THE ANALYSIS OF TOBACCO PRODUCTION IN TEMANGGUNG, CENTRAL JAVA FROM 1986 – 2005

A THESIS

Presented as Partial Fulfillment of the Requirements to Obtain the Bachelor Degree in Economics Department

By:

TASRIKASARI MUNAWAROH

Student Number: 02313180

DEPARTMENT OF ECONOMICS

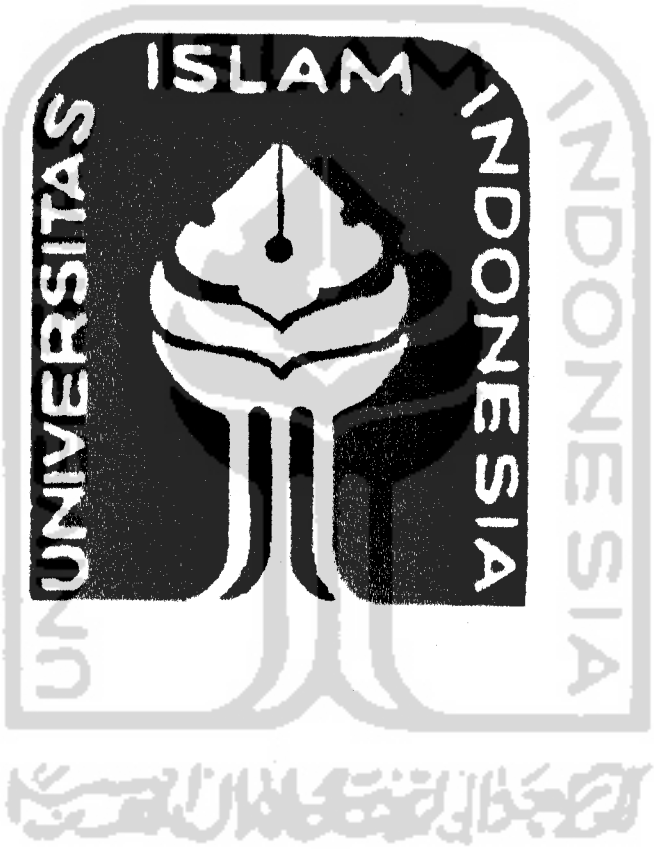
INTERNATIONAL PROGRAM

FACULTY OF ECONOMICS

ISLAMIC UNIVERSITY OF INDONESIA

YOGYAKARTA

2007


UNIVERSITAS ISLAM INDONESIA

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APPROVAL

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A BACHELOR DEGREE THESIS

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Defended before the Board of Examiners on November 30, 2007 and Declared Acceptable

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DEVOTION PAGE

Sometimes You Might Feel That You'll Be The Happier One
But It's Always Nice To Have Someone To Laze Around With....
Someone To Think About....
Someone to Care About.....
And Someone To Share Your Joy....
So Take A Chance....
You'll Never Know What You Will Got
Until You'll Have Really Tried
So If there's Somebody You Miss
Tell Him Or Her That You Do....
Cause There's Something That Only Love Can Do....

This thesis is devoted to my lovely parents, my sister, my brother and my beloved friends

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The writer realizes that this thesis is not perfect, therefore the writer hopes the other parties to give their critics and recommendations to this thesis. The writer hopes this thesis can give contributions and benefits for others.

Wassalamualaikum Wr. Wb.

Yogyakarta, 7th July, 2007

Tasrikasari Munawaroh

MOTTO

The earlier you decide your goal and the more often you practice, then it will be easier to you to achieve your goal.
(Beverly K. Bachel)

The secret of going forward is to start it (Sally Berger)

The possibility to make your dream come true has made your life more interesting (Paulo Coelho)

The future is belongs to them who believe on their beautiful dream (Eleanor Roosevelt)

You must believe in yourself. The more you love and accept yourself, the faster you can achieve your goal (Florence Griffith Joyner)

Most of us depend on what we do not have, cannot be had, or the one which we never have. We waste too much energy to feel down when we actually can use that energy to do, or at least try to do, some things that we really want (Terry McMillan)

It's so amazing when we can do something impossible (Walt Disney)

STATEMENT FREE OF PLAGIARISM

Herein I declare the originality of this thesis; there is no other work which has ever presented to obtain any university degree, and in my concern there is neither one else's opinion nor published written work, except acknowledged quotation relevant to the topic of this thesis which have been stated or listed on the thesis bibliography.

If in the future this statement is not proven as it supposed to be, I am willing to accept any sanction complying to the determinated for its consequences.

Yogyakarta, 7th July, 2007

Tasrikasari Munawaroh

TABLE OF CONTENTS

LIST OF TABLES

PAGE

LIST OF CURVE

PAGE

LIST OF APPENDICES

ABSTRACT

Tasrikasari Munawaroh (2007). "The Analysis of Tobacco Production in Temanggung, Central Java from 1986 – 2005." Yogyakarta: Department of Economics, International Program, Faculty of Economics, Islamic University of Indonesia, Yogyakarta.

The objective of this research is to analyze the influence of two independent variables to the tobacco production in Temanggung, Central Java, they are: the labors who work in the tobacco's fields and the width area of tobacco land.

This research uses multiple regression models Ordinary Least Square (OLS) method. To eliminate the mistakes and to make the estimation process easier, the writer uses E – views software version 4.1. The data used in this research are secondary data on the basis of annually data from 1986 – 2005.

Based on the research which concerns with the analysis of tobacco production in Temanggung, Central Java by using the OLS method, it can be concluded that:

* Based on the research, labor does not have a significant effect on the tobacco's production. It means the change of labor does not give any effect to tobacco's production. The hypothesis is not proven.
* The regression result shows that the width area of tobacco land has a significant and positive effect on the tobacco production. The hypothesis is proven.
* The elasticity coefficient of land which is equal to 1.439582863 shows that the use of land in tobacco production in Temanggung is still in the stage 1 of production. It means that the tobacco production in Temanggung is still be able to be increased by land – extensification.
* The two independent variables tested by econometric method in classical assumption deviation, which are Multicollinearity test, Autocorrelation test and Heteroscedasticity test, showed that the classical assumption deviation do not exist.

INTISARI

Tasrikasari Munawaroh (2007). "Analisis Produksi Tembakau di Temanggung, Jawa Tengah Tahun 1986 – 2005." Jurusan Ekonomi Pembangunan, International Program, Fakultas Ekonomi, Universitas Islam Indonesia, Yogyakarta.

Tujuan dari penelitian ini adalah untuk menganalisa pengaruh kedua variabel bebas terhadap produksi tembakau di Temanggung, Jawa – Tengah, yaitu: luas lahan dan jumlah tenaga kerja yang bekerja di sawah.

Penelitian ini menggunakan model regresi majemuk, yaitu metode Ordinary Least Square (OLS). Untuk memperkecil kesalahan dan mempermudah penelitian ini, penulis menggunakan bantuan software komputer E – Views versi 4.1. Data yang digunakan dalam penelitian ini adalah data sekunder, berdasarkan data tahun 1986 – 2005.

Berdasarkan hasil penelitian mengenai analisis produksi tembakau di Temanggung, Jawa – Tengah, dengan menggunakan metode Ordinary Least Square (OLS) kesimpulannya adalah:

- Berdasarkan hasil penelitian, tenaga kerja yang bekerja di sawah tidak mempunyai pengaruh yang signifikan terhadap produksi tembakau. Hal itu berarti perubahan tenaga kerja yang bekerja di sawah tidak memberikan pengaruh sama sekali terhadap produksi tembakau. Hipotesis tidak terbukti.
- Hasil regresi menunjukkan bahwa luas lahan mempunyai pengaruh yang signifikan dan positif terhadap produksi tembakau. Hipotesis telah terbukti.
- Hasil koefisien elastisitas luas lahan yaitu 1.439582863 menunjukkan bahwa penggunaan luas lahan dalam produksi tembakau di Temanggung masih berada dalam tahap 1 dari tahap produksi. Hal itu berarti bahwa produksi tembakau di Temanggung masih dapat ditingkatkan dengan cara ekstensifikasi – lahan.
- Kedua variabel bebas, yaitu: luas lahan dan jumlah tenaga kerja, setelah dilakukan tes ekonometri tentang adanya penyimpangan asumsi klasik yang diantaranya, tes multikollinearitas, tes autokorelasi dan tes heterokedastisitas, menunjukkan tidak adanya penyimpangan asumsi klasik.

CHAPTER I

INTRODUCTION

1.1. Background of the Study

There is one region in Central Java which is famous of tobacco. It is Temanggung, a small town located in the foot of Sumbing and Sindoro mountains. Temanggung is 77 km from Semarang, since 1970s has been known as tobacco producer area because it has good quality of tobacco. Tobacco center villages in Temanggung are Kedu, Ngadirejo, Parakan, and Bulu. Famous commodities from Temanggung are not only tobacco, but also rice, coffee, and vanilla. But the commodity which becomes superior product of Temanggung is tobacco (www.temanggung.go.id).

Commodities which are developed in Temanggung are (Temanggung dalam angka, various editions):

1. Seasonal crops:
    1) Highlands: Tobacco, corn, chili, asparagus, potato, cabbage.
    2) Lowlands: Tobacco, corn, chili, asparagus, peanut, soybean.
2. Perennial crops:
    1) Highlands: Arabica coffee.
    2) Lowlands: Robusta coffee

Agriculture sector is still dominant in giving contribution to the local government's revenue, especially in the rural areas (Priyadi, 1997:71). If it is seen from the physical condition, Temanggung has a good potential to be improved, especially in agriculture sector. Table 1.1 below shows the economic structure of Temanggung.

Table 1.1: Economic Structure of Temanggung based on Current Price from 2000 – 2004 (in %)

Sector	2000	2001	2002	2003	2004
1. Agriculture	38.28	38.23	37.47	36.42	36.41
2. Mining	1.33	1.35	1.45	1.60	1.63
3. Industry	14.93	14.29	14.10	14.17	14.34
4. Electricity and water	1.10	1.17	1.31	1.58	1.59
5. Construction	5.84	6.11	6.28	6.36	6.46
6. Trading	10.45	10.93	10.89	11.25	11.32
7. Transportation	5.50	5.61	6.07	6.15	6.20
8. Finance	4.20	4.28	4.39	4.39	4.40
9. Services	18.37	18.03	18.04	18.08	17.65
GRDP	100	100	100	100	100

Source: GRDP of Temanggung Regency, year 2004; Central Bureau of Statistic Temanggung

In the last five years, agriculture sector is still a reliable sector in Temanggung because it has given the biggest contribution to the GRDP of

Temanggung. But the role of agriculture sector is continuing to decline from year to year as shown in the table above.

One of the agriculture's commodity which is famous in Temanggung is tobacco. It is a seasonal plant, which is usually planted between April – September (Annual report of Forestry and Estate Office Temanggung, various editions).

Tobacco has high economic value and has high potential. Because of that reasons, Temanggung depends on those "green gold." Almost all of the economic wheels of this Regency are actuated by tobacco. Temanggung without tobacco will be desolate. Therefore, if tobacco prohibited in that area, it can be ensured that Temanggung will not have something to be proud of and the economic activities in Temanggung will not develop. It can be said that tobacco is the barometer of Temanggung's economy. If the tobacco's harvest is success, the farmers will get money from the tobacco's trading. Hence, it will increase the income of the farmers. Temanggung's tobacco contributes 70 – 80% of the total of the farmer's income (Rochman and Suwarso, 2000).

Few years ago, the price of Temanggung's tobacco was very high, because the demand from the cigarette manufacturers was bigger than the supply of tobacco by the farmers. Then if the plant season came, many farmers were interested to plant tobacco, because it promised high return. They expected to gain more money by planting it.

But, nowadays the live of tobacco's farmer in Temanggung is in the worst condition, because the price of tobacco slump.

Table below shows the Average Price of Tobacco from 1998 – 2005

Table 1.2: The Average Price of Tobacco from 1998 – 2005 (Continue to the next page)

Quality	1998		1999		2000		2001	
	Lp	Hp	Lp	Hp	Lp	Hp	Lp	Hp
A	2,500	3,500	4,000	5,000	8,000	8,500	9,000	10,000
B	4,000	5,000	6,000	7,250	12,000	13,000	19,000	20,000
C	5,000	6,500	11,000	12,000	20,000	21,000	28,000	29,000
D	-	-	15,000	16,000	27,000	28,000	37,500	38,500
E	-	-	-	-	-	-	39,000	43,000
F	-	-	-	-	-	-	-	-
G	-	-	-	-	-	-	-	-

Source: Industry and Commerce Office of Temanggung

Note:

Lp = Means the lowest price / kg

Hp = Means the highest price / kg

Table 1.2: The Average Price of Tobacco from 1998 – 2005 (Continued)

Quality	2002		2003		2004		2005	
	Lp	Hp	Lp	Hp	Lp	Hp	Lp	Hp
A	7 ,500	8,500	7,500	10,000	6,000	8,500	6,000	7,500
B	13,000	14,500	14,000	20,000	12,500	14,500	10,000	12,500
C	18,500	20,000	19,000	30,000	17,500	22,500	14,000	16,000
D	28,000	30,000	26,000	35,000	24,000	26,000	19,000	24,000
E	31,500	35,000	30,000	45,000	35,000	37,500	27,500	30,000
F	42,500	45,000	40,000	60,000	45,000	50,000	-	-
G	-	-	-	-	50,000	60,000	-	-

Source: Industry and Commerce Office of Temanggung

Note:

Lp = Means the lowest price / kg

Hp = Means the highest price / kg

From the table above, it can be seen that the tobacco's price continue to decline. At 2002 it reached its peak. Thousand tons tobacco could not be absorbed by the cigarette manufacturers. It caused by oversupply, there were more farmers plant tobacco because it promises high profit and there were many Temanggung's tobacco which were mixed with tobacco from other areas, such as from East Java and West Java, which has bad quality. Then, because of that conditions the tobacco's price slump.

