

The input output table contains entries for tradable goods, nontradable goods and services, and output. The tradable goods are fertilizers – Urea, SP-36, and KCl. The nontradable goods and services are labor, capital, tools, buildings, and land. The outputs are dry clove and dry flower stem.

Since the increase of clove prices in 1999, the farmers have used more fertilizers in clove farming. For a 15-year old Zanzibar clove tree, the farmer uses 1 kg Urea, 0.5 kg SP-36, and 0.5 kg KCl. The production per hectare is 2,700 kg of dry clove and 56 kg dry flower stem.

Labor is used for fertilizing, weeding, harvesting, drying, and marketing. For fertilizing, weeding, and drying, the labor use is 15, 120, and 180 man-days, respectively. For weeding, the farmers use a machete to mow the grass and a hoe for circle weeding. The farmer pays both the harvesting and marketing labor in kilograms of harvested clove.

The tools used in clove harvesting are 30 ladders, 25 rolls of rope, 35 wheat flour sacks, 46 canvases, 46 gunny-sacks, and 8 winnowing baskets. The building cost is the cost for building the floor for clove drying.

#### **Private Prices Table**

The prices of Urea, SP-36, and KCL are Rp. 63,500, Rp. 97,500 and Rp.110,000 per sack, respectively. Each sack contains 50 kilograms of fertilizer. Wages for fertilizing, weeding, and drying are Rp. 25,000 per man-day. Tools such as ladders, ropes, wheat-flour sacks, and gunny-sacks last for less than one year. Canvases, winnowing baskets, hoes, shovels, machetes, and buildings last for more than one year. Capital costs based on the annual capital recovery calculation (Appendix Table A.1.2.2. and Appendix Table A.1.2.3).

The clove farmers need working capital for clove harvesting, and they borrow money from the village moneylender. The cost of working capital is the interest rate charged by the village moneylender – 12 percent per month.

The prices of dry clove and dry flower stem are Rp. 70,000 and Rp.1750 per kilogram, respectively.

#### **Private Prices Budget Table**

The total cost of clove production excluding land is Rp. 35,953,509 and the total revenue of both dry clove and dry flower stem is Rp. 189,098,000. Therefore, the profit, excluding land, is Rp. 153,144,491. This profit is exceptionally high due to the peak clove price of Rp. 70,000 per kilogram in 2001.

#### **The Break-Even-Point Calculation**

The break-even-point for this clove budget is calculated by dividing the total costs with the quantity of clove produced in one hectare. The calculation is  $\text{Rp}35,655,900 / 2700 = \text{Rp}13,209$ . For any price more than Rp.13,209, the clove farmer will profit from clove farming. This price is the starting point from which the government can consider a tax on cloves for this zone. Based on Provincial Regulation No. 2 /2002, the provincial government has established that the profit tax is Rp. 2000 per kilogram for dry clove. This tax amount was only 2.8 percent of the dry clove price in 2001. If the government uses the revenue effectively and gives it back to farmers in the form of research and extension education about fertilizers, the incomes of farmers could increase in the long-run.

#### **Zanzibar Monoculture Budget at Social Prices**

The calculations of the Social Import Parity Price for cloves and the Social Import Parity Prices for fertilizers (Urea, SP-36 and KCl) are presented in Appendix Table A.1.3. Appendix Table A.1.4 consists of two sub-tables – a social prices table and a social budget table.

### **Social Prices Table**

The calculation of the Social Import Parity Price for cloves is taken from the clove c.i.f. price at Bitung port, North Sulawesi Province. The Social Import Prices for fertilizers are taken from f.o.b. prices at foreign country ports. The social price of investment capital is 15 percent plus a 12.5 percent inflation rate – 27.5 percent per year. The social price of working capital is 20 percent plus the inflation rate of 12.5 percent – 32.5 percent annually.

### **Social Budget Table**

This table is calculated by multiplying the Appendix Table A.1.4.1. and Appendix Table A.1.4.2.

### **Zanzibar Monoculture PAM**

**Table 2. The PAM of the Monoculture Zanzibar Clove for the Area <400m above sea level (Rps 000)**

	Revenues	Costs			Profit
	Tradable Output	Tradable Inputs	Domestic Resources		
			Labor	Capital	
Private	189,098	602.10	28,665	6,686.41	153,144.49
Social	198,477	686.79	27,990	6,395.95	163,404.26
Divergence	-9,379	-84.69	675	290.46	-10,259.77

The divergence between private prices and social prices on revenues is only minus Rp.9,379,000 (Table 2). That divergence is small, because there is only a slight difference between the private price of clove and social price of clove, caused by errors in the data rather than a policy or market failure.

There is a slight difference between the tradable inputs (fertilizers) at private prices and social prices, again caused by errors in the data. The small divergence in capital results from the assumed differences in the private and social interest rates.

The net transfer, the divergence in profit between private prices and social prices, is only minus Rp.10,259,770 – a very small divergence. This result indicates the near absence of policies or market failures influencing clove production in 2001.

### **The Zanzibar Multiple Cropping PAM (< 400m above sea level)**

#### **Zanzibar Multiple Cropping Budgets**

For the area less than 400 meters above sea level, the farmers generally plant Zanzibar clove with coconut as a multiple cropping system. The sub-districts used as the sampling area are Pineleng and Tenga. The farmers do not use fertilizers in these districts. The calculation is based

on the assumption that in one hectare of cloves containing 180 clove trees, the farmers plant 50 coconut trees. The multiple cropping data are shown in Appendix Table A.2.1.

### **Input-output Table**

Planting the Zanzibar variety with coconut is done without using fertilizers. The production per hectare per year is 1980 kg of dry clove and 800 kg of copra. The calculation of copra yield per year is based on the assumption that there are 50 coconut trees per hectare and every tree yields 20 nuts every 3 months. One thousand nuts produce 200 kg of copra.

Labor is used for weeding, harvesting, drying, and marketing both for cloves and coconuts. For weeding, the advantage of multiple cropping is that the hired labor weeds both crops. Labor requirements are 100 man-days. For weeding, the farmers use a machete to mow the grass and a hoe for circle weeding. The farmer pays both the harvesting and marketing labor of clove in kilograms of harvested clove. For coconut, the labor is used in climbing to pick the nut and in processing/marketing.

The tools used in clove harvesting are 20 ladders, 20 rolls of rope, 20 wheat flour sacks, 30 canvases, 30 gunny-sacks, and 5 winnowing baskets. The farmer does not build the floor for clove drying.

### **Private Prices Table**

The wages for weeding and drying are Rp. 25,000 per man-day. For harvesting clove, the cost is Rp. 1,250 per liter of clove or Rp. 6,250 per kg of dry clove. For picking coconuts, the labor cost is Rp. 1,000 per tree. The cost for processing/marketing of coconut is Rp. 25 per nut. For clove harvesting, the tools that last for less than one year are ladders, ropes, wheat-flour sacks, and gunny-sacks. Canvas, winnowing baskets, hoes, shovels, machetes, and buildings are tools that last for more than one year. Their costs are based on an annual capital recovery cost calculation.