At that time, the collector forced to reject tobacco from the farmers in a huge amount. They did not want to suffer from a loss because big cigarette manufacturers only want to buy tobacco with "E","F","G", or super quality. At that time, on the average only 30% tobacco fulfilled the quality requirement determined by the cigarette manufacturers (Temanggung Regency in Central Java Profile).

Recently, the farmers do not enjoy the profit from tobacco's trading, because the tobacco's price is still under the production cost. On the average, the price of tobacco is only Rp. 17, 500 – Rp. 22, 000/kgs; meanwhile the production cost is around Rp. 23, 000/kgs (www.sinarharapan.com).

The price of tobacco in the last few years tends to be stable, there was no significant increase; meanwhile the production cost tends to be increase. The farmers could not set higher price because the tobacco production exceeded the demands (www.sinarharapan.com).

Taking care of tobacco plant is very difficult. But if the tobacco's farmers get success in cultivating it, they will get huge profit, as long as the quality of tobacco is good. It can be said that the quality of tobacco becomes the measurement of the success of planting tobacco. In contrary, if they failed, they will get huge loss, just like the Temanggung's farmers experienced in the last five years because the tobacco's price slump. (www.pikiranrakyat.com).

Tobacco stimulates the economic activities. It can grow other business activities such as tobacco drying industry, clove – flavored cigarette industry, others cigarette industries, and industry which process other product from tobacco. Also it can absorb many labors involved in the tobacco's cultivation process. Hence, it can create many job fields available in the society, such as tobacco basket trader and the provider of the transportation service (Mamat H. S., S. R. P. Sitorus, H. Hardjomidjojo, and A. K. Seta, 2006:146 – 153).

From 3,220 tobacco drying industries which absorb 22,993 labors, can be gained 3,025 tons dry tobacco which have production value of Rp. 60.5 billions. Four clove – flavored cigarette manufacturers in Temanggung produce 2.5 million stick of clove – flavored cigarettes which have production value of Rp 230 millions. Whereas two others cigarette manufacturers produce 5.7 million cigarette whose have production value of Rp 1.7 millions. Industry which processes other product from tobacco produces 22 tons which has production value of Rp. 220 millions (Temanggung Regency in Central Java Profile).

Tobacco also gives contribution to the local government revenue. For three years, from 1995 – 1997, local government in Temanggung determined to give Rp. 2, 000 per tobacco basket as a contribution to the local government. One tobacco basket contains 40 kilograms of tobacco's slice. At that time, every year local government in Temanggung received approximately Rp. 850 millions. But, since the economic crisis hit this country, the local government did not ask for

such contribution anymore until now (Temanggung Regency in Central Java Profile).

A dry – slice – tobacco, when its color has changed into black – brown, will be sold to the cigarette manufacturers in Central Java and East Java as raw materials for clove – flavored cigarette. Temanggung's tobacco is very important for making the clove – flavored cigarette, because it gives the taste to the clove – flavored cigarette. The taste of Temanggung's tobacco is different with tobacco from other areas. So, Temanggung's tobacco is needed by almost all clove – flavored cigarette manufacturers in Indonesia. It contributes 18% from the total needs of the clove – flavored cigarettes manufacturers (Mastur, 2004). Thus, almost all clove – flavored cigarette manufacturers are the main consumer of Temanggung's tobacco. Because of that reasons, the existence of tobacco in Temanggung cannot be replaced by other commodity.

The demand for Temanggung's tobacco is volatile. Sometimes it is high, but sometimes it is low. It depends on many factors. It is determined by internal and external factors, that are consumption level which affected by the population and the growth of income; the needs of cigarettes manufacturers and its production; the consumer taste; the content of tar – nicotine and anti – cigarette campaign done by WHO; the volume of exports and imports; tobacco stock and ad – valorem tax.

Table 1.3. below shows the demand of Temanggung's tobacco by cigarette manufacturers in 2004 – 2005

Table 1.3: Purchasing Plan of Temanggung's Tobacco by Cigarette Manufacturers

No.	Cigarette Manufacturers	2004	2005	2006
1.	Gudang Garam	5, 000	3, 750	4, 125
2.	Djarum Kudus	7, 500	4, 000	800
3.	Nojorono	n/a	n/a	800
4.	Sukun	n/a	n/a	350
5.	Bentoel	n/a	n/a	300
6.	Others	n/a	100	675
	Total	12, 500	7, 850	7, 050

Source: Industry and Commerce Office of Temanggung

Note: N/A means not available

In 2004, Djarum Kudus bought 7,500 tons original Temanggung's tobacco. Meanwhile Gudang Garam bought 5,000 tons. That amount was adjusted with the needs of Gudang Garam manufacturer in Kediri, East Java.

On 2005, Gudang Garam purchased 3,750 tons, whereas Djarum purchased 4,000 tons, and Wismilak purchased 100 tons.

In 2006, Gudang Garam was the biggest consumer of Temanggung's tobacco; meanwhile Bentoel is the fewest consumers.

Table above shows the purchasing of Temanggung's tobacco decrease from year to year. It is because the cigarette production volume slump. In 2000, the cigarette production still achieved 232.46 billion stick. But, in 2003 it decreased 15% became 198.38 billion stick. It was caused by the government decision to increase the cigarette tax. The government tried to get more revenue from cigarette tax. But, that government decision gave negative impact to the farmers. Because of that decision, the cigarette manufacturers press the tobacco's price from the farmers. Means the cigarette manufacturers are willing to buy tobacco with lower price. It has made the farmers suffer from a loss, because the price is under the production cost (www.sinarharapan.com).

In 2003, the government revenue from cigarette tax achieved Rp. 27.03 trillion increased sharply from the previous year which was Rp. 22.3 trillion. Therefore, the higher claims toward cigarette tax revenue, the cigarette production will be lower (www.sinarharapan.com).

The reason why the writer chooses Temanggung as her research object is because tobacco seems to have good prospect in the market (both national and international). Based on the data and background of the study above, the writer is interested in analyzing the production of tobacco in Temanggung. Therefore, the writer decides to choose the topic "**The Analysis of Tobacco Production in Temanggung, Central Java From 1986 – 2005**"

1.2. Problem Identification

One of the main problems in tobacco cultivation is the decreasing of the land productivity caused by erosion. For tens of year since 1970s, tobacco planting is done continuously. From day to day, the tobacco plant area increase. The area spread until the hills and water absorption area.

Tobacco which is planted on the dry field with altitude 800 – 1,400 m above the sea surface, and soil obliqueness approximately 40%. The method of soil cultivation still does not notice the natural resources preservation, so that it caused the fertility of the soil decline. Soil erosion has achieved 47.50 tons/hectare/annum. Whereas, the proper erosion maximum limit is 12 tons per hectare per annum (www.KCM.com).

The other cause of soil erosion is because the needs of organic fertilizer are very high. It is caused by the characteristics of tobacco which is not able to restrain water. The effect is when rain comes, soil in the tobacco plant area experience serious erosion. Tobacco plant also can be said as a cause of the environmental damage, because it absorbs the nutrition's element from soil in a huge amount. As the result, tobacco growing which is done continuously has caused the soil damage and run out of nutrition. The consequence is the farmers need plenty of organic fertilizers every entering plant time. For example, in a village in Kledung sub – district, when tobacco plant time is coming, there are more than 3, 000 truck carry on organic fertilizers enter that village. Those huge

organic fertilizers are only used for once in a village (Temanggung Regency in Central Java Profile).

The needs of fertilizer of tobacco plant per hectare are 600 kg Urea/Za fertilizer, 100 kg TSP fertilizer, 50 KCL/ZK fertilizer, and 16, 000 kg organic fertilizer. (Annual report of Forestry and Estate Office Temanggung, various editions)

Basically, tobacco plant depends on the weather condition. Climate also play important role in determining the quality of tobacco. If the weather is not good, less sunshine or rain, it can be ensured that the quality of Temanggung's tobacco will be decline. Then, if the merchants or farmers offer their tobacco to the representative of the cigarette manufacturers, there are big possibilities that they will reject it.

The other problem occurs in tobacco's cultivation are planting tobacco needs expensive cost and has high risk. The cost that is needed from plant the tobacco's seed until harvest and produce chopped – bit tobacco is very expensive compared to the other crops.

Besides that, the fluctuation of tobacco's price when harvest time is coming is not stable. There is no standard of price per quality which can be used as guidance in the efforts to increase the revenue of the farmer. So, the price agreement per quality between farmers and cigarette manufacturers basically has not been stable yet, sometimes it is dominated by the cigarette manufacturers.

Until now, the local government has not found yet the substitutes commodity which has economic value equal with tobacco. Farmers in Temanggung are a little bit difficult to be turned away from tobacco which promises high profit and gives welfare to them from year to year. Their resistance is very high. Farmers in that region have relied on their live on tobacco since tens years ago.

Tobacco has high economic potential. Because of that, the Government of Central Java Province interferes in tobacco planting matter in some Regencies. Tobacco whose has high economic value also encourages the farmers to plant that commodity. As a consequence, since 2001 the width area of tobacco plant in Central Java exceeded the estimation. Then, it can be ensured that tobacco production exceeds the demand of tobacco from the cigarette manufacturers. Because of over supply the tobacco's price drop to the lowest level. In this condition, the tobacco's farmers will face huge loss. On the other side, the cigarette manufacturers also not benefited from that condition, because the production capacity and the ability to store tobacco are limited. For them, surplus tobacco only will be rubbish (www.KCM.com). Table 1.4 below shows the width area of land and tobacco production in Central Java.

Table 1.4: the width area of land and tobacco production in Central Java

Year	The width area of land (hectare)	Tobacco production (ton)
2001	59, 681	38, 794
2002	63, 040	42, 727
2003	50, 238	29, 214
2004	49, 133	32, 560

Source: Forestry and Estate Office, Central Java

In 2002, Forestry and Estate Office of Central Java has decided the width area of tobacco plant not more than 47, 990 hectares. But, the realization, the entirety of the width area of tobacco plant in Central Java was 63, 040 hectares. On that year, the cigarette manufacturers only needed 25, 038 tons tobacco, meanwhile chopped bit tobacco's production in Central Java was 42, 727 tons (www.sinarharapan.com).

In 2004, the width area of tobacco plant was 49, 133 hectares and the production was 32, 560 tons; meanwhile, the demand from the cigarette manufacturers only 22, 160 tons (www.sinarharapan.com).

Therefore, there was 10,400 tons tobacco oversupply. It has caused the price of tobacco in the market decline, because based on the economic law, if there are many certain commodities (supply of certain commodities) in the market, meanwhile the demand is remain constant or decrease; the price of those certain commodities will be decreased.

Clove – flavored cigarette manufacturers, such as Djarum Kudus, Gudang Garam Kediri, and HM Sampoerna Surabaya usually have already had stock of tobacco for five years in the average. So, tobacco that they buy this year will be used to produce cigarette in the next three until five years later. Then the problem occurs, because if the tobacco they bought has good quality and if it is kept for a long time then the taste of the tobacco will be better. Conversely, if the tobacco they bought has bad quality, it will be damaged if it is stored for a long time (www.pikiranrakyat.com).

In some cases, other thing which makes the tobacco's price lower is the price manipulation which is usually done by the merchants. They usually press farmer's commodity price.

In order to fulfill the demand from the cigarette manufacturers, the tobacco farmers do two things. First, the farmers buy tobacco from other areas in Central Java as a mixture of Temanggung's tobacco. They mix Temanggung's tobacco with others tobacco because they expect that they will get more money by selling more tobacco to the cigarette manufacturers, even though it is not original ffrom Temanggung. The effects from this action are the quality of Temanggung's tobacco become lower and so does its price. Second, the farmers extend their land in the slope of Sumbing and Sindoro Mountains. This action will damage the main function of the forest as protector for the areas surrounding Sumbing and Sindoro Mountains. Land cultivation is done very intensively,

which may damage the environment. Now, almost half of that mountain's slope arid.

Another problem in tobacco is the tobacco's marketing. The trading chain is too long, that is from farmer to middleman, then to big merchant, next to the representative of cigarette manufacturers. The effect is the farmers as the tobacco's producers are not benefited because they do not know exactly how much the need of the cigarette manufacturers and how much actually the best price for their tobacco.

Trading chain which is too long will benefit the third parties, such as middleman and person which are trusted by the cigarette manufacturers. They will get profit from that condition and will not suffer from loss. Usually middleman buys tobacco from farmers with low price and then they sell it to the cigarette manufacturers with higher price. If the long trading chain were erased, the tobacco's price would not be that cheap and the farmers can enjoy the profit like what they have expected.

Big cigarette manufacturers are the biggest domestic tobacco absorber. Nevertheless, the farmers never know how much they need. Cigarette manufacturers seem to be closed about their needs of tobacco. Transparency from cigarette manufacturers about their need of tobacco will give benefit for the farmers. If there is transparency from cigarette manufacturers, it will enable the farmers to make better planning to plant tobacco and the price of tobacco will be

better too (not too low, so that the farmers will not suffer from loss). So, the tobacco's price can be accepted by all parties.

Problem faced by the tobacco's farmers placed them in a weak position. The problems are low quality of tobacco that they produced (the quality of tobacco was not good enough), farmers found some difficulties in produce tobacco which fit with market demand, over production, low bargaining position, and the taxes acceptance policy.

1.3. Problem Formulation

Based on the problem identification above, the writer formulates the following problems:

1. Does labor affect the tobacco production?
2. Does the width area of tobacco plant affect the tobacco production?

1.4. Problem Limitation

There are some limitations on this research:

1. This research is limited from 1986 – 2005.
2. The writer only used secondary data in this research, which are labors who work in the tobacco's fields and the width area of land. So, the writer only used labor and land as the factors of production. The writer

did not use other production's factors because the limited research time.

3. The writer only concern on agriculture production in doing this research.

1.5. Research Objectives

1. To analyze whether labor affect tobacco production.
2. To analyze whether the the width area of land affect the tobacco production.

1.6. Research Contributions

1. The Local Government

The writer hopes this research can be useful for local government to identify the potential of agriculture sector in Temanggung. This research might also be able to give some supporting data for local government of Temanggung about tobacco production.

2. The Writer

This research can give many positive contributions for the writer, mainly concerning to the analysis of tobacco production in Temanggung, Central Java. This research can be used also to practice the writer's ability in systematically analytical thought. Besides that, this thesis is presented as the

partial fulfillment of the requirement for the Bachelor Degree in Economics of Department of International Program, Faculty of Economic, the Islamic University of Indonesia, Yogyakarta.

3. Other Parties

This research might also give contribution for other parties that want to make similar research in the future, especially concerning about agriculture and microeconomics. It can be a reference for them in doing their research.

1.7. Definition of Terms

Production is the act of combining factors of production (labor, capital, etc.) by firms to produce outputs of goods and services. The relationship between inputs and outputs in physical terms is shown by the production function and in cost terms by the cost function. (DR. Chrsitopher Pass, B.Sc. (Econ), M. Sc., M.Phil., Ph.D. and DR. Bryan Lowes, B.Sc., M.Phil., Ph.D., Cert.Ed., ACMA, 1993:434)

CHAPTER II

REVIEW OF RELATED LITERATURE, THEORETICAL FRAMEWORK, AND HYPOTHESES FORMULATION

2.1. Literature Review

2.1.1. The Analysis of Sugarcane Production in PT. Gunung Madu Plantations Lampung

This research was written by M. Ariza Eka Yusendra. This research used time series data, from 1994 – 2003.

The objectives of this research were:

1. To know the factors affecting the production of sugarcane in Gunung Madu Plantations Company.
2. To know the production's elasticity.
3. To know the rate of returns to scale of sugarcane in Gunung Madu Plantations Company.

This research used statistics and econometrics as the analysis tools, especially regression and correlation with OLS approach. This research used Cobb – Douglas production function which was written as follows:

$$\text{Ln } Y = \ln a + b1 \ln X1 + b2 \ln X2 + b3 \ln X3 + b4 \ln X4 + b5 \ln X5 + \mu$$

The variables in this research were:

1. Dependent variable : Sugarcane Production (kg)
2. Independent variables : Land (M^2), seed (M^2), pesticide (lt), fertilizer (kg), labor (people).

The results of this research were:

1. There were 4 regression models to estimate the production and productivity of sugarcane, that were production model without dummy, production model with dummy, productivity model without dummy, and productivity model with dummy.
2. Based on the coefficient of determination (R^2), the model that could be used was production model without dummy and regression model with dummy.
3. On the production's regression model without dummy, the factors of production in the sugarcane production process were the width area of land, seed, labor, fertilizer, and pesticide. They simultaneously affected the sugarcane production.
4. On the production's regression model with dummy, the factors of production in the sugarcane production process were the width area of land, seed, labor, fertilizer, pesticide, and dummy. They simultaneously affected the sugarcane production.

5. On the production's regression model without dummy, one of the production factor (seed) affected negatively to the sugarcane production; meanwhile other factors of production (the width area of land, labor, and fertilizer) affected positively.
6. On the production's regression model with dummy, the width area of land, labor, and fertilizer affected positively.
7. On the production's regression model without dummy, the width area of land, labor, and fertilizer were inelastic, meanwhile seed was elastic.
8. On the production's regression model with dummy, the width area of land, labor, and fertilizer were inelastic.
9. PT. Gunung Madu Plantations was capital – intensive and increasing returns to scale.

2.1.2. The Analysis of Japanese Eggplant Production in PT. Handaru Inti Tulodho Sleman

This research was written by Novi Febriyanto Yudith. This research used secondary data taken from PT. Handaru Inti Tulodho. The data were compilation between time series and cross section data. The time series data were taken from 1997 – 2001; meanwhile the cross

section data was the data of the plant location of Japanese eggplant which consists of 61 sample of Japanese eggplant plant location.

The objectives of this research were:

1. To know the factors affecting the Japanese eggplant production.
2. To know the elasticity of Japanese eggplant's production.
3. To know the rate of returns to scale of Japanese eggplant production in PT. Handaru Inti Tulodho.

This research used descriptive analysis method. This method also used study case technic, so this research focused on the recent phenomenon and in the real context.

This research used statistics instrument. Meanwhile to analyze the factors of production of Japanese eggplant, the writer used Cobb – Douglas production function.

The Cobb – Douglas production function was:

$$\text{Ln } Y = \text{Ln } X1 + \text{Ln } X2 + \text{Ln } X3 + \text{Ln } X4 + \text{Ln } X5 + D$$

Where: Y = Japanese eggplant production (kg)

X1 = the width area of land (M^2)

X2 = fertilizer (kg)

X3 = pesticide (lt)

X4 = labor (people)

X5 = seed

D = Dummy variable; D0 = dry season and D1 = wet season

The estimate equation of the regression result was:

Ln Y = 19.561 + 0.001277 Ln X1 – 5.948 Ln X2 + 6.573 Ln X3 + 0.584 Ln X4 – 0.595 Ln X5 – 0.507 D

The results of this research were:

1. Based on the t – test, the width area of land was not significant to the Japanese eggplant production; whereas other variables (seed, labor, pesticide, and fertilizer) were significantly influence the Japanese eggplant production.
2. Based on the F – test, all variables simultaneously affected the Japanese eggplant production.
3. The regression's coefficient of Cobb – Douglas production function showed the elasticity. The elasticity of fertilizer was – 5.948; it means if the fertilizer was increased by 1%, the Japanese eggplant production would decrease by 5.948%. The elasticity of pesticide was 6.573; it means if the pesticide was increased by 1%, the Japanese eggplant production would increase by 6.573%. The elasticity of labor was 0.584; it means if the labor was increased by 1%, the Japanese eggplant production would increase by 0.584%. The elasticity of seed was 0.595; it means if the seed was increased by 1%, the Japanese

eggplant production would decrease by 0.595%. The elasticity of season showed that dry season gave better effect to the Japanese eggplant production than wet season.

4. Pesticide, seed and fertilizer were elastic; meanwhile the labor was inelastic.
5. PT. Handaru Inti Tulodho was decreasing returns to scale and labor – intensive.

2.1.3. The Efficiency of Using the Factors of Production on The Temanggung's Tobacco Farming in Pujon, Malang

This research was written by Sri Yulaikah and Mukani. This research used primary data taken randomly from 28 tobacco's farmers in Ngabab village, Pujon, Malang. This research used cross section data, from April 1988 until Juni 1988.

The objectives of this research were:

1. To know the factors affecting the tobacco production.
2. To know the efficiency level on the Temanggung's tobacco farming in Pujon, Malang.

This research used econometrics as the analysis tools. The analysis method of this research was Cobb – Douglas production function which was written as follows:

$$\text{Ln } Y = b_0 + b_1 \ln X_1 + b_2 \ln X_2 + b_3 \ln X_3 + b_4 \ln X_4 + b_5 \ln X_5 + b_6 \ln X_6 + b_7 \ln X_7 + b_8 \ln X_8 + \mu$$

Where:

Y = Tobacco production (kg)

X_1 = Seed (tree)

X_2 = Urea fertilizer (kg)

X_3 = TSP fertilizer (kg)

X_4 = ZA fertilizer (kg)

X_5 = ZK fertilizer (kg)

X_6 = Organic fertilizer (kg)

X_7 = Pesticide (litre/kg)

X_8 = Labor (people)

The results of this research were:

1. The using of Urea and ZK fertilizer were on the stage 2 of production. It means the tobacco production in Pujon, Malang was increasing return to scale.
2. Urea and ZK fertilizer influenced the tobacco production on the 5% significance level.
3. The regression's coefficient of Urea fertilizer was 0.219 and ZK fertilizer was 0.295. It means if the using of Urea fertilizer was increased by 10%, the tobacco production would increase 2.19%;

meanwhile if the using of ZK fertilizer was increased by 10%, the tobacco production would increase 2.95%

4. ZA fertilizer, pesticide, and labor influenced the tobacco production on the 10% significance level. Whereas seed, TSP fertilizer and organic fertilizer did not affected the tobacco production.
5. To increase the income of the tobacco's farmers, it can be done by increasing the using of Urea, ZK, ZA fertilizer, and reduced the using of pesticide and labor.

2.1.4. Relative Economic Efficiency of Tobacco Farming According to The System of Land Ownership in Temanggung, Central Java

This research was written by Dewi Kusuma Wardani and Waridin. This research used primary data taken from the tobacco's farmers and secondary data taken from related institutions. This research used cross section data, from April 2001 until September 2001. This research used survey method.

The objectives of this research were:

1. To analyze the allocation of the using of factors of production in tobacco farming according to the land ownership.

2. To analyze and compare the efficiency levels, in terms of technique, cost and economic of the owner farmers and non – owner (rent and sharecropping) farmers who cultivated tobacco farming in Temanggung, Central Java.

This research used econometrics as the analysis tools. The analysis method of this research was Cobb – Douglas production function which was written as follows:

$$\text{Ln } Q = \ln \acute{\alpha}_0 + \acute{\alpha}_1 D_L + \acute{\alpha}_2 \ln L + \acute{\alpha}_3 \ln K_1 + \acute{\alpha}_4 \ln K_2 + \acute{\alpha}_5 \ln K_3 + v$$

Where:

Q = Tobacco production (kg)

L = Labor (people)

K_1 = Seed (tree)

K_2 = Fertilizer (kg)

K_3 = Pesticide (litre)

D_L = Dummy varianle of the land ownership (D = 1 means the owner farmers, and D = 0 means the non – owner farmers)

v = Standard error

The results of this research were:

1. The input variables, namely seed, fertilizer, pesticide amd labor affected the tobacco production.

2. The input variables for the owner farmers and non – owner (rent and sharecropping) farmers have not been used optimally.

2.1.5. The Analysis of Using of Inputs of paddy in Seso Village, Jepon sub – district, Blora

This research was written by Siti Fatimah Nurhayati. The objectives of this research were:

1. To analyze the level of using of inputs (land, labor, seeds, fertilizer and pesticide) in paddy production in Seso village, Jepon sub – district, Blora.
2. To measure whether the using of inpust (labor, seeds, fertilizer, and pesticide) in paddy production in Seso village, Jepon sub – district, Blora has been economically efficient or has not been yet.

This research used econometrics instrument, meanwhile the model that was used was Cobb – Douglas production function.

Mathematically, the paddy production function could be written as:

$$Y = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7)$$

Where:

Y = Paddy production (kg)

X_1 = Land (m^2), because in the short – run this variable was relatively constant, so this variable was not included in the model. Dummy variable was used as the substitute for this variable to see whether there was difference of using of input for the width area of land which was less than 1 hectare (D = 0) with the width area of land which was more than 1 hectare (D = 1)

X_2 = Labor (hour)

X_3 = Seed (kg)

X_4 = Solid fertilizer (kg)

X_5 = Liquid complement fertilizer (litre)

X_6 = Solid pesticide (kg)

X_7 = Liquid pesticide (litre), this variable was not used in the model because the paddy production in Seso village did not use this type of pesticide.

The Cobb – Douglas production function could be written as:

$$Y = a + b_1 D + b_2 \log X_2 + b_3 \log X_3 + b_4 \log X_4 + b_5 \log X_5$$

The results of this research were:

The coefficient of determination (R^2) was 0.8727 which means the variation of paddy production could be explained by the independent

variables as 87.27% and the rest 12.73% was explained by other variable outside the model.

The result of t – test was labor, seed, solid fertilizer, and liquid complement fertilizer influenced the paddy production, even though they were significant at the different level. Whereas the dummy variable showed that there was no difference in the using of inputs.

From F – test, it was known that all inputs simultaneously affected the paddy production with 1% significance level.

Based on the classical assumption test, it showed that there was correlation between labor and solid fertilizer. There was no heteroscedasticity which means each disturbance element has the same variance.