Working capital costs are computed on the basis of the interest rate charged by moneylenders. The moneylender charges 12 percent per month or 36 percent per 3 months. The prices of dry clove and copra are Rp. 70,000 and Rp.1700 per kilogram, respectively.

### **Private Budget Table**

The total cost of clove production excluding land is Rp. 24,883,501, and the total revenue of both dry clove and copra is Rp. 139,960,000. The profit excluding land is Rp. 115,076,499. This profit is exceptionally high due to the unusually high clove price of Rp. 70,000 per kilogram.

### **Social Prices Table**

The calculation of the Social Import Parity Price for clove is taken from the c.i.f. price at Bitung port, North Sulawesi Province. The social import prices for fertilizers are taken from f.o.b. prices at foreign country ports. The social price of working capital is equal to 20 percent plus and inflation rate of 12.5 percent or 32.5 percent.

### **Social Budget Table**

This table is calculated by multiplying the Appendix Table A.2.2.1. and the Appendix Table A.2.2.2.

### **Multiple Cropping Zanzibar PAM**

**Table 3. The PAM of the Multiple Cropping Zanzibar Clove for Area <400 m Above Sea Level (000Rp/Ha)**

	Revenues	Costs			Profit
	Tradable Output	Tradable Inputs	Domestic Resources		
			Labor	Capital	
Private	139,960	0	20,071	4,812.50	115,076.50
Social	149,016	0	18,671	4,496.37	125,848.63
Divergence	-9,056	0	1400	316.13	-10,772.13

The divergence between private prices and social prices on revenues is only minus Rp. 9,056. The divergence is tiny, because there is only slight difference between the private price of clove and its social price. The net transfer is only minus Rp.10,722, again demonstrating the lack of policy effects and market failures in clove production.

### **Comparing Monoculture and Multiple Cropping PAMs**

The private and social profit of monoculture Zanzibar variety for areas less than 400 meters above sea level (the first system) is substantially higher than that of multiple cropping Zanzibar variety for areas less than 400 meters above sea level (the second system). The first system uses fertilizers that increase the clove production to 2,700 kg per hectare (in Tareran District), while the second system does not use fertilizers and achieves yields of only 1,980 kg per hectare (in Tenga District). The high production of the first system and the exceptionally high price of clove, Rp 70,000 per kilogram, result in the unusually high profit of the first system.

### **The Sikotok Monoculture PAM (>400m above sea level)**

Although the Sikotok monoculture system of clove farming does not use fertilizers, it still produces good cloves. The difference between the Sikotok variety and the Zanzibar variety for this agroclimatic zone is that the Sikotok variety only produces cloves every two years while the Zanzibar variety, at less than 400 meters above sea level, produces cloves every year. Due to the difference in the life cycles, the Sikotok production data obtained from the farmers has been divided by two.

### **Sikotok Monoculture Budget at Private Prices**

#### **Input-output Table**

The Sikotok variety farmers do not use fertilizers. The production per hectare is 1,080 kg of dry clove and 150 kg dry flower stem. For weeding and drying, the labor requirements are 200 and 120 man-days, respectively. For weeding, the farmers use machetes to mow the grass and hoes for circle weeding. The farmer pays both the harvesting and marketing labor in kilogram of harvested clove. The tools used in clove harvesting are 20 ladders, 20 rolls of rope, 25 wheat flour sacks, 100 canvases, 40 gunny-sacks, and 5 winnowing baskets.

#### **Private Prices Table**

The wages for fertilizing, weeding, and drying are Rp. 25,000 per man-day. Ladders, ropes, wheat-flour sacks, and gunny-sacks are the tools that last for less than one year. Canvasses,

winnowing baskets, hoes, shovels, machetes, and buildings last for more than one year. Costs for these items are computed using the annual capital recovery factor. The cost of working capital is 12 percent per month or 36 percent per 3 months. The prices of dry clove and dry flower stem are Rp. 70,000 and Rp.1750 per kilogram, respectively.

### Private Budget Table

The total cost of clove production excluding land is Rp. 27,650,645, and the total revenue of both dry clove and dry flower stem is Rp. 75,862,500. Therefore, the profit excluding land is Rp. 48,211,855. This profit is exceptionally high due to the peak clove price of Rp. 70,000 per kilogram.

### The Break-even-point Calculation

The Break-even-point for this clove budget is  $\text{Rp. } 27,650,645/1080 = \text{Rp. } 25,602$ .

### Monoculture Sikotok PAM

**Table 4. The PAM of the Monoculture Sikotok Clove for the Area >400m above sea level**

The PAM of the Monoculture Sikotok Clove for Area >400 m above sea level (000Rp/Ha)					
	Revenues	Costs			Profit
	Tradable Output	Tradable Inputs	Domestic Resources		
			Labor	Capital	
Private	75,862.50	0	24,416	3,234.64	48,211.86
Social	80,802.42	0	23,416	2,779.10	54,607.32
Divergence	-4,939.92	0	1,000	455.54	-6,395.46

The net transfer, minus Rp.6,395,460, is relatively small, reflecting the slight difference between the private price of clove and social price of clove. As for the other systems, monoculture Sikotok clove production faced few policies or market failures.

### The Sikotok Multiple Cropping PAM (> 400m above sea level)

For Kombi and Kakas sub-districts, the farmers planting clove with corn used fertilizers for corn. They could not cultivate all of their fields; therefore, only about half of the area was planted with corn. The corn yield per hectare was 6 tons per year.

### Multiple Cropping Sikotok Budget at Private Prices

#### Input-output Table

Planting the Sikotok variety with corn uses 90 kg Urea, 45 kg SP-36, and 45 kg KCl. The production per hectare per year is 1,080 kg of dry clove, 150 kg dry flower stem, and 6,000 kg of corn per year. The farmer pays both the harvesting and marketing labor of clove in kilograms of harvested clove. The tools used in clove harvesting are 20 ladders, 20 rolls of rope, 25 wheat flour sacks, 100 canvases, 40 gunny-sacks, and 5 winnowing baskets.

#### Private Prices Table

The wages for weeding and drying are Rp. 25,000 per man-day. For harvesting cloves, the cost is Rp. 1,500 per liter of clove or Rp. 7,500 per kg of dry clove. The prices of dry clove, dry flower stem are Rp. 70,000, and Rp. 1,750 per kilogram, respectively.

#### Private Budget Table

The total cost of clove production excluding land is Rp. 29,776,695, and the total revenue of dry clove, dry flower stem, and corn is Rp. 80,802,420. The profit (excluding land), therefore, is Rp. 51,025,725. This clove profit is exceptionally high due to the high clove price.