Inputs which were used by paddy's farmer in Seso village were fit with the Agriculture Office's suggestion. But, the using of inputs has not been efficient yet. It was proven by the Marginal Value Product divided by the price of input; the result was not equal to one.

Therefore, the conclusions from this research were:

1. There was no difference in using of inputs for the width area of land which less than 1 hectare with the one which more than 1 hectare.

2. The using of inputs (labor, seed, solid fertilizer, and liquid complement fertilizer) in paddy production in Seso village has not achieved the economic efficiency level yet.

2.1.6. The Optimalization of Paddy and Corn Production in Boyolali

This research was written by Fransisca Widyaningtyas. The data that were used in this research is secondary data, time series data for 11 years (from 1986 – 1996).

The analysis of this research used Linear Programming (LINDO program).

The objectives of this research were:

1. Compared actual paddy and corn production with paddy and corn production if all resources were used to produce paddy and corn.
2. Compared actual paddy and corn production with paddy and corn production if the available resources were used to produce paddy, corn, sweet potato, soybean, and peanut.
3. To know the maximum contribution of paddy and corn to the local government revenue if all resources were used to produce paddy and corn.

4. To know the maximum contribution of paddy and corn to the local government revenue if the resources were used to produce paddy, corn, sweet potato, soybean, and peanut.

The variables in this research were:

1. Dependent variable: Paddy production in wet – fields, paddy production in dry – fields, corn production in wet – fields, corn production in dry – fields.
2. Independent variables: The width area of wet – fields, the width area of dry – fields, urea fertilizer, TSP fertilizer, KCL fertilizer, ZA fertilizer, human labor, animal labor, rice consumption and corn consumption.

In the analysis, the writer used two assumptions:

1. Assumed all available resources were used to produce paddy and corn.
2. Assumed the using of resources to produce paddy and corn concerned the proportion of using the resources to produce other crops, such as sweet potato, soybean, and peanut.

The results of this research were:

1. For 11 years (1986 – 1996), the real production of paddy was surplus, in the average 2,068.58 tons. But, the surplus only happened in 1986, 1992, and 1995. Based on Optimalization Linear Programming

analysis with the first assumption, paddy surplus was 22,913.15 tons in the average, surplus happened every year. Meanwhile, the result of Optimalization Linear Programming analysis with the second assumption, paddy surplus was 2,142 tons in the average, surplus on the 9th year.

2. On the corn, the optimum production was smaller compared to the real corn production. It caused in the reality the farmer would rather to plant corn, because of low production cost, the marketing and the maintenance were relatively easier, the physical condition of Boyolali was suitable to plant corn, and the secondary result of corn's production that could be used to feed the cattle.
3. The contribution of paddy and corn to the local government revenue were not maximal. The real contribution was only 10.68%. Meanwhile based on Optimalization Linear Programming, the maximal contribution on the first assumption was 21.72% in the average, and 17% on the second assumption.
4. The paddy production was elastic to the change of the width area of wet – fields, human labor, and animal labor.
5. Corn production was constant to the change of the width area of wet – fields, human labor, and animal labor.

2.2. Theoretical Framework

2.2.1. The roles of agriculture sector

Agriculture is an important sector in almost all developing countries. Agriculture sector plays an important role. This is shown by its contribution to GDP and its role on labour absorbtion.

Agriculture sector in most of developing countries is the main provider of job field and the main source of revenue for the majority of citizens. The contribution of agriculture sector in allocating job field in developing countries can achieve 35% (Daryanto, 2001). GDP of developing countries in Asia and Africa that come from agriculture sector is 41% and 57% (World Bank, 1997).

In the future, the relevancy between agriculture sector with industrial sector still be development model, concerning four roles of agriculture sector in the economic development which is still relevant (Daryanto, 2001).

Those four roles of agriculture sectors are:

1) Agriculture sector yields/produces food and raw material for industrial and service sector.
2) Agriculture sector can bring currency exchange which comes from export of agricultural product or import of substitution product.

3) Agriculture sector is a potential market for industrial sector's product.

4) Surplus transfer of labor from agriculture sector to industrial sector is a source of economic growth.

2.2.2. Production Theory

Production is an activity to process input into output, or change any output become other output (give value added).

In practice, factors affecting production can be distinguished into 2 (Soekartawi: 1994), they are:

1. Biology factor, such as land.
2. Social economy factor, such as labor, production cost, price, education evel, income, risk, etc.

Production's Factors

Factor of production is all sacrifice which is given to the plant in order to that plant is able to grow up well and yield high output. The production's factor is used to know how the scarce resources, such as land, labor, and capital can be managed well in order to achieve the maximum production. The main production's factors consist of land, capital, fertilizer, pesticide, labor, and management aspect. Those main production's factors are more important than other factors of production.

The relationship between factors of production (input) and production (the amount of output that can be obtained) is usually called production function or it also may be called factor relationship. The theory of production begins with the notion of the production function. The production function specifies the maximum output that can be produced with a given quantity of inputs (Samuelson, 2001:109).

More specifically, the production function is a table, a graph, or an equation showing the maximum output rate that can be achieved from any specific set of usage rates of inputs (Edwin Mansfield, 1994:182). In the short – run, production function shows total maximum output that can be produced from the total of various variables input and the total of fixed input.

The production function is:

$$P = f(\text{Land, Labor, Capital})$$

Based on the equation above, the amount of production depends on the role of the production's factors and other factors which are not include in the production function. But, it also must consider that production also affected by the local condition, concerning agriculture's characteristic which its adaptation depends on the local condition (Soekartawi: 1999).

But, there are often some obstacles in the process of increasing the agriculture output. According to Gomez (1980), some obstacles which are

often affecting the agriculture production can be classified into two, they are:

a. The obstacle which influence yield gap I, which consists of variable outside human capability, so that it is difficult to do transfer of technology which is caused by difference in agro – climate and technology which is difficult to be adopted.

b. The obstacle which influence yield gap II, which consists of biologic technical variable (such as seeds, fertilizer, pesticide, land, etc.).

There are 2 types of production's factors:

1. Fixed production's factor.

   It means the production's factor still can be used more than one time of production process. Fixed production's factor only available in the short – term company. Production's factors which are considered to be fixed are capital, tools, machinery, and building.

2. Variable production's factor.

   Variable production's factor is the factors which are increased in the short run, such as labor, land, etc.

Short Run and Long Run Production Function

Production requires not only labor and land but also time. There are two different period of time:

1. Short run

   It is a period in which firms can adjust production by changing variable factors such as materials and labor but cannot change fixed factors such as capital.

2. Long run

   It is the period of time in which all inputs, fixed and variable can be adjusted. When all factors can be adjusted, the total amount of input will be higher and the level of efficiency can be increase.

In the short run, there are 3 stages of production:

1. Stage 1.

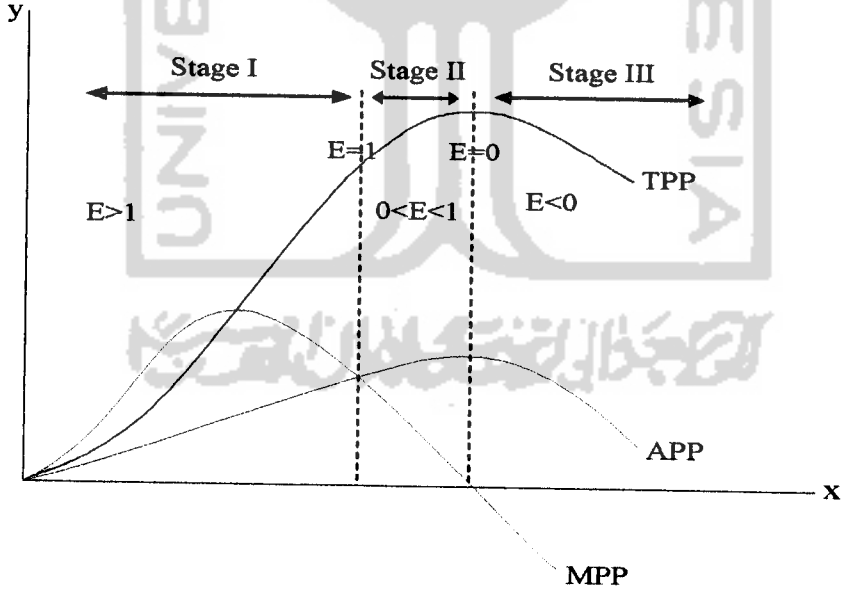
   It is the situation where there is increasing at increasing rate. Means if the input is added 1%, therefore the output will increase more than 1%, so that the average product curve will always increase. This area is irrational and elastic. If the marginal product has not been equal with average product yet, the using of production's factors will be added continuously in order to increase the production to achieve the maximal point. The rational producer will not stop his production in this stage.

2. Stage 2.

It is the situation where there is increasing at decreasing rate. It is inelastic and it is rational area because the production is in optimum condition. Every increase of production's factors still can increase the production. But, the percentage of the increasing of production is continuously to decline every increasing of production's factors.

3. Stage 3.

It is the situation where there is decreasing. It is elastic and irrational area because every increase in production's facors will decrease the production. It cannot increase the total product (output). Therefore, it will only causes in loss.



Curve 2.1. The curve of the stages of production

Total, Average, and Marginal Product

1. The total physical product (TPP) or total product (TP) is designates the total amount of output produced on the various level of using of input.

   TPP = f (X) or Y = f (X)

2. The marginal product of an input (MP) is the extra output produced by 1 additional unit of input while other inputs are held constant. The term "marginal" means "extra". Marginal Product is derived from total product.

$$MP = \frac{\Delta TP}{\Delta X}$$

$$= \frac{\Delta Y}{\Delta X}$$

$$= \frac{df(Y)}{dX}$$

3. The average product (APP) is the average output per unit of input on the various level of using of input.

$$AP = \frac{TP}{X}$$

$$= \frac{d(Y)}{X}$$

The Elasticity of Production

It is the percentage change from output as a result from the percentage change of input (Soekartawi:1994).

The formula of Elasticity of production:

$$\text{Elasticity of production} = \frac{ThePercentageChangeOfOutput}{ThePercentageChangeOfInput}$$

$$= \frac{dY/Y}{dx/X} = \frac{dY/dX}{Y/X}$$

$$= \text{MP} \cdot \frac{1}{AP}$$

$$= \frac{MP}{AP}$$

The Law of Diminishing Returns (LODR)

The law of diminishing returns holds that we will get less and less extra output when we add additional doses of an input while holding other inputs fixed. In other words, the marginal product of each unit of input will decline as the amount of that input increases, holding all other inputs constant (Samuelson, 2001:110)

It happens when we add more and more variable input to the fixed input. After some points we get less and less extra input, because the input does not work efficiently.

For example more of an input such as labor is added to a fixed amount of land, machinery, and other inputs. The labor has less and less of

the other factors to work with. The land gets more crowded, the machinery is overworked and the marginal product of labor declines. We can calculate the marginal product of each input (labor, land, machinery, water, fertilizer, etc.), and the marginal product would apply to any output (wheat, corn, steel, soybeans, and so forth). We would find that other inputs also tend to show the law of diminishing returns.

According to the law of diminishing returns, the marginal product of each input will generally decline as the amount of that input increases, when all other inputs are held constant.

Diminishing returns in farm experiments

The law of diminishing returns is often observed in agriculture. As farmer adds more labor, the fields will be more thoroughly seeded and weeded, irrigation ditches will be neater, and scarecrows better oiled. At some point, however, the additional labor becomes less and less productive. The third hoeing of the field or the fourth oiling of the machinery adds little to output. Eventually, output grows very little as more people crowd onto the farm; too many tillers spoil the crop (Samuelson, 2001:111)

Returns to Scale

Diminishing returns and marginal products refer to the response of output to an increase of a single input when all other inputs are held

constant. It reflects the impact on output of a balanced increase in all inputs.

Three important things in Returns to Scale:

1. Constant returns to scale denotes a case where a change in all inputs leads to a proportional change in output. For example, if labor, land, capital, and other inputs are doubled, then under constant returns to scale output would also double. Many handicraft industries (such as haircutting in America or handloom operation in a developing country) show constant returns.
2. Increasing returns to scale (also called economies of scale), arise when an increase in all inputs leads to a more – than – proportional increase in the level of output. For example, an engineer planning a small – scale chemical plant will generally find that increasing the inputs of labor, capital, and materials by 10% will increase the total output by more than 10%. Engineering studies have determined that many manufacturing processes enjoy modestly increasing returns to scale for plants up to the largest size used today.
3. Decreasing returns to scale occur when a balanced increase of all inputs leads to a less – than – proportional increase in total output. In many processes, scaling up may eventually reach a point

beyond which inefficiencies set in. These might arise because the costs of management or control become large. One case has occurred in electricity generation, where firms found that when plants grew too large, risks of plant failure grew too large. Many productive activities involving natural resources, such as growing wine grapes or providing clean drinking water to a city, show decreasing returns to scale (Samuelson, 2001:112).

Production shows increasing, decreasing, or constant returns to scale when a balanced increase in all inputs leads to a more – than – proportional, less – than – proportional, or just – proportional increase in output.

2.2.3. Non – linear Production Function

This function is similar to the Cobb – Douglas production function (for this reason, it also called semi Cobb – Douglas production function). The difference lays on that the summation of α and β are not necessarily to be 1. It can be bigger than 1 if the production is increasing returns to scale; it can be less than 1 if the production is decreasing returns to scale. If econometrically proven that α and β equals to 1, then this non – linear production function is a Cobb – Douglas production function.