#### Multiple Cropping Sikotok PAM

**Table 5. The PAM of the Multiple Cropping Sikotok Clove for the Area >400m above sea level**

The PAM of the Multiple Cropping Sikotok Clove for Area >400 m above sea level (000 Rp/Ha)					
	Revenues	Costs			Profit
	Tradable Output	Tradable Inputs	Domestic Resources		
			Labor	Capital	
Private	83,362.50	301.050	26,241	3,234.645	53,585.805
Social	88,302.42	343.395	23,956	2,779.103	61,223.922
Divergence	-4,939.92	-42.345	2,285	455.542	-7,638.117

The divergence between private prices and social prices on revenues is only minus Rp.4,939,920. At the private level, the contribution of corn is Rp. 7,500,000 or only 9 percent of the farmers' total revenue. The rest is contributed by dry clove and dry flower stem. Except for the implied tax on clove output and on costs of capital, the divergences affecting this system were minor. The net transfer was about 13 percent.

#### The Calculation of Internal Rate of Return of Clove Production

The Internal Rate Return (IRR) analysis of clove production in Minahasa Regency examines the Zanzibar variety planted on the area less than 400 meters above sea level. The Zanzibar variety responds well to fertilizer, and cloves grow better at elevations of less than 400 meters (Hadiwijaya, 1983). The assumptions used in this calculation are based on the experience of the clove farmers in Tareran District – one hectare of clove plantation contains 180 trees, and the average price of clove is Rp. 70.000 per kilogram in 2001;

Because the farmers never rent their land, the opportunity cost of land is estimated by using the returns to land from planting corn. The total cost of planting corn is 25 percent of the total revenue. The use of three kinds of fertilizer (Urea, SP-36, and KCl) doubles the production of cloves. The IRR analysis thus compares two technologies – one with fertilizer applications and the other without the use of chemical fertilizers.

The IRR results for clove production without using fertilizers in Minahasa Regency are summarized in Appendix Table B.1. The IRR value is 81 percent. This rate of return is much higher than the social opportunity cost of capital, which is assumed to be 15 percent (plus the rate of inflation). Without using fertilizer, clove production in 2001 was very profitable. The extremely high profit resulted from the unusually high price of cloves in that year.

The IRR results for clove production using fertilizers in Minahasa Regency are summarized in Appendix Table B.2. That IRR value is 102 percent. This rate of return is also much higher than the social opportunity cost of capital. Clove production with fertilizer is even more profitable than clove production without fertilizer. This result demonstrates the benefit of extension programs that would promote the use of fertilizer in clove production.

### **Conclusion and Policy Implications**

The North Sulawesi provincial regulation No 2 /2002 is not complete, because it does not give the break-even starting point from which the impact of the clove profit tax could be calculated. The clove monoculture systems – the Zanzibar variety for areas less than 400 meters above sea level, and the Sikotok variety for areas more than 400 meters above sea level – have break-even points of Rp.12,801/kg and Rp. 25,602/kg, respectively. Therefore, the provincial government could start to collect clove profit tax if the price of cloves is higher than Rp. 25,602 plus the indicated profit tax of Rp 2000, that is, Rp.27,602.

The measured divergence between private and social levels of revenues and profit is small and results from minor errors in the data, because there are no significant remaining policies or market failures influencing clove prices.

In the 2001 harvest season, profits from clove production were extremely high because of the exceptionally high clove price in that year, Rp.70,000 per kilogram. (The clove price fell to less than half of that level in 2002.) Because of the unusually high clove price in 2001, clove revenues dominated in the two multiple cropping farming systems studied. The share of corn in the clove-corn system was only nine percent and the share of copra in the clove-copra system was only one percent.

The use of chemical fertilizers improves the productivity and profitability of clove production. Based on the high 2001 clove price, the internal rate of return (IRR) for clove production without fertilizer was 81 percent, whereas the IRR for clove production with fertilizer was 102 percent. These rates of return are far higher than the social opportunity cost of capital (15 percent plus the rate of inflation). Fertilizer applications increased the IRR by more than a quarter. Even at much lower clove prices, it would be beneficial for the government to provide effective extension to encourage greater use of chemical fertilizers in clove production.

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## Appendix

Appendix Table A.1.1. Farm Budgets at Private Price of 15 years old Zanzibar Monoculture for Area less than 400 m above sea level in 2001 harvest

Table A.1.1.1. Input-Output Table

Quantities(Unit)		
Tradables	Fertilizers (Kg/ha)	
	Urea	180
Factors	SP-36	90
	KCI	90
	Labor (unit/ha)	
	Fertilizing(man-day)	15
	Weeding(man-day)	120
	Harvesting(kg)	2700
	Drying(man-day)	180

Table A.1.1.2. Private Prices Table

Price(Rp/unit)	
Fertilizers (Kg/ha)	
Urea	1270
SP-36	1950
KCI	2200
Labor (unit/ha)	
Fertilizing(Rp/man-day)	25000
Weeding(Rp/man-day)	25000
Harvesting(Rp/kg)	7500

Table A.1.1.3. Private Prices Budget

P-Budget(Rupiah)	
Fertilizers(Rp/ha)	
Urea	228600
SP-36	175500
KCI	198000
Labor (Rp/ha)	
Fertilizing	375000
Weeding	3000000

	Marketing( kg)	2700	Drying(Rp/man-day)	25000	Harvesting	20250000
	Tools		Marketing(Rp/kg)	200	Drying	4500000
	Ladder	30	Tools		Marketing	540000
	Rope	25	Ladder	125000	Tools	
	Wheat flour sack	35	Rope	60000	Ladder	3750000
	Canvas	46	Wheat flour sack	5700	Rope	1500000
	Gunny sack	46	Canvas(an.rec.cost./year)	13582	Wheat flour sack	199500
	Winnowing basket	8	Gunny sack	7500	Canvas	624772
	Hoe	1	Winnowing basket(a.r.c./year)	5432	Gunny sack	345000
	Shovel	1	Hoe(aa.r.c./year)	15648	Winnowing basket	43456
	Machete	1	Shovel(depreciation/year)	3500	Hoe	15468
	Building	1	Machete(a.r.c./year)	12518	Shovel	10953
	Capital		Building(a.r.c./year)	119762	Machete	12518
	Working capital (Rp/ha)	180000	Capital		Building	119762
		0	Working capital (Rp/ha)	0.36	Capital	
Output	Dry clove(kg/ha)	2700	Dry clove(Rp/kg)	70000	Working capital (Rp/ha)	64800
	Dry Flower stem(kg/ha)	56	Dry Flower stem(Rp/kg)	1750	Dry clove(kg/ha)	189000000
					Dry Flower stem(kg/ha)	98000
					Total Revenue(Rp/Ha)	189098000
					Total Costs(excluding land)(Rp/Ha)	35953509
					Profit(excluding Land)(Rp/Ha)	153144491

Appendix Table A.1.2.1. The Calculation of Social Price of Clove, cif price at Surabaya port based on based on BPS trade data on harvesting season 2001.

Description	Unit
Indonesia total import of clove in 2001	16,899,469 kg
Indonesia total export of clove in 2001	6,323,790 kg
Indonesia net Import of clove in 2001	10,575,879 kg
Total value of clove import in 2001	US\$ 2,280,959
Total volume of clove import in 2001	337,703 kg
The average cif clove import price in 2001	US\$ 6.75543 per kilogram

Appendix Table A.1.2.2. The Calculation of Annual Capital Recovery Cost of Clove Farming at Private Prices

Capital Recovery Cost	Canvas	Winnowing Basket	Hoe	Shovel	Machete	Building
(1)Initial Cost(Rp)	20000	8000	30000	21000	24000	250000
(2)Useful Life(years)	2	2	6	6	6	10
(3)Salvage value(Rp)	10000	4000	5000	3500	4000	25000
(4)Interest rate(%/year)	48%	48%	48%	48%	48%	48%
(5)Present Value of Salvage value(Rp)	4565.3762	1826.15	475.783	333.0479	380.6261	495.82515

(6)Net Cost(Rp)	15434.624	6173.85	29524.2	20666.95	23619.37	249504.17
(7)Recovery Ratio(%)	88%	88%	53%	53%	53%	48%
(8)Annual Recovery Cost(Rp)	13582.469	5432.988	15647.8	10953.48	12518.27	119762

**Appendix Table A.1.2.3.** . The Calculation of Annual Capital Recovery Cost of Clove Farming at Social Prices

Capital Recovery Cost	Canvas	Winnowing Basket	Hoe	Shovel	Machete	Building
(1)Initial Cost(Rp)	20000	8000	30000	21000	24000	250000
(2)Useful Life(years)	2	2	6	6	6	10
(3)Salvage value(Rp)	10000	4000	5000	3500	4000	25000
(4)Interest rate(%/year)	27.5%	27.5%	27.5%	27.5%	27.5%	27.5%
(5)Present Value of Salvage value(Rp)	6151.5748	2460.63	1163.9	814.7303	931.1204	2202.1193
(6)Net Cost(Rp)	13848.425	5539.37	28836.1	20185.27	23068.88	247797.88
(7)Recovery Ratio(%)	71.4%	71.4%	35.8%	35.8%	35.8%	30.1%
(8)Annual Recovery Cost(Rp)	9887.7756	3955.11	10323.3	7226.327	8258.659	74587.162

**Assumption for Appendix Table 1.2.2 and Appendix Table 1.2.3.**

Nominal interest rate is 4 % per month or 48 percent per year borrowed from big village user or village cooperative.  
Social interest rate is 15 percent plus 12.5 percent of inflation rate, that is 27.5 percent.

Appendix Table A.1.3. The Calculation of Social Prices of Clove Input and Output

Table A.1.3.1. Social Import Parity Price Calculations for Input

Import Parity Prices	Urea	SP-36	KCI
F.o.b.(\$/ton) <sup>4)</sup>	105.30 <sup>1)</sup>	147.70 <sup>2)</sup>	118.10 <sup>3)</sup>
Freight & insurance(\$/ton)	36.6	66.6	44.4
C.i.f. at Bitung port(\$/ton)	141.9	211.3	162.5
Exchange rate(Rp/\$)	10000	10000	10000
Exchange rate premium(%)	10	10	10
Equilibrium exchange rate(Rp/\$)	11000	11000	11000
C.i.f. In domestic currency(Rp/ton)	1560900	2324300	1787500
Weight conversion factor(kg/ton)	1000	1000	1000
C.i.f. In dom.curr. and weigh units(Rp/kg)	1560	2324	1787
Transportation cost(Rp/kg)	200	200	200
Marketing costs(Rp/kg)	50	50	50

Table A.1.3.2. The Social Import Parity Price for Output

Import parity Prices	Clove
C.i.f. price at Surabaya port(\$/kg)	6.75543
Transportation cost(\$/kg)	0.015
C.i.f. price at Bitung port(\$/kg)	6.77043
Exchange rate(Rp./\$)	10000
Exchange rate premium(%)	10
Equilibrium exchange rate(Rp/\$)	11000
C.i.f.in domestic currency(Rp/kg)	74474
Transportation costs(Rp/kg)	150
Marketing costs(Rp/kg)	50
Value before processing(Rp/kg)	74674
Processing conversion factor	1
Import parity value at wholesale(Rp/kg)	74674
Distribution costs to farm(Rp/kg)	1200

Value before processing(Rp/kg)	1810	2574	2037
Processing conversion factor	1	1	1
Import parity value at wholesale (Rp/kg)	1810	2574	2037
Distribution costs to farm(Rp/kg)	150	150	150
Import parity value at farm gate (Rp/kg)	1660	2424	1887

Import parity value at farm gate(Rp/kg)	73474
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<sup>1)</sup>F.o.b. price at Black Sea

<sup>2)</sup>F.o.b. price of Diammonium Phosphate at US Gulf

<sup>3)</sup>F.o.b. price at Vancouver

<sup>4)</sup> Source: <http://www.worldbank.org/prospects/pinksheets>

Appendix Table A.1.4.Farm Budgets at Social Price of 15 years old Zanzibar Monoculture for Area less than 400 meters above sea level

Table A.1.4.1.Input-Output Table

	Quantities(Unit)		
Tradables	Fertilizers (Kg/ha)		
	Urea	180	
	SP-36	90	
	KCl	90	
	Factors	Labor (unit/ha)	
		Fertilizing (man-day)	15
		Weeding(man-day)	120
	Harvesting(kg)	2700	
	Drying(man-day)	180	
	Marketing( kg)	2700	
	Tools		
	Ladder	30	
	Rope	25	
	Wheat flour sack	35	
	Canvas	46	
Gunny sack	46		
Winnowing basket	8		

Table A.1.4.2. Social Prices Table

Price(Rp/unit)	
Fertilizers (Kg/ha)	
Urea	1660
SP-36	2424
KCl	1887
Labor (unit/ha)	
Fertilizing (Rp/man-day)	20000
Weeding(Rp/man-day)	
Weeding(Rp/man-day)	20000
Harvesting(Rp/kg)	7500
Drying(Rp/man-day)	25000
Marketing(Rp/kg)	200
Tools	
Ladder	125000
Rope	60000
Wheat flour sack	5700
Canvas(a.r.c/year)	9667
Gunny sack	7500