2.2.4. Theory of Regression

The writer uses the regression analysis with the OLS (ordinary least square) method or smallest square method.

Earlier approach has indicated that according to certain assumption smallest square method yields the linear estimating and do not deflect to have the variants which is minimum. Shortly, mentioned appraiser of BLUE.

Data analysis used in a regression model can be in the form of linear function or non – linear function that is also known as log linear function.

Linear function can be written as follows:

$$Y = \acute{\alpha}_0 + \acute{\alpha}_1 X_1 + \acute{\alpha}_2 X_2 + \ldots + \mu$$

Meanwhile log linear function can be written as follows:

$$\text{Ln } Y = \text{Ln } \acute{\alpha}_0 + \acute{\alpha}_1 \text{ Ln } X_1 + \acute{\alpha}_2 \text{ Ln } X_2 + \ldots + \mu$$

Where:

Y = Variable which is the level of depended price X_1, X_2 ... X_n

X_1, X_2 = Independent variables

$\acute{\alpha}_0$ or Ln $\acute{\alpha}_0$ = Intercept

$\acute{\alpha}_1, \acute{\alpha}_2, \ldots \acute{\alpha}_n$ = Coefficient of regression

μ = Error term

In the linear function, $\acute{\alpha}_1$, $\acute{\alpha}_2$, ... $\acute{\alpha}_n$ are the marginal productivity of inputs.

In the log linear function, $\acute{\alpha}_1$, $\acute{\alpha}_2$, ..., $\acute{\alpha}n$ are the elasticity coefficients of inputs.

2.3. Hypotheses Formulation

As guidance, this research uses the following hypotheses:

1. That labors who work in the tobacco's fields have a significant effect on the tobacco production. The effect can be positive which means that the use of labors are in the stage 1 if the coefficient is bigger than 1 or in the stage 2 if the coefficient is less than 1. The effect can also be negative, if the use of labors is in the stage 3 of production.
2. That the width area of tobacco plant has a significant effect on the tobacco production.

CHAPTER III

RESEARCH METHOD

3.1. Research Method

The research method used in this research is quantitative analysis. The quantitative analysis is a characteristic of variables where the mark stated on the numerical form. The characteristics of the measurement variable make the mark being placed in an interval.

The writer also used literature study in order to get theory to help solving the problems in this research by learning the literatures and books related to the analysis and problems of research. Referring to the former research, M. Ariza Eka Yusendra, Novi Febriyanto Yudith, and Sri Yulaikah and Mukani, the writer uses different variables and different methodologies.

3.2. Research Subject

The research subject is The Analysis of Tobacco Production in Temanggung, Central Java From 1986 – 2005

3.3. Research Setting

The research setting is on Faculty of Economics of Islamic University of Indonesia, Yogyakarta (library and reference room), Center Bureau of Statistic

of Temanggung, Industry and Commerce Office of Temanggung, and Forestry and Estate Office of Temanggung.

3.4. Research Instrument

The research instruments utilized in this research were through the literature and data study in the library and reference room in the Faculty of Economics of Islamic University of Indonesia, Yogyakarta, also through Center Bureau of Statistic of Temanggung, Industry and Commerce Office of Temanggung, and Forestry and Estate Office of Temanggung from where the writer gathered the data. This research also supported by phenomena watching in agriculture field in Temanggung that focused on the tobacco production in which sourced from newspapers and internet.

Some of data missing in this research due to the limitedness of the Forestry and Estate Office and Central Bureau of Statistic in Temanggung in providing the data. The missing data are: tobacco labor in 1986, 1987, 1991, and 1993. Therefore, to complete the data, the writer used linear interpolation method to estimate the missing data. The formula to calculate it and the result will be explained in Appendix II.

3.5. Research Variables

The variables in this thesis are categorized into two variables: dependent variable and independent variables. Both variables are described as follows:

3.5.1. Dependent variable

The dependent variable in this research is the production of tobacco (Q_t) in Temanggung.

3.5.2. Independent variables

The independent variables in this research consist of two variables, they are:

3.5.2.1. Labors who work in the tobacco's fields (Lb_t)

3.5.2.2. The width area of tobacco plant (L_t)

3.6. Choosing Regression Model

The writer runs the MWD (Mc Kinnon, White, Davidson) test to choose the best model for this research. After getting the result of the estimation, the decision to choose the best model is shown by the value of Z in which it is provided through MWD test. The result of MWD test can be looked on the Appendix III. MWD test shows that the probability of Z value both in the linear and non – linear model is not statistically significant. Therefore, the writer may choose linear or non – linear model in the regression analysis. However, the linear model is more appropriate to test the

hypothesis because the regression's result shows better result than non – linear model. It has higher coefficient of determination (R^2). So, the writer decides to use linear regression function in this research.

3.7. Technique of Data Analysis

Mathematically, the production function of tobacco in Temanggung can be written as follows:

$$Q_t = f(Lb_t, Lt)$$

Where:

Q_t = The production of tobacco in Temanggung (ton)

Lb_t = Labors who work in the tobacco's fields (people)

L_t = The width area of tobacco plant (hectare)

The linear regression function for tobacco can be written as follows:

$$Q_t = \alpha_0 + \alpha_1 Lb_t + \alpha_2 Lt$$

Where:

α_o = Intercept of tobacco

α_1, α_2 = Coefficient of regression of tobacco

But, that production function cannot be used yet as an analysis tools because that model should be tested with some steps of statistical testing that are t – test, F – test and R^2.

t – test is used to test the significant level from each regression coefficient (parameter). The next test is F – test, which is used to test whether all independent variable simultaneously affect the dependent variable or not. The other test is measure the Goodness of Fit or it is also known as the coefficient of determination (R^2) from regression equation, which gives total variation percentage or proportion in independent variables explain in the model. The higher the R^2, the regression line of the model is better (Aan M.Yunianto, 2003:150 – 151). Beside those statistical tests, the writer also analyzes the classical assumptions deviation, such as multicollinearity, autocorrelation, and heteroscedasticity. By using OLS method, it is expected that the Best Linear Unbiased Estimator (BLUE) will be got by the writer. Basically, the content of this method is normal determination through minimization of Error Square.

3.7.1. Statistical Test

3.7.1.1. t – test

t – test is used to know the correlation between the dependent variable and independent variable individually. In this research, the writer uses two tail test.

Computed t value: $t = \frac{\beta_i}{Se\beta_i}$

The hypotheses that use two tail test can be written as follows:

- Ho: $\beta i = 0$; i = 1, 2, ...etc.

  Individually, the independent variable does not have an effect on the dependent variable.

- Ha: $\beta_i \neq 0$; i = 1, 2, ...etc.

  Individually, the independent variable has an effect on the dependent variable. The effect might be positive or negative.

Critical t – value = t_α df (n – k)

Where: α = Level of significance

df = Degree of freedom

n = The amount of data

k = The number of variables (including constant)

The decision for two – tail hypotheses will be made with the parameter (α) 5% based on the following rules:

1. When the value of computed – t < critical – t value (t table value), Ho is accepted. In this case, the independent variables significantly do not influence the dependent variable.

2. When the value of computed – t > critical – t value (t table value), Ho is rejected. In this case, the independent variables significantly influence the dependent variable.

3.7.1.2. F – test

F – test is a test of the overall significance of the observed or estimated regression line, whether all independent variables simultaneously have an effect on dependent variable by using F distribution. The testing of F test is as the same as the testing for t – test.

Computed F value:

$$F = \frac{R^2 / (k - 1)}{(1 - R^2) / (n - k)}$$

The hypotheses are formulated as follows:

- Ho: $\beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = 0$: all of the independent variables simultaneously do not affect the dependent variable.
- Ha: $\beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq \beta_5 \neq 0$: all of the independent variables simultaneously affect the dependent variable.

To find critical F – value: F_α df denominator = (n – k), df numerator = (k – 1)

Where: α = Level of significance

n = The number of observations

k = The number of variables (including constant)

The decisions are as follows:

1. If the computed F value < critical F value, the decision is accept Ho and Ha is rejected. It means all independent variables are not statistically significant.
2. If the computed F value > critical F value, the decision is reject Ho and Ha is accepted. It means all independent variables are statistically significant.

3.7.1.3. Coefficient of Determination (R^2)

R^2 is a summary measure that tells how well the sample regression line fits the data (Gujarati: 2003: 81). R^2 is used to detect how far the independent variables influence the dependent variable in the model (Gujarati, 1995: 207). R^2 almost invariably increases and never decreases.

R^2 formula:

$$R^2 = 1 - \frac{\sum et^2}{\sum yi^2}$$

R^2 behavior:

1. R^2 is always taken to be positive.
2. Border is among $0 < R^2 < 1$

Note:

- $R^2 > 1$: Perfectly match
- $R^2 < 0$: No relation between independent variables with dependent variable
- $R^2 = 1$: Independent variables explain the dependent variable as much as 100%.
- $R^2 = 0$: Dependent variable has nothing explained by independent variables

The closer the number of R^2 to 1, the better the model explains about relationship between dependent variable and independent variables. If R^2 closer to 0, the regression line is not good enough, because it is unable to explain the actual data.

3.7.2. Classical Assumption Test

Basically this test is used to know whether the model in this research is a valid model or not. We can say the model is a valid model if there is no autocorrelation, heteroscedasticity, and multicollinearity in the model.

3.7.2.1. Autocorrelation

The term autocorrelation is defined as correlation between members of series of observations ordered in time (as in time

series data) or space (as in cross sectional data). (Gujarati, 1995: 400). In its relationship with the assumption of OLS method, autocorrelation is correlation between one residual with the others. Whereas one important assumption of OLS method related to the residual is there is no relationship between one residual with the others. (Widarjono, 2005:177)

If there is no autocorrelation between residual, stated as follows: $E(e_i e_j) = 0 \qquad i \neq j$

Whereas if there is autocorrelation among residual: $E(e_i e_j) \neq 0 \qquad i \neq j$

The tool of analysis used to detect autocorrelation is using LM test (Lagrange Multiplier test). This test uses the level of degree (χ^2). The decisions are as follows:

- If the computed χ^2 (Obs*R – squared) value < critical χ^2 value = there is no autocorrelation in the model.
- If the computed χ^2 (Obs*R – squared) value > critical χ^2 value = there is autocorrelation in the model.

The critical χ^2 value can be seen from χ^2 – table, with certain level of significance and df = the number of lag used.

To choose the length of proper residual lag, we can use criteria which are stated by Akaike and Schwarz. Based on these

criteria, the chosen lag is when the value of Akaike and Schwarz's criteria is the smallest.

3.7.2.2. Heteroscedasticity

An important assumption of heteroscedasticity shows the conditional variance of Y increases as X increases. Here the variances of Y are not the same (Gujarati, 2003: 388). It is a situation where the variance is not constant for all the free variables. To detect the heteroscedasticity, the writer uses one of the formal method; that is White's General Heteroscedasticity Test with cross term.

The White test is thus a two – stage procedure. In the first stage, the writer runs the OLS regression disregarding the heteroscedasticity question. The writer gets μ_i from this regression, and then in the second stage the writer runs the regression as follows:

The linear regression for tobacco:

$$Q_t = \alpha_0 + \alpha_1 Lb_t + \alpha_2 Lt + \mu_i$$

From the regression above, then do a regression with auxiliary regression, the model is:

$$\mu^2_i = \acute{\alpha}_0 + \acute{\alpha}_1 Lb_t + \alpha_2 Lt + \alpha_3 Lb_t^2 + \alpha_4 Lt^2 + \alpha_5 Lb_t Lt + \mu_I$$

Degree of freedom for χ^2 = number of regressors (excluding the constant) in auxiliary regression. (Gujarati, 2003: 413)

The decisions are as follows:

- If the Obs*R – squared (computed chi – square) value < critical χ^2 (chi – squared) value at the chosen level of significance, there is no heteroscedasticity in the model.
- If the Obs*R – squared value > critical χ^2 value, therefore there is heteroscedasticity in the model.

3.7.2.3. Multicollinearity

Multicollinearity means the existence of a perfect or exact linear relationship among some or all – explanatory variables of a regression model (Gujarati, 1995: 320). The consequences of multicollinearity are if there is perfect collinearity between the X's, their regression's coefficients are in determine and their standard errors are not defined. If the collinearity is high but not perfect, the estimation of regression coefficients is possible but their standard errors tend to be large. As a result, the population values of coefficients cannot be estimated precisely. However, if the objective is to estimate linear combination of these coefficients, the estimable functions can be done even in the presence of perfect multicollinearity (Gujarati, 1995: 345).

The writer uses Correlation Matrix test to detect the Multicollinearity. That method tests the correlation coefficient (r) among independent variables.

The decisions are as follows:

- If the correlation (r) < 0.85 = there is no multicollinearity in the model. It means the model fulfill the assumption.
- If the correlation (r) > 0.85 = there is multicollinearity in the model (Widarjono: 2005). It means the model does not fulfill the assumption.