Table A.1.4.3.Social Prices Budget

P-Budget(Rupiah)	
Fertilizers(Rp/ha)	
Urea	298800
SP-36	218160
KCl	169830
Labor (Rp/ha)	
Fertilizing	300000
Weeding	
Weeding	2400000
Harvesting	
Harvesting	20250000
Drying	
Drying	4500000
Marketing	
Marketing	540000
Tools	
Ladder	3750000
Rope	1500000
Wheat flour sack	199500
Canvas	454802

	Hoe	1	Winnowing basket(a.r.c/year)	3955	Gunny sack	319516
	Shovel	1	Hoe(a.r.c/year)	10323	Winnowing basket	31840
	Machete	1	Shovel(a.r.c./year)	7226	Hoe	10323
	Building	1	Machete(a.r.c./year)	8258	Shovel	7226
	Capital		Building(a.r.c./year)	74587	Machete	8258
	Working capital (Rp/ha)	180000	Capital		Building	74587
			Working capital	0.0812	Capital	
Output	Dry clove(kg/ha)	2700	Dry clove(Rp/kg)	743474	Working capital (Rp/ha)	14616
	Dry Flower stem(kg/ha)	56	Dry Flower stem(Rp/kg)	1750	Dry clove(Rp/ha)	198379800
					Dry Flower stem(Rp/ha)	98000
					Total Revenue(Rp/Ha)	198477800
					Total Costs(excluding land) (Rp/Ha)	35072742
					Profit(excluding Land)(Rp/Ha)	163405058

Appendix Table A.2.1. Farm Budgets at Private Price of 15 years old Zanzibar Multiple Cropping with Coconut for Area less than 400 m above sea level in 2001 harvest

Table A.2.1.1. Input-Output Table

	Quantities(Unit)	
Tradables	Fertilizers (Kg/ha)	
	Urea	0
	SP-36	0
	KCl	0
Factors	Labor (unit/ha)	
	Fertilizing (man-day)	0
	Weeding( clove + coconut) (man-day)	160
	Harvesting(kg)(clove)	1980
	Climbing(tree)(coconut)	200
	Processing/marketing (nut)(coconut)	4000
	Drying(man-day)(clove)	120
	Marketing( kg)(clove)	1980
	Tools	
	Ladder(clove)	20
	Rope(clove)	20
	Wheat flour sack(clove)	20
	Canvas (clove+coconut)	30
	Gunny sack (clove+coco.)	30
	Winnowing basket(clove)	5
	Hoe	1

Table A.2.1.2. Private Prices Table

Price(Rp/unit)	
Fertilizers (Kg/ha)	
Urea	1270
SP-36	1950
Kecil	2200
Labor (unit/ha)	
Fertilizing (Rp/man-day)	25000
Weeding(Rp/man-day)	25000
Harvesting(Rp/kg)(clove)	6250
Climbing(tree)(coconut)	1000
Process./mark.(nut)(coconut)	25
Drying(Rp/man-day)	25000
Marketing(Rp/kg)	200
Tools	
Ladder	125000
Rope	60000
Wheat flour sack	5700
Canvas(a.r.c./year)	13582
Gunny sack	7500
Winnowing	5432

Table A.2.1.3. Private Prices Budget

P-Budget(Rupiah)	
Fertilizers(Rp/ha)	
Urea	0
SP-36	0
KCl	0
Labor (Rp/ha)	
Fertilizing	0
Weeding	4000000
Harvesting	12375000
Climbing(tree)(coconut)	200000
Process./mark.(nut)(coconut)	100000
Drying(Rp/man-day)	3000000
Marketing	396000
Tools	
Ladder	2500000
Rope	1200000
Wheat flour sack	114000
Canvas	407460
Gunny sack	25000

	Shovel	1	basket(a.r.c./year)				
	Machete	1	Hoe(a.r.c./year)	15648	Winnowing basket	27160	
	Building	1	Shovel(a.r.c./year)	10953	Hoe	15648	
	Capital		Machete(a.r.c./year)	12518	Shovel	10953	
	Working capital (Rp/ha)	500000	Building(a.r.c./year)	119762	Machete	12518	
			Capital		Building	119762	
			Working capital (Rp/ha)	0.36	Capital		
Output	Dry clove(kg/ha)	1980	Dry clove(Rp/kg0)	70000	Working capital (Rp/ha)	180000	
	Dry Flower stem(kg/ha)	0	Dry Flower stem(Rp/kg)	1750	Dry clove(Rp/ha0)	138600000	
	Copra(kg/ha)	800	Copra(Rp/kg)	1700	Dry Flower stem(Rp/ha)	0	
					Copra(Rp/ha)	1360000	
					Total Revenue(Rp/Ha)	139960000	
					Total Costs(excluding land)		
					Rp/Ha)	24883501	
					Profit(excluding Land)(Rp/Ha)	115076499	

Appendix Table A.2.2.Farm Budgets at Social Price of 15 years old Zanzibar Multiple Cropping with Coconut for Area less than 400 m above sea level in 2001 harvest

Table A.2.2.1.Input-Output Table

Quantities(Unit)		Table A.2.2.2. Social Prices Table		Table A.2.2.3.Social Prices Budget		
Tradables	Fertilizers (Kg/ha)		Price(Rp/unit)	P-Budget(Rupiah)		
	Urea	0	Fertilizers (Kg/ha)	Fertilizers(Rp/ha)		
	SP-36	0	Urea	1660	Urea	0
	KCl	0	SP-36	2424	SP-36	0
Factors	Labor (unit/ha)		Kecil	1887	KCl	0
	Fertilizing (man-day)	0	Labor (unit/ha)		Labor (Rp/ha)	
	Weeding( clove + coconut)		Fertilizing (Rp/man-day)	20000	Fertilizing	0
	(man-day)	160	Weeding(Rp/man-day)	20000	Weeding	3200000
	Harvesting(kg)(clove)	1980	Harvesting(Rp/kg)(clove)	6250	Harvesting	12375000
	Climbing(tree)(coconut)	200	Climbing(tree)(coconut)	1000	Climbing(tree)(coconut)	200000
	Processing/marketing	4000	Process./mark.(nut)(coconut)	25	Process./mark.(nut)(coconut)	100000
	(nut)(coconut)		Drying(Rp/man-day)	20000	Drying(Rp/man-day)	2400000
	Drying(man-day)(clove)	120	Marketing(Rp/kg)	200	Marketing	396000
	Marketing( kg)(clove)	1980	Tools		Tools	
	Tools		Ladder	125000	Ladder	2500000
	Ladder(clove)	20	Rope	60000	Rope	1200000
	Rope(clove)	20	Wheat flour sack	5700	Wheat flour sack	114000
	Wheat flour sack(clove)	20	Canvas(a.r.c./year)	9887	Canvas	296610
	Canvas (clove+coconut)	30	Gunny sack	7500	Gunny sack	225000
	Gunny sack(clove+coco.)	30	Winnowing	3955	Winnowing basket	19775
	Winnowing basket(clove)	5	basket(a.r.c./year)	10323	Hoe	10323
	Hoe	1	Shovel(a.r.c./year)	7226		
	Shovel	1				
	Machete	1				