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CHAPTER IV

THE DESCRIPTION OF RESEARCH AREA

4.1. The Location, the width area and the border of research area

Temanggung is a Regency in Central Java with geographical position lies between 110°23' – 110°46'30" East Longitude and 7°14' – 7°32'35" South Latitude. The farthest distance from the West to the East is 43,437 km; meanwhile the farthest distance from North to the South is 34,375 km. The borders of Temanggung are:

- In the North border with Kendal.
- In the South border with Magelang.
- In the West border with Wonosobo.
- In the East border with Semarang.

The entirety width area of Temanggung is 87,065 Ha, 20,644 Ha are fields.

The morphology of Temanggung is a concave. It means low in the middle, while in its surroundings are mountains and hills. Basically the morphology of Temanggung can be differentiated into two that are lowlands and highlands area. Most of Temanggung's areas are highlands area with 500 – 1450 m height above sea surface.

4.2. Climate

Climate is the average of atmosfir condition in certain place in the long period of time. The condition of climate is different in each area. It depends on the location of its latitude. Factors that affect climate are sunlight's radiation, evaporation and rainfall.

The type of climate can be determined by using the data of rainfall and temperature. In this research, the writer only uses rainfall data and uses Schmidt – Ferguson climate classification to determine the type of climate in Temanggung.

Climate classification according to Schmidt – Ferguson

Climate type classification according to Schmidt – Ferguson is based on the Q value, which is a comparison of the average of dry – month and the average of wet – month. The decision of wet – month and dry – month is based on Mohr method that are if the total amount of rainfall in 1 month is more than 100 mm, it called wet – month, and if the total amount of rainfall in 1 month is less than 60 mm, it called dry – month. As a base of climate classification, Schmidt – Fergusson uses this formula:

$$Q = \frac{AverageOfDryMonth}{AverageOfWetMonth}$$

Based on the Q value, hence the climate of the research area can be determined by looking at the table 4.1 below.

Table 4.1. Type of Climate Based On Schmidt – Ferguson Based On The Q Value (Bayong, 1999)

No	Climate Type	Criteria	Explanation
1.	A	$0 \leq Q < 0{,}143$	Very wet
2.	B	$0{,}143 \leq Q < 0{,}333$	Wet
3.	C	$0{,}333 \leq Q < 0{,}600$	Rather Wet
4.	D	$0{,}600 \leq Q < 1{,}000$	Medium
5.	E	$1{,}000 \leq Q < 1{,}670$	Rather Dry
6.	F	$1{,}670 \leq Q < 3{,}000$	Dry
7.	G	$3{,}000 \leq Q < 7{,}000$	Very Dry
8.	H	$7{,}000 \leq Q$	Extremely Dry

Therefore, based on the Q value, it is known that Temanggung has C climate type (rather wet). The computation can be seen on the table 4.2. below:

Tabel 4.2. Total and Average of Wet – Month and Dry – Month in Temanggung (counted from rainfall data)

Year	Month	Station					
		Jumo	Jumprit	Ngadirejo	Pleret	Kledung	Kandangan
1986	WM	7	6	6	9	3	6
	DM	4	6	5	3	4	4
1987	WM	7	7	7	6	5	8
	DM	2	4	3	6	5	3
1988	WM	7	9	9	8	7	8
	DM	3	3	3	3	3	2
1989	WM	10	11	11	9	10	9
	DM	1	1	1	2	0	2
1990	WM	8	9	9	8	10	8
	DM	3	2	2	3	2	1
1991	WM	6	8	7	6	7	6
	DM	4	4	4	6	4	5
1992	WM	8	4	4	9	10	7
	DM	0	6	5	0	1	3
1993	WM	-	-	-	-	-	-
	DM	-	-	-	-	-	-
1994	WM	6	4	6	6	7	5
	DM	5	6	6	6	5	6
1995	WM	6	6	8	9	8	8
	DM	5	4	4	3	4	3
1996	WM	8	8	8	8	8	-
	DM	3	4	3	3	2	-
1997	WM	5	4	4	4	4	5
	DM	3	3	3	3	3	2
Total	WM	78	76	79	82	79	70
	DM	33	43	39	38	33	31
Q		0.423	0.565	0.493	0.463	0.416	0.436
Climate Type		C (rather wet)	C (rather wet)	C (rather wet)	C (rather wet)	C (rather wet)	C (rather wet)

Source: Pengolahan Data Hujan Periode Tahun 1987 – 1997

Note: * (-) = The data is not available

* WM = Wet – Month

* DM = Dry – Month

On the rather – wet climate, generally there are much rains which causes big water reserve on the ground. The implications of such condition are fertile soil and high humidity.

The research area generally has cold weather, where the weather approximately between 20°C – 30°C. The sub – districts whose has cold weather are Tretep, Bulu (the slope of Sumbing Mountain), some parts of Tembarak, Ngadirejo and Candiroto. The condition of nature with fertile land causes the research area is very suitable for agriculture.

4.3. The Condition of Social and Economy

4.3.1. Population and Growth

Population in Temanggung in 2002 was 669,010 people (see the detail in table 4.3.). The areas whose have good facility and infrastructure are considerably have big population, such as in Temanggung (70,840 people), Kedu (48,798 people), Ngadirejo (47,676 people) and Parakan (45,977 people).

Table 4.3. The Amount of Population, Growth, The Size of The Family and Population Density in Temanggung on 2002

Sub – districts	The Width area (Ha)	The Amount of Population (people)		Population Growth (%/annum)	The amount of family	The family member (person/family)	Population Density (person/Km^2)
		2001	2002	2002	2002	2002	2002
Selopampang	1,729	16,798	16,777	-0.125	4,547	3.69	9.70
Tembarak	2,684	25,699	25,699	0.265	6,326	4.07	9.60
Tlogomulyo	2,484	19,287	19,287	1.120	4,554	4.28	7.85
Bulu	4,304	39,961	39,961	0.128	9,611	4.16	9.30
Kledungn	3,221	24,495	24,495	0.363	5,576	4.41	7.63
Bansari	2,254	21,061	21,061	1.059	5,115	4.16	9.44
Ngadirejo	5,331	47,676	47,676	0.814	12,516	3.84	9.02
Candiroto	5,994	28,677	28,677	0.363	7,343	3.92	4.80
Wonoboyo	4,398	22,519	22,519	0.409	5,560	4.07	5.14
Tretep	3,365	18,122	18,122	0.441	4,260	4.27	5.41
Bejen	6,884	17,395	17,395	0.540	4,515	3.87	2.54
Gemawang	6,711	28,151	28,196	0.160	7,739	3.64	4.20
Kndangan	7,836	43,076	43,358	0.655	10,881	3.98	5.53
Kaloran	6,392	40,425	40,577	0.376	11,478	3.54	6.35
Pringsurat	5,727	42,712	42,965	0.592	10,001	4.30	7.50
Kranggan	5,761	39,026	39,308	0.723	9,501	4.14	6.82
Temanggung	3,339	70,238	70,840	0.857	16,572	4.27	21.22
Kedu	3,496	18,547	48,798	0.517	12,313	3.96	13.96
Parakan	2,223	45,783	45,977	0.424	11,388	4.04	20.68
Jumo	2,932	25,738	25,917	0.695	7,029	3.69	8.84
Jumlah	87,065	635,386	667,605	10.376	166,825	80.3	175.53
Average	**4,353**	**31,769.3**	**33,380**	**0.519**	**8.341**	**4.02**	**8.78**

Source : Temanggung dalam angka dalam RLKT Kab. Temanggung ,2004

The growth rate of population in 2001 until 2002 was 0,52%. The highest growth was in Tlogomulyo sub – district (1,120%), Bansari (1,059%) and Temanggung (0,857%). Meanwhile, Selopampang sub – district has negative growth rate, that was -0,125% per annum. The other sub – districts have positive population growth.

In the average, each family consists of 3 – 4 members. Kledung, Pringsurat and Tlogomulyo tend to have big family size; meanwhile Kaloran, Gemawang and Jumo have relatively small size family. Sub – districts whose have big family size usually located in the area whose has high soil fertility. Generally, volcano's areas, such as Sumbing Mountain and some part of Sindoro Mountain relatively have fertile land. Hence, the population there tends to has big family size. Meanwhile the sediment hilly places whose have unfertile land in the North and North East of Temanggung (some part of Candiroto, Bejen and Gemawang), only have small size family and low population density (RLKT Kab. Temanggung, 2004).

4.3.2. Job Classification and Education Level

4.3.2.1. Job Classification

Based on the job classification, it is still dominated by agriculture sector. People who work in that field are 247,860; those who work in industrial sector are 17,886; meanwhile those who work in construction sector are 12,614; merchant 45,819; service 24,838; transportation 6,099; and in other sector are 7,038.

Table 4.4 below shows the job field in Temanggung in percentage.

Table 4.4. Job Field in Temanggung in 2003

No.	Job Field	Percentage (%)
1.	Agriculture	52
2.	Construction	4,43
3.	Trading	4,36
4.	Transportation	1,48

Source: Jateng Dalam Angka, 2004

According to table 4.4 above, it shows that agriculture sector is dominated among the others, which is 52 %. Only few people work in transportation sector.

Most of people live in Temanggung are farmers. Their livelihood depends on the agriculture sector. There are various farmers in Temanggung that are landlord, tenant farmer, farm worker, small farmer, etc.

The reasons why most people there choose to work in agriculture sector are because the land is fertile, so it is very suitable to be used as a field, and the weather is very good for agriculture plants such as paddy, tobacco, coffee, vegetables, fruit, etc.

4.3.2.2. Education Level

Based on education level, people who study in university are 212,280; in academy are 296,655; Senior High School student

are 68,358; Junior High School student are 44,457; elementary student are 2,559; and not/not yet graduated from elementary school are 3,774 (Pem. Kab. Temanggung, 2004)

Beside affected by the physical condition of the area (natural resources), population livelihood also affected by education (human resources), the accessibility of the area and the development of industrial and service sector.

Table 4.5 shows the condition of population livelihood and the education status of the society. The society's education status is determined based on the total amount of student who graduates from Senior High School.

Generally, Temanggung has high dependency to agriculture sector (71, 5%). Temanggung and Parakan as the center of governance and center of trade only have less population work in the agriculture sector, compared to other sub – districts. Populations in those areas have relatively higher education level (university and college). Population in Kedu sub – district which has fertile soil also has higher education level. Population livelihood in Temanggung and Parakan dominantly work in services sector, meanwhile population in Kedu dominantly in industrial and agriculture sector. Better and high accessibility will

encourage the growth of industry. It shows by some sub – districts which have well – educated population (their education level are higher than those in other sub – districts), hence it will has bigger productive labor.

The high accessibility level and its closeness with the main agriculture's commodity market in Parakan encourage the society who lived around Sindoro Mountain, such as Ngadirejo, Bansari and some part of Kledung to decrease their dependency in agriculture sector and divert to industry and construction sector. These areas have farmer percentage a little above 50% and the education level are relatively better compared with areas which has mountainous or hilly morphology. From those three sub – districts mentioned above, Bansari has the highest productive labor.

Table 4.5. The Percentage of Population Livelihood in the Age above 10 Year, Total of Productive Labor also the Percentage of Education Status in 2002

Sub – district	Agriculture	Industry	Construction	Services	Productive Labor	Education	
						Graduate from Senior High School	Status
Temanggung	39.18	6.41	3.89	50.52	42,557	36.05	High
Parakan	39.18	6.41	3.89	50.52	27,621	18.93	Medium
Kledung	53.52	4.38	5.6	36.49	14,769	6.74	Low
Bansari	53.54	4.38	5.59	36.49	12,784	5.51	Low
Ngadirejo	56.88	3.2	4.94	34.98	28,875	10.84	Medium
Kedu	64.51	12.72	3.4	19.38	29,316	17.55	Medium
Tlogomulyo	67.21	8.64	4.46	19.69	11,717	5.23	Low
Kranggan	67.22	8.63	4.47	19.68	23,617	13.62	Medium
Pringsurat	71.71	9.84	3.06	15.39	25,811	9.79	Low
Gemawang	76.20	2.92	3.56	17.32	16,939	4.25	Low
Jumo	76.21	2.91	3.56	17.32	15,569	7.19	Low
Kaloran	79.87	5.74	2.28	12.29	24,380	7.49	Low
Kandangan	79.92	2.7	2.37	15.05	26,049	8.55	Low
Bulu	84.69	0.98	2.71	16.39	24,038	9.54	Low
Selopampang	84.69	1.04	2.92	11.34	10,079	10.72	Medium
Tembarak	86.27	1.05	2.91	11.35	15,481	8.54	Low
Bejen	86.28	0.74	2.43	10.57	10,506	6.46	Low
Candiroto	91.69	0.73	2.42	10.57	17,290	9.23	Low
Tretep	91.69	0.46	2.66	5.18	10,935	1.92	Low
Wonoboyo	91.72	0.45	2.66	5.17	13,583	4.22	Low
Total	1442.18	84.33	18.71	415.69	101,912	50.63	
Average	72.109	4.2165	2.672857	20.7845	14,559	7.232857	

Source: Kabupaten Temanggung dalam angka, 2003 dalam RLKT,2004

Areas which have high dependency to agriculture generally have more difficult accessibility, relatively lower education level, even very low, and have low productive labor. In those areas, more than 75% people work in the agriculture sector.

From the condition above, it indicates that many people in Temanggung work in the agriculture sector. Thus, it can be said that the agriculture sector absorbs a lot of labors.