Output	Building Capital	1	Machete(a.r.c./year)	8258	Shovel	7226
	Working capital (Rp/ha)	500000	Building(a.r.c./year)	74587	Machete Building	8258 74587
	Dry clove(kg/ha)	1980	Working capital (Rp/ha)	0.0812	Capital	40600
	Dry Flower stem(kg/ha)	0	Dry clove(Rp/kg0)	85500	Working capital (Rp/ha)	169290000
	Copra(kg/ha)	800	Dry Flower stem(Rp/kg))	1750	Dry clove(Rp/ha0)	0
			Copra(Rp/kg)	1700	Dry Flower stem(Rp/ha)	1360000
					Total Revenue(Rp/Ha)	149018520
					Total Costs(excluding land)Rp/Ha	23167379
					Profit(excluding Land)(Rp/Ha	125849141

Appendix Table A.3.1. Farm Budgets at Private Price of 18 years old Sikotok Monoculture for Area More than 400 m above sea level in 2001 harvest

Table A.3.1.1. Input-Output Table

	Quantities(Unit)		
Tradables	Fertilizers (Kg/ha)		
	Urea	0	
	SP-36	0	
	KCI	0	
	Factors	Labor (unit/ha)	
		Fertilizing (man-day)	0
		Weeding(man-day)	200
		Harvesting(kg)	2160
		Drying(man-day)	120
		Marketing( kg)	2160
		Tools	
		Ladder	20
		Rope	20
		Wheat flour sack	25
	Canvas	100	
	Gunny sack	40	
	Winnowing basket	5	
Hoe	2		
Shovel	1		
Machete	2		
Building	0		
Capital			
Working capital (Rp/ha)	200000		
Output	Dry clove(kg/ha)	1080	
	Dry Flower stem(kg/ha)	150	

Table A.3.1.2. Private Prices Table

Price(Rp/unit)	
Fertilizers (Kg/ha)	
Urea	1270
SP-36	1950
KCI	2200
Labor (unit/ha)	
Fertilizing (Rp/man-day)	25000
Weeding(Rp/man-day)	25000
Harvesting(Rp/kg)	7500
Drying(Rp/man-day)	25000
Marketing(Rp/kg)	100
Tools	
Ladder	60000
Rope	4000
Wheat flour sack	6000
Canvas(a.r.c./year)	13582
Gunny sack	7000
Winnowing basket(a.r.c/year)	5432
Hoe(a.r.c./year)	15648
Shovel(a.r.c./year)	10953
Machete(a.r.c./year)	12518
Building(a.r.c./year)	119762
Capital	
Working capital (Rp/ha)	0.36
Dry clove(Rp/kg)	70000
Dry Flower stem(Rp/kg)	1750

Table A.3.1.3. Private Prices Budget

P-Budget(Rupiah)	
Fertilizers(Rp/ha)	
Urea	0
SP-36	0
KCI	0
Labor (Rp/ha)	
Fertilizing	0
Weeding	5000000
Harvesting	16200000
Drying	3000000
Marketing	216000
Tools	
Ladder	1200000
Rope	80000
Wheat flour sack	150000
Canvas	1358200
Gunny sack	280000
Winnowing basket	27160
Hoe	31296
Shovel	10953
Machete	25036
Building	0
Capital	
Working capital (Rp/ha)	72000
Dry clove(Rp/ha)	75600000
Dry Flower stem(Rp/ha)	262500
Total Revenue(Rp/Ha)	75862500

Total Costs(excluding land) (Rp/Ha)	27650645
Profit(excluding Land)(Rp/Ha)	48211855

Appendix Table A.3.2.Farm Budgets at Social Price of 18 years old Sikotok Monoculture for Area less than 400 m above sea level in 2001 harvest

Table A.3.2.1.Input-Output Table

	Quantities(Unit)	
Tradables	Fertilizers (Kg/ha)	
	Urea	0
	SP-36	0
	KCl	0
Factors	Labor (unit/ha)	
	Fertilizing (man-day)	0
	Weeding(man-day)	200
	Harvesting(kg)	2160
	Drying(man-day)	120
	Marketing( kg)	2160
	Tools	
	Ladder	20
	Rope	20
	Wheat flour sack	25
	Canvas	100
	Gunny sack	40
	Winnowing basket	5
	Hoe	2
	Shovel	1
	Machete	2
	Building	0
	Capital	
	Working capital (Rp/ha)	200000
Output	Dry clove(kg/ha)	1080
	Dry Flower stem(kg/ha)	150

Table A.3.2.2. Social Prices Table

Price(Rp/unit)	
Fertilizers (Kg/ha)	
Urea	1660
SP-36	2424
KCl	1887
Labor (unit/ha)	
Fertilizing (Rp/man-day)	20000
Weeding(Rp/man-day)	20000
Harvesting(Rp/kg)	7500
Drying(Rp/man-day)	25000
Marketing(Rp/kg)	100
Tools	
Ladder	60000
Rope	4000
Wheat flour sack	6000
Canvas(a.r.c./year)	9887
Gunny sack	7000
Winnowing basket(a.r.c./year)	3955
Hoe(a.r.c./year)	10323
Shovel(a.r.c./year)	7226
Machete(a.r.c./year)	8258
Building(a.r.c./year)	74587
Capital	
Working capital (Rp/ha)	0.0812
Dry clove(kg/ha)	74574
Dry Flower stem(kg/ha)	1750

Table A.3.2.3.Social Prices Budget

P-Budget(Rupiah)	
Fertilizers(Rp/ha)	
Urea	0
SP-36	0
KCl	0
Labor (Rp/ha)	
Fertilizing	0
Weeding	4000000
Harvesting	16200000
Drying	3000000
Marketing	216000
Tools	
Ladder	1200000
Rope	80000
Wheat flour sack	150000
Canvas	988700
Gunny sack	280000
Winnowing basket	19775
Hoe	20646
Shovel	7226
Machete	18516
Building	0
Capital	
Working capital (Rp/ha)	16240
Dry clove(kg/ha)	80539920
Dry Flower stem(kg/ha)	262500
Total Revenue(Rp/Ha)	80802420
Total Costs(excluding land) (Rp/Ha)	26195103
Profit(excluding Land)(Rp/Ha)	54607317

Appendix Table A.4.1. farm budget at private price of 18 years old Sikotok Multiple Cropping with Corn for Area More than 400 m Above sea level in 2001 harvest