4.3.3. Health

There are 4 hospitals in Temanggung. One unit belongs to the government; whereas the other three are belong to private. The other health service is Public Health Center (Puskesmas). It is available in every Sub – districts. So far, those health facilities can be reached out and can provide their service to the need of the society.

4.3.4. Banking

There are 4 units of State bank in Temanggung, such as BNI 1946, BRI, Mandiri Bank, and BPD. Their branches are available almost in every sub – districts. Besides that there are 2 Private Bank in Temanggung, such as Lippo Bank and NISP Bank.

4.3.5. Tourism Facility

4.3.5.1. Inn/Hotel

Inn/hotel facility in Temanggung can be easily found since entering Temanggung's gate.

There is only one hotel that having star; meanwhile there are 5 unit of jasmine hotel. So far, those hotels can fulfill the

need of the newcomer/tourists who stay the night in Temanggung.

4.3.5.2. Shopping Center

Traditional market still becomes reliable market of Temanggung's society to do sell and buy transaction of various commodities. There are 8 units of traditional market. Beside that, there are 2 modern shopping centers in the downtown. But, there are also available special markets, such as 1 unit of animal market, 1 unit of fruit market, and 1 unit of tobacco market. It can be said that there is only few amount of markets in Temanggung. It is caused by there are still many left behind villages in some sub – districts. Those villages do not have many economic facilities (the economic facilities are not complete). Even traditional market which is useful to fulfill the need of the society is rare there. So, if the society who lives in those villages wants to buy something to fulfil their necessities, they have to go to the sub – districts area first.

CHAPTER V

RESEARCH FINDING AND DISCUSSION

5.1. Research Description

The objective of this research is to analyze tobacco production in Temanggung from 1986 – 2005. The factors that affect the production of tobacco in Temanggung, Central Java that are examined in this research consist of the number of labors who work in the tobacco's fields, and the width area of tobacco plant.

The type of data being observed and examined in this research is time series data. The writer used annually data from 1986 until 2005. It covers the total value of production of tobacco (Q_t) in Temanggung, Central Java measures in tons; the number of labors who work in the tobacco's fields (Lb_t) measure in people; and the width area of tobacco plant (L_t) measures in hectare.

5.2. Research Findings

The writer uses the E – views software 4.1 to regress the data. Meanwhile the writer estimates the data using Ordinary Least Square (OLS). Through this test, it will get the regression equation line that is created from series data observation and the level of data influence including all independent variables toward dependent variable.

Based on the MWD test, both variables (labor and land) are not significant to the tobacco production. But, the regression result in linear form is better than log – linear one, because it has higher coefficient of determination (R^2). Hence, the writer decides to use linear form.

The regression result:

Dependent Variable: TOBACCOPROD
Method: Least Squares
Date: 01/01/08 Time: 16:51
Sample: 1986 2005
Included observations: 20

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-3716.299	2126.662	-1.747480	0.0986
TOBACCOLABOR	0.020819	0.028580	0.728466	0.4762
TOBACCOLAND	0.607210	0.160424	3.785025	0.0015
R-squared	0.676177	Mean dependent var		8092.647
Adjusted R-squared	0.638080	S.D. dependent var		2862.416
S.E. of regression	1722.024	Akaike info criterion		17.87787
Sum squared resid	50411246	Schwarz criterion		18.02723
Log likelihood	-175.7787	F-statistic		17.74887
Durbin-Watson stat	1.774096	Prob(F-statistic)		0.000069

5.2.1. Statistical Test

5.2.1.1. t – test

Ho: $\alpha_1 \leq 0$; Ha: $\alpha_1 > 0$

Ho: The independent variables do not have relationship with dependent variable.

Ha: The independent variables have relationship with dependent variable.

Critical t – value = t_α df (n – k)

Where:

α = Level of significance

n = The amount of data = 20

k = The number of variables (including constant) = 3

df = 17

Critical t – value at α = 5%, two tail test, with df = 17 (including constant) is 2.110

The decision for two – tail hypotheses will be made with the parameter (α) 5% based on the following rules:

1. When the value of computed – t < critical – t value (t table value), Ho is accepted. In this case, the independent variables significantly do not influence the dependent variable.
2. When the value of computed – t > critical – t value (t table value), Ho is rejected. In this case, the independent variables significantly influence the dependent variable.

t – test of the number of labors who work in the tobacco's fields

The computed t – value is 0.728466. So, it is smaller than the critical t – value, which is 2.110. It means that the

number of labors who work in the tobacco's fields significantly does not influence the tobacco production.

t – test of the width area of tobacco plant

The computed t – value is 3.785025. Therefore, it is bigger than the critical t – value, which is 2.110. It means that the width area of tobacco plant significantly influences the tobacco production.

5.2.1.2. F – test

Ho: $\beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = 0$: all of the independent variables simultaneously do not affect the dependent variable.

Ha: $\beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq \beta_5 \neq 0$: all of the independent variables simultaneously affect the dependent variable.

Critical F – value: F_α df denominator = (n – k), df numerator = (k – 1)

Where: α = Level of significance

n = The number of observations = 20

k = The number of variables (including constant)

df denominator = 20 – 3 = 17

df numerator = 3 – 1 = 2

Critical F – value at α = 5%, with df denominator = 17 and df numerator = 2 is 3.59

The decisions are as follows:

1. If the computed F value < critical F value, the decision is accept Ho and Ha is rejected. It means all independent variables are not statistically significant.
2. If the computed F value > critical F value, the decision is reject Ho and Ha is accepted. It means all independent variables are statistically significant.

In the regression result, the computed F – value is 17.74887. The computed F – value is greater than the critical F – value which is 3.59. It means that all of the independent variables influence simultaneously to the tobacco production. Therefore, the labors who work in the tobacco's fields and the width area of tobacco plant simultaneously affect the tobacco production in Temanggung significantly.

5.2.1.3. Coefficient of Determination (R^2)

The regression result shows that R^2 is 0.676177. It means that the variation of the dependent variable can be explained by the independent variables about 67.6177%, while the rest, 32.3823% are explained by factors outside the model.

5.2.2. Classical Assumption Test

5.2.2.1. Autocorrelation test

The decisions are as follows:

- If the computed χ^2 (Obs*R – squared) value < critical χ^2 value = there is no autocorrelation in the model.
- If the computed χ^2 (Obs*R – squared) value > critical χ^2 value = there is autocorrelation in the model.

Autocorrelation test (LM Method)

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.058561	Probability	0.943335
Obs*R-squared	0.154954	Probability	0.925448

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 01/01/08 Time: 17:06
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	126.0258	2348.960	0.053652	0.9579
TOBACCOLABOR	0.001899	0.032775	0.057949	0.9546
TOBACCOLAND	-0.012573	0.174044	-0.072241	0.9434
RESID(-1)	0.049732	0.296041	0.167991	0.8688
RESID(-2)	-0.082701	0.290793	-0.284400	0.7800

R-squared	0.007748	Mean dependent var	-2.05E-13
Adjusted R-squared	-0.256853	S.D. dependent var	1628.872
S.E. of regression	1826.119	Akaike info criterion	18.07009
Sum squared resid	50020676	Schwarz criterion	18.31902
Log likelihood	-175.7009	F-statistic	0.029281
Durbin-Watson stat	1.862333	Prob(F-statistic)	0.998150

The critical χ^2 value with $\alpha = 5\%$ and df = 2 is 5.99147

From the LM test above, it is known that the computed χ^2 (Obs*R – squared) value is 0.154954; therefore it is smaller

than the critical χ^2 value which is 5.99147. So, the decision is there is no autocorrelation in the model.

5.2.2.2. Heteroscedasticity test

The degree of freedom for χ^2 = number of regressors (independent variables) in the auxiliary regression, excluding the constant. (Widarjono, 2005: 161)

The decisions are as follows:

- If the Obs*R – squared (computed chi – square) value < critical χ^2 (chi – squared) value at the chosen level of significance, for example at $\acute{\alpha}$ = 5%, there is no heteroscedasticity in the model.
- If the Obs*R – squared value > critical χ^2 value, therefore there is heteroscedasticity in the model.

Heteroscedasticity test with cross – term

White Heteroskedasticity Test:

F-statistic	1.091293	Probability	0.407486
Obs*R-squared	5.608897	Probability	0.346153

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 01/01/08 Time: 18:02
Sample: 1986 2005
Included observations: 20

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	7587544.	17444139	0.434962	0.6702
TOBACCOLABOR	139.0063	312.3270	0.445067	0.6631
TOBACCOLABOR^2	-0.004094	0.002546	-1.608290	0.1301
TOBACCOLABOR*TOBACCOLAND	0.022775	0.027800	0.819240	0.4264
TOBACCOLAND	-726.3821	2614.166	-0.277864	0.7852
TOBACCOLAND^2	-0.027994	0.104961	-0.266706	0.7936

R-squared	0.280445	Mean dependent var	2520562.
Adjusted R-squared	0.023461	S.D. dependent var	2759844.
S.E. of regression	2727278.	Akaike info criterion	32.71883
Sum squared resid	1.04E+14	Schwarz criterion	33.01755
Log likelihood	-321.1883	F-statistic	1.091293
Durbin-Watson stat	1.886748	Prob(F-statistic)	0.407486

The regression result of white – heteroscedasticity test with cross – term shows that computed χ^2 (Obs*R-squared) value is 5.608897. Hence, the critical χ^2 value with df = 5 and α = 5% is 11.0705; so there is no heteroscedasticity in the model because the computed χ^2 value is smaller than the critical χ^2 value.

5.2.2.3. Multicollinearity test

To detect Multicollinearity (Widarjono, 2005):

1. If (r) > 0.85⟶ Multicollinearity
2. If (r) < 0.85⟶ No Multicollinearity

Table 5.1. Correlation Matrix

	TOBACCOPROD	TOBACCOLAND	TOBACCOLABOR
TOBACCOPROD	1.000000	0.816130	0.635044
TOBACCOLAND	0.816130	1.000000	0.688809
TOBACCOLABOR	0.635044	0.688809	1.000000

From the regression result above, all of the independent variables have (r) less than 0.85. It means it fulfills the assumption.

5.3. Interpretation of The Result & Research Discussion

5.3.1. Interpretation of The Result

Estimate equation:

$Q_t = -3716.299 + 0.020819\ Lb_t + 0.607210\ Lt + \mu_t$

From the calculation of the elasticity of land (as it can be seen at Appendix VIII), the writer finds out that the coefficient is

1.439582863. This means that the use of land is in the stage 1 of production.

5.3.2. Research Discussion

From the regression result, we can see that only land has a significant effect on the tobacco production. While labor does not have any effect on the tobacco production. Therefore, the effect of the labors who work in the tobacco's fields cannot be discussed in this research because the regression result shows that the number of labors does not have any effect on the tobacco production.

The width area of tobacco plant

Land (can be consider as natural resources) is the contribution to productive activity made by land (for example, a factory site or farm) and basic raw – materials. However, as stocks of exhaustible natural resources begin to deplete, their price will tend to rise, providing an incentive to seek other natural or synthetic substitutes for them. Natural resources are one of the three main factors of production; the other two are labor and capital. (Collins Dictionary of Economics, 1993)

Based on the t – test, land has a significant and positive effect on the tobacco production. It is such an important finding because the tobacco production is land – intensive production.[1] Moreover, from the

[1] Land – intensive firm/industry is a firm or industry that produces its output of goods or services using proportionately large inputs of land and relatively small amount of labor and capital.

calculation of the elasticity of land (see appendix VIII), the size of the elasticity coefficient of land which is equal to 1.439582863 shows that the use of land in tobacco production in Temanggung is still in the stage 1 of production. It means that the tobacco production in Temanggung is still be able to be increased by land – extensification.

CHAPTER VI

CONCLUSIONS AND RECOMMENDATIONS

In the last part of this thesis, the writer made some conclusions and recommendations related to The Analysis of Tobacco Production in Temanggung From 1986 – 2005 as follows:

6.1. Conclusions

1. Based on the research, labor does not play significant role to the tobacco's production. It means the change of labor does not give any effect to the tobacco's production.
2. The elasticity coefficient of land which is equal to 1.439582863 shows that the use of land in tobacco production in Temanggung is still in the stage 1 of production. It means that the tobacco production in Temanggung is still be able to be increased by land – extensification.

6.2. Recommendations

1. The fact that labor does not have any effect on the tobacco production is not uncommon in the agricultural production in Indonesia in general. One of the strong causes of it is there are a lot of disguished unemployments in agricultural production. So, from the researcher's observation many labors who work in the tobacco production are direct and extended family member

of the farmer. For that reason, if the tobacco production wants to be increased, the authority should introduce the method of efficient labor use in the tobacco production.

2. Eventhough tobacco production is significantly and positively affected by land, but the researcher found that the use of land is still in the stage 1 of production. It means that the tobacco production in Temanggung still can be increased by land – extensification. The decision is in the hand of the authority and the farmers themselves.

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APPENDIX I

Data of Tobacco Production, The Width Area of Land, and Tobacco's Labor

Year	Tobacco Production (ton)	The Width Area of Land (hectare)	Tobacco's Labor (people)
1986	2966.2757	12353	24758
1987	5628.622	13060.179	24364
1988	6813.086	13874.78	24188
1989	5576.892	16001.312	32526
1990	10616.56	21539.22	46637
1991	7643	19204.5	55560
1992	6601	16417	55188
1993	10370.42	19698.75	52916
1994	9816.604	19760	53103
1995	8370.33	21064	57383
1996	8664.39	20284.9	57053
1997	10044.83	19410	53279
1998	4758.386	17227	63117
1999	6637.65	11645	40757
2000	12326.65	19909	66702
2001	14260.05	24239.3	90204
2002	10237.5	17719.5	68659
2003	7109.444	15024.846	53641
2004	9496	19312	96419
2005	3915.25	14593	51607

Source: Estate and Forestry Office of Temanggung, annual report, 1986 – 2005

APPENDIX II

Linear Interpolation Method

Assume $\frac{dY}{dX}$ = constant

$\Delta Y = Y_{n+1} - Y_n$

$\Delta X = X_{n+1} - X_n$

The writer uses the closer year to calculate the missing data.

The calculation of missing data:

Tobacco labor 1986, 1987, 1991, and 1993

1. **Tobacco labor 1987**

   The writer uses tobacco production in 1987, 1988, and 1989, also uses tobacco labor in 1988 and 1989 to calculate tobacco labor in 1987.

   Assume $\frac{dY}{dX}$ = constant

   $\Delta Yt = Yt_{n+1} - Yt_n$

   $\Delta Xt = Xt_{n+1} - Xt_n$

   Where: Yt = Tobacco production in 1987

   Xt = Labor – Tobacco in 1987

   Yt_{n+1} = Tobacco production in 1989

   Yt_n = Tobacco production in 1988

Xt_{n+1} = Labor – Tobacco in 1989

Xt_n = Labor – Tobacco in 1988

The calculation is:

$\Delta Yt_1 = Yt_{n+1} - Yt_n$

$= 5,576.892 - 6,813.086$

$= -1,236.194$

$\Delta Yt_2 = Yt_n - Yt$

$= 6,813.086 - 5,628.622$

$= 1,184.464$

$\Delta Xt = Xt_{n+1} - Xt_n$

$= 32,526 - 24,188$

$= 8,338$

$\frac{dY}{dX} = \frac{-1,236.194}{8338}$

$= - 0.14826$

$\Delta Xt = - 0.14826 \times \Delta Yt_2$

$= - 0.14826 \times 1,184.464$

$= -175,6086326$

$Xt = 24,188 - \Delta Xt$

$= 24,188 + 175,6086326$

$X_{1987} = 24,363.60863$

So, the tobacco labor in 1987 is 24,364

2. Tobacco labor 1986

The writer uses tobacco production in 1986, 1987, and 1988, also uses tobacco labor in 1987 and 1988 to calculate tobacco labor in 1986.

Assume $\frac{dY}{dX}$ = constant, therefore the writer uses the same $\frac{dY}{dX}$ as the calculation of tobacco labor in 1987.

$$\frac{dY}{dX} = \frac{-1,236.194}{8338}$$

$$= -0.14826$$

$$\Delta Yt_3 = Yt - Yt_{1986}$$

$$= 5,628.622 - 2,966.2757$$

$$= 2,662.3463$$

$$\Delta Xt = -0.14826 \times \Delta Yt_3$$

$$= -0.14826 \times 2,662.3463$$

$$= -394.7194624$$

$$Xt = 24,363.60863 - \Delta Xt$$

$$= 24,363.60863 + 394.7194624$$

$$X_{1986} = 24,758.32809$$

So, the tobacco labor in 1986 is 24,758

3. Tobacco labor 1993

The writer uses tobacco production in 1993, 1994, and 1995, also uses tobacco labor in 1994 and 1995 to calculate tobacco labor in 1993.

Assume $\frac{dY}{dX}$ = constant

$\Delta Yt = Yt_{n+1} - Yt_n$

$\Delta Xt = Xt_{n+1} - Xt_n$

Where: Yt = Tobacco production in 1993

Xt = Labor – Tobacco in 1993

Yt_{n+1} = Tobacco production in 1995

Yt_n = Tobacco production in 1994

Xt_{n+1} = Labor – Tobacco in 1995

Xt_n = Labor – Tobacco in 1994

The calculation is:

$\Delta Yt_1 = Yt_{n+1} - Yt_n$

= 8,370.33 – 9,816.604

= -1,446.274

$\Delta Yt_2 = Yt_n - Yt$

= 9,816.604 – 10,370.42

= - 553.816

$\Delta Xt = Xt_{n+1} - Xt_n$

= 57,383 – 53,103

= 4,280

$\frac{dY}{dX} = \frac{-1,446.274}{4280}$

$= -0.337914486$

$\Delta Xt = -0.337914486 \times \Delta Yt_2$

$= -0.337914486 (-553.816)$

$= 187.142449$

$Xt = 53{,}103 - \Delta Xt$

$= 53{,}103 - 187.142449$

$X_{1993} = 52{,}915.85755$

So, the tobacco labor in 1993 is 52,916

4. Tobacco labor 1991

The writer uses tobacco production in 1989, 1990, and 1991, also uses tobacco labor in 1989 and 1990 to calculate tobacco labor in 1991.

Assume $\frac{dY}{dX}$ = constant

$\Delta Yt = Yt_{n-1} - Yt_{n-2}$

$\Delta Xt = Xt_{n-1} - Xt_{n-2}$

Where: Yt = Tobacco production in 1991

Xt = Labor – Tobacco in 1991

Yt_{n-1} = Tobacco production in 1990

Yt_{n-2} = Tobacco production in 1989

Xt_{n-1} = Labor – Tobacco in 1990

Xt_{n-2} = Labor – Tobacco in 1989

Yt_n = Tobacco production in 1992

The calculation is:

$\Delta Yt_1 = Yt_{n-1} - Yt_{n-2}$

$= 10,616.56 - 5,576.892$

$= 5,039.668$

$\Delta Yt_2 = Yt_n - Yt$

$= 6,601 - 7,643$

$= -1,042$

$\Delta Xt = Xt_{n-1} - Xt_{n-2}$

$= 46,637 - 32,526$

$= 14,111$

$\frac{dY}{dX} = \frac{5,039.668}{14,111}$

$= 0.357144638$

$\Delta Xt = 0.357144638 \times \Delta Yt_2$

$= 0.357144638 (- 1,042)$

$= - 372.1447128$

$Xt = 55,188 - \Delta Xt$

$= 55,188 + 372.1447128$

$X_{1991} = 55,560.14471$

So, the tobacco labor in 1991 is 55,560.

APPENDIX III

The Result of MWD Test

LINEAR

Dependent Variable: TOBACCOPROD
Method: Least Squares
Date: 12/11/07 Time: 11:42
Sample: 1986 2005
Included observations: 20

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-4664.37079082	2171.52880009	-2.14796635008	0.0473772414295
TOBACCOLAND	0.639914026221	0.157551018244	4.06163053309	0.000906690018919
TOBACCOLABOR	0.0403021177074	0.0309777529835	1.3010019716	0.211682797813
Z1	-30866.9808397	21763.5903238	-1.41828532795	0.175291099564

R-squared	0.712341271185	Mean dependent var	8092.646985
Adjusted R-squared	0.658405259532	S.D. dependent var	2862.41623348
S.E. of regression	1672.97085001	Akaike info criterion	17.8594460692
Sum squared resid	44781303.4398	Schwarz criterion	18.0585925239
Log likelihood	-174.594460692	F-statistic	13.2071550965
Durbin-Watson stat	1.87510704038	Prob(F-statistic)	0.000135009676529

LOG – LINEAR

Dependent Variable: LTOBACCOPROD
Method: Least Squares
Date: 12/11/07 Time: 11:46
Sample: 1986 2005
Included observations: 20

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-7.43192096671	3.94021082313	-1.8861734309	0.0775579966749
LTOBACCOLAND	1.43478365089	0.448017679892	3.20251569366	0.0055482951851
LTOBACCOLABOR	0.226489943353	0.27309274144	0.829351751197	0.419107188188
Z2	0.000437346693328	0.000578437103951	0.756083401878	0.460587084545

R-squared	0.620525710177	Mean dependent var	8.93151548263
Adjusted R-squared	0.549374280835	S.D. dependent var	0.392761193751
S.E. of regression	0.263655332165	Akaike info criterion	0.34850833749
Sum squared resid	1.11222614686	Schwarz criterion	0.547654792201
Log likelihood	0.514916625103	F-statistic	8.72119809703
Durbin-Watson stat	1.99673969207	Prob(F-statistic)	0.00116813189738

APPENDIX IV

The Regression Result

Dependent Variable: TOBACCOPROD
Method: Least Squares
Date: 01/01/08 Time: 16:51
Sample: 1986 2005
Included observations: 20

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-3716.299	2126.662	-1.747480	0.0986
TOBACCOLABOR	0.020819	0.028580	0.728466	0.4762
TOBACCOLAND	0.607210	0.160424	3.785025	0.0015

R-squared	0.676177	Mean dependent var	8092.647
Adjusted R-squared	0.638080	S.D. dependent var	2862.416
S.E. of regression	1722.024	Akaike info criterion	17.87787
Sum squared resid	50411246	Schwarz criterion	18.02723
Log likelihood	-175.7787	F-statistic	17.74887
Durbin-Watson stat	1.774096	Prob(F-statistic)	0.000069

APPENDIX V

Autocorrelation Test (LM Method)

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.058561	Probability	0.943335
Obs*R-squared	0.154954	Probability	0.925448

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 01/01/08 Time: 17:06
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	126.0258	2348.960	0.053652	0.9579
TOBACCOLABOR	0.001899	0.032775	0.057949	0.9546
TOBACCOLAND	-0.012573	0.174044	-0.072241	0.9434
RESID(-1)	0.049732	0.296041	0.167991	0.8688
RESID(-2)	-0.082701	0.290793	-0.284400	0.7800

R-squared	0.007748	Mean dependent var	-2.05E-13
Adjusted R-squared	-0.256853	S.D. dependent var	1628.872
S.E. of regression	1826.119	Akaike info criterion	18.07009
Sum squared resid	50020676	Schwarz criterion	18.31902
Log likelihood	-175.7009	F-statistic	0.029281
Durbin-Watson stat	1.862333	Prob(F-statistic)	0.998150

APPENDIX VI

Heteroscedasticity Test With Cross – Term

White Heteroskedasticity Test:

F-statistic	1.091293	Probability	0.407486
Obs*R-squared	5.608897	Probability	0.346153

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 01/01/08 Time: 18:02
Sample: 1986 2005
Included observations: 20

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	7587544.	17444139	0.434962	0.6702
TOBACCOLABOR	139.0063	312.3270	0.445067	0.6631
TOBACCOLABOR^2	-0.004094	0.002546	-1.608290	0.1301
TOBACCOLABOR* TOBACCOLAND	0.022775	0.027800	0.819240	0.4264
TOBACCOLAND	-726.3821	2614.166	-0.277864	0.7852
TOBACCOLAND^2	-0.027994	0.104961	-0.266706	0.7936

R-squared	0.280445	Mean dependent var	2520562.
Adjusted R-squared	0.023461	S.D. dependent var	2759844.
S.E. of regression	2727278.	Akaike info criterion	32.71883
Sum squared resid	1.04E+14	Schwarz criterion	33.01755
Log likelihood	-321.1883	F-statistic	1.091293
Durbin-Watson stat	1.886748	Prob(F-statistic)	0.407486

APPENDIX VII

Correlation Matrix

	TOBACCOPROD	TOBACCOLAND	TOBACCOLABOR
TOBACCOPROD	1.000000	0.816130	0.635044
TOBACCOLAND	0.816130	1.000000	0.688809
TOBACCOLABOR	0.635044	0.688809	1.000000

APPENDIX VIII

Elasticity

Year	Tobacco Production (ton)	The Width Area of Land (hectare)	Land/Prod	ά2 X Land/Prod
1986	2966.2757	12353	4.164481407	2.528714755
1987	5628.622	13060.179	2.320315523	1.408918789
1988	6813.086	13874.78	2.036489779	1.236576959
1989	5576.892	16001.312	2.869216761	1.742217109
1990	10616.56	21539.22	2.028832315	1.23192727
1991	7643	19204.5	2.512691352	1.525731316
1992	6601	16417	2.487047417	1.510160062
1993	10370.42	19698.75	1.899513231	1.153403429
1994	9816.604	19760	2.012916076	1.222262771
1995	8370.33	21064	2.516507712	1.528048648
1996	8664.39	20284.9	2.341180395	1.421588148
1997	10044.83	19410	1.932337332	1.173334551
1998	4758.386	17227	3.620345218	2.19830982
1999	6637.65	11645	1.754385965	1.065280702
2000	12326.65	19909	1.615118463	0.980716081
2001	14260.05	24239.3	1.699804699	1.032138411
2002	10237.5	17719.5	1.730842491	1.050984869
2003	7109.444	15024.846	2.113364421	1.28325601
2004	9496	19312	2.033698399	1.234882005
2005	3915.25	14593	3.727220484	2.26320555
Average			**2.370815472**	**1.439582863**

The formula to calculate the elasticity: ά2 x (the average of $\frac{Land(X2)}{Tobacco\,\Pr oduction(Y)}$)

In the regression result, the value of ά2 is equal to 0.607210.

Therefore, the elasticity is 0.607210 x 2.370815472 = 1.439582863