Table A.4.1.1. Input-Output Table

	Quantities(Unit)	
Tradables	Fertilizers (Kg/ha)	
	Urea	90
	SP-36	45
	KCI	45
Factors	Labor (unit/ha)	
	Fertilizing (man-day)	7
	Harvesting(m.d.)(corn)	16
	Weeding(m.d.)(clove+corn)	250
	Harvesting(kg)(clove)	2160
	Drying(m.d.)(clove+corn)	120
	Marketing( kg)(clove+corn)	2160
	Tools	
	Ladder	20
	Rope	20
	Wheat flour sack	25
	Canvas	100
	Gunny sack	40
	Winnowing basket	5
	Hoe	2
	Shovel	1
	Machete	2
	Building	0
	Capital	
	Working capital (Rp/ha)	200000
Output	Corn(kg/ha)	6000
	Dry clove(kg/ha)	1080
	Dry Flower stem(kg/ha)	150

Table A.4.1.2. Private Prices Table

Price(Rp/unit)	
Fertilizers (Kg/ha)	
Urea	1270
SP-36	1950
KCI	2200
Labor (unit/ha)	
Fertilizing (Rp/man-day)	25000
Harvesting(corn)(Rp/m.d.)	25000
Weeding(Rp/man-day)	25000
Harvesting(Rp/kg)	7500
Drying(Rp/man-day)	25000
Marketing(Rp/kg)	100
Tools	
Ladder	60000
Rope	4000
Wheat flour sack	6000
Canvas(a.r.c./year)	13582
Gunny sack	7000
Winnowing basket(a.r.c./year)	5432
Hoe(aa.r.c./year)	15648
Shovel(a.r.c./year)	10953
Machete(a.r.c./year)	12518
Building(a.r.c./year)	119762
Capital	
Working capital (Rp/ha)	0,36
Corn(Rp/kg)	1250
Dry clove(kg/ha)	70000
Dry Flower stem(kg/ha)	1750

Table A.4.1.3. Private Prices Budget

P-Budget(Rupiah)	
Fertilizers(Rp/ha)	
Urea	114300
SP-36	87750
KCI	99000
Labor (Rp/ha)	
Fertilizing	175000
Harvesting(corn)(Rp)	400000
Weeding	6250000
Harvesting	16200000
Drying	3000000
Marketing	216000
Tools	
Ladder	1200000
Rope	80000
Wheat flour sack	150000
Canvas	1358200
Gunny sack	280000
Winnowing basket	271160
Hoe	31296
Shovel	10953
Machete	25036
Building	0
Capital	
Working capital (Rp/ha)	72000
Corn(Rp/ha)	7500000
Dry clove(kg/ha)	75600000
Dry Flower stem(kg/ha)	262500
Total Revenue(Rp/Ha)	83362500
Total Costs(excluding land) (Rp/Ha)	29776695
Profit(excluding Land)(Rp/Ha)	53585805

Appendix Table A.4.2.Farm Budgets at Social Price of 18 years old Sikotok Multiple Cropping with Corn

Table A.4.2.1.Input-Output Table

	Quantities(Unit)	
Tradables	Fertilizers (Kg/ha)	
	Urea	90
	SP-36	45
	KCl	45
Factors	Labor (unit/Hukum Adat)	
	Fertilizing (man-day)	7
	Harvesting(m.d.)(corn)	16
	Weeding(m.d.)(clove+corn)	250
	Harvesting(kg)(clove)	2160
	Drying(m.d.)(clove+corn)	120
	Marketing(kg)(clove+corn)	2160
	Tools	
	Ladder	20
	Rope	20
	Wheat flour sack	25
	Canvas	100
	Gunny sack	40
	Winnowing basket	5
	Hoe	2
	Shovel	1
	Machete	2
	Building	0
	Capital	
	Working capital (Rp/ha)	200000
Output	Corn(kg/ha)	6000
	Dry clove(kg/ha)	1080
	Dry Flower stem(kg/ha)	150

Table A.4.2.2. Social Prices Table

Price(Rp/unit)	
Fertilizers (Kg/ha)	
Urea	1660
SP-36	2424
KCl	1887
Labor (unit/ha)	
Fertilizing (Rp/man-day)	20000
Weeding(Rp/man-day)	20000
Harvesting(Rp/kg)	7500
Drying(Rp/man-day)	20000
Marketing(Rp/kg)	100
Tools	
Ladder	60000
Rope	4000
Wheat flour sack	6000
Canvas(a.r.c./year)	9887
Gunny sack	7000
Winnowing basket(a.r.c./y)	3955
Hoe(a.r.c./year)	10323
Shovel(a.r.c./year)	7226
Machete(a.r.c./year)	8258
Building(a.r.c./year)	74587
Capital	
Working capital (Rp/ha)	0.0812
Corn(Rp/kg)	1250
Dry clove(kg/ha)	74547
Dry Flower stem(kg/ha)	1750

Table A.4.2.3.Social Prices Budget

P-Budget(Rupiah)	
Fertilizers(Rp/ha)	
Urea	149400
SP-36	109080
KCl	84915
Labor (Rp/ha)	
Fertilizing	140000
Weeding	5000000
Harvesting	16200000
Drying	2400000
Marketing	216000
Tools	
Ladder	1200000
Rope	80000
Wheat flour sack	150000
Canvas	988700
Gunny sack	280000
Winnowing basket	19775
Hoe	20646
Shovel	7226
Machete	16516
Building	0
Capital	
Working capital (Rp/ha)	16240
Corn(Rp/ha)	7500000
Dry clove(kg/ha)	80539920
Dry Flower stem(kg/ha)	262500
Total Revenue(Rp/Ha)	88302420
Total Costs(excluding land)(Rp/Ha)	27078498
Profit(excluding Land)(Rp/Ha)	61223922

Appendix Table B.1. The IRR Calculation of The Clove Production per Hectare in Minahasa Regency without using Fertilizer

Year	Additional Cost (million Rupiah)							Discount Factor 50%	Cost (Present Value 50%)	Production (kg) <sup>6)</sup>	Gross Production Value (Million Rp) <sup>7)</sup>	Production (Present Value 50%)	Additional Value	Net Present Value 50%
	Land Rent For Corn <sup>8)</sup>	Capital include seedling <sup>1)</sup>	Farming		Harvesting		Total Cost							
			using hoe <sup>2)</sup>	Using machete <sup>3)</sup>	tools <sup>4)</sup>	wor-ker <sup>5)</sup>								
{1}	{2}	{3}	{4}	{5}	{6}	{7}	{8}	{9}	{10}	{11}	{12}	{13}	{14}	{15}
1	9	1,41	0,15	0,15	0,345	0	11,055	0,667	7,373685	0	0	0	-11,055	-7,3737
2	9	0,25	0,15	0,15	0,345	0	9,895	0,444	4,39338	0	0	0	-9,895	-4,3934
3	9	0	0,15	0,15	0,345	0	9,645	0,296	2,85492	0	0	0	-9,645	-2,8549
4	9	0	0,15	0,15	0,345	0	9,645	0,198	1,90971	0	0	0	-9,645	-1,9097
5	9	0	0,15	0,15	0,345	1,35	10,995	0,132	1,45134	180	12,6	1,6632	1,605	0,21186
6	9	0,08	0,15	0,15	0,345	2,7	12,425	0,088	1,0934	360	25,2	2,2176	12,775	1,1242
7 to 10	36	0	0,6	0,6	1,7	16,2	55,1	0,141	7,7691	2160	151,2	21,3192	96,1	13,5501
11 to 14	36	0	0,6	0,6	1,38	27	65,58	0,028	1,83624	3600	252	7,056	186,42	5,21976
15 to 20	54	0,08	0,9	0,9	3,35	64,8	124,03	0,006	0,74418	8640	604,8	3,6288	480,77	2,88462
21 to 30	90	0,16	1,5	1,5	7,77	203	303,43	0	0	27000	1890	0	1586,6	0
31 to 40	90	0,16	1,5	1,5	6,33	135	234,49	0	0	18000	1260	0	1025,5	0
41 to 44	36	0,08	0,6	0,6	3,93	27	68,21	0	0	3600	252	0	183,79	0
45 to 47	27	0	0,45	0,45	1,935	8,1	37,935	0	0	1080	75,6	0	37,665	0
Total	423	2,22	7,05	7,05	28,47	485	952,44	2	29,425955	64620	4523,4	35,8848	3571	6,45885

1) The capital consists of the cost of buying 1 machete, 1 hoe and 1 shovel.

2) Farming cost using hoe is Rp 25.000/man-day

81%

3) Farming cost using machete is Rp 25.000/man-day

4) Harvesting tools consist of 3 ladders, 7 big ropes, 20 little ropes, 8 gunny sack and 2 winnowing basket

5) Harvesting cost is Rp.1500 per litre of wet clove or Rp.7500 per kilogram of dry clove

6) One Hectare clove farming contains 180 trees

7) Production value based on the clove price Rp.70000 per kilogram on 2001 harvest

8) The production of corn per Hectare is 3 ton per 3 months with price Rp. 1000 per kilogram and the total cost is 25 percent of the total revenue.

Appendix Table B.2. The IRR Calculation of The Clove Production per Hectare in Minahasa Regency using Fertilizer

Year	Additional Cost (million Rupiah)								Dis- count Factor 50%	Cost( Present Value 50 %)	Pro- duct- ion (kg) <sup>6)</sup>	Gross Production Value(Mi- llion Rp) <sup>7)</sup>	Pro- duction (Present Value 50%)	Addi- tional Value	Net Pre- sent Value 50%	
	Fertilizer <sup>9)</sup>		Land rent for corn <sup>8)</sup>	Capita l Includ e Seed- Ling <sup>1)</sup>	Farmin g using ma- chete <sup>3)</sup>		Harvesting work- er <sup>5)</sup>									Total Cost
	Material	work- er			hoe <sup>2)</sup>	chete <sup>3)</sup>	tools <sup>4)</sup>	ker <sup>5)</sup>								
{1}	{2}	{3}	{4}	{5}	{6}	{7}	{8}	{9}	{10}	{11}	{12}	{13}	{14}	{15}	{16}	
1	0,018	0,125	9	1,41	0,15	0,15	0,345	0	11,198	0,667	7,4691	0	0	-11,2	-7,4691	
2	0,036	0,125	9	0,25	0,15	0,15	0,345	0	10,056	0,444	4,4649	0	0	-10,1	-4,4649	
3	0,054	0,125	9	0	0,15	0,15	0,345	0	9,824	0,296	2,9079	0	0	-9,82	-2,9079	
4	0,072	0,125	9	0	0,15	0,15	0,345	0	9,842	0,198	1,9487	0	0	-9,84	-1,9487	
5	0,09	0,125	9	0	0,15	0,15	0,345	2,7	12,56	0,132	1,6579	360	25,2	3,3264	12,64	1,66848
6	0,108	0,125	9	0,08	0,15	0,15	0,345	5,4	15,358	0,088	1,3515	720	50,4	4,4352	35,04	3,0837
7 to 10	1,204	1	36	0	0,6	0,6	1,7	32	73,504	0,141	10,364	4320	302,4	42,638	228,9	32,2743
11 to 14	1,204	1	36	0	0,6	0,6	1,38	54	94,784	0,028	2,654	7200	504	14,112	409,2	11,458
15 to 20	3,612	1,5	54	0,08	0,9	0,9	3,35	130	193,94	0,006	1,1637	17280	1209,6	7,2576	1016	6,09395
21 to 30	6,021	2,5	90	0,16	1,5	1,5	7,77	405	514,45	0	0	54000	3780	0	3266	0
31 to 40	6,021	2,5	90	0,16	1,5	1,5	6,33	270	378,01	0	0	36000	2520	0	2142	0
41 to 44	2,4	1	36	0,08	0,6	0,6	3,93	54	98,61	0	0	7200	504	0	405,4	0
45 to 47	1,8	0,75	27	0	0,45	0,45	1,935	16	48,585	0	0	2160	151,2	0	102,6	0
Total	22,64	11	423	2,22	7,05	7,05	28,47	969	1470,7	2	33,982	129240	9046,8	71,77	7576	37,788

1) The capital consists of the cost of buying 1 machete, 1 hoe and 1 shovel. 102%

2) Farming cost using hoe is Rp 25.000/man-day

3) Farming cost using machete is Rp 25.000/man-day

4) Harvesting tools consist of 3 ladders, 7 big ropes, 20 little ropes, 8 gunny sack and 2 winnowing basket

5) Harvesting cost is Rp.1500 per litre of wet clove or Rp.7500 per kilogram of dry clove

6) One Hectare clove farming contains 180 trees. The use of Fertilizers according to the doses will double the production.

7) Production value based on the clove price Rp.70000 per kilogram on 2001 harvest

8) The production of corn per Hectare is 3 ton per 3 months with price Rp. 1000 per kilogram and the total cost is 25 percent of the total revenue.

9) The price of fertilizers are Urea Rp.1270 per kilogram, SP-36 Rp.1950 per kilogram and KCl Rp.2200 per kilogram.

For one clove tree, the farmer will spread the ratio Urea:SP-36:KCl=2:1:1. For the 8 to 14 years old, the use of fertilizers are 0.5 kilogram Urea, 0.25 kg SP-36 and 0.25 kg KCl. For more than 15 years old the use are 1 kg Urea, 0.5 kg SP-36 and 0.5 kg KCl.

For 1 years old, the use of fertilizers are 0.03 kg Urea, 0.015 kg SP-36 and 0.015 kg KCl. The dose will increase as the same as the use at the first year up to 7 years old, for every next year.