HOW TO SOLVE SUPPLY BOTTLENECK IN AGRICULTURAL SECTOR[1)]

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INTRODUCTION

Although its contribution on GDP creation continues declining, agricultural sector remains to be utmost important. Of in particular its roles on employment creation, poverty alleviation, and national food security enhancement. The last three may be the most critical issues faced by Indonesia now and some years to come. In Indonesia in 2002, unemployment rate was still very high; open unemployment 9.0 percent or 9,132 million persons and underemployment 31.17 percent or 31,411 million persons. Poverty incidence is also still very high. In 2002, the poverty incidence was 18.2 percent or 38.4 million persons. Most of the unemployed or underemployed are poor people, live in rural areas and are dependent on agriculture for their living. Food security, especially of its self-reliance, is also a pressing problem for Indonesia.

Increasing agricultural production, food stuffs in particular, is clearly directly contributing to enhancing national food security. Many studies have shown that agricultural growth is the most effective one among all sector in the economy for employment creation and poverty alleviation (Islam and Nazara, 2000; Sumarto and Suryahadi, 2004; Simatupang and Dermoredjo, 2003). Higher agricultural growth is beneficial for improving over all economic growth. Promoting high and sustainable agricultural production growth may be the most appropriate strategy to achieve the three top priority of national development objectives: reducing unemployment, eradicating poverty, and achieving self-reliance based national food security.

But statistics have shown that agricultural productions, of almost all commodities, have been slowing down in recent years. This raises some questions to answer. What are the profiles of production growth of the major agricultural commodities, their rate and sources, over time? What are the constraints, opportunities and policies to revitalize and or accelerate the commodity production growth? These all are basically supply side questions of agricultural commodities.

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This paper reviews the supply side issues. The commodity coverage encompassing food, horticulture and estate crops which are all land based production. Production growth rate is computed and decomposed by its sources: harvested area (land size and cropping intensity), and yield. The constraints are identified as those related to the sources of the commodity production. The constraints may also include product distribution abstracts as well as unavailability of incentives that determine willingness to produce. It is in this sense the focus are supply constraints rather than just production constraints.

ORGANIZATIONAL FRAMEWORK

Supply constraints include production and distribution constraints. They may be micro (individual specific) or macro constraints, as well as direct and indirect constraints. The constraints are numerous and complex. In this review, the discussion is focused on some macro constraints which are considered of high important and can be addressed with some appropriate government policies. The framework on identifying the constraints is summarized in Figure 1.

By computation, production is harvested area times yield. Production growth, then, can be decomposed into two sources, harvested area and yield growths:

$$Q = A * Y$$
$$gQ = g_A + g_Y \quad ....(1)$$

$\quad$ Q $\quad=\quad$ production
$\quad$ A $\quad=\quad$ harvested area
$\quad$ Y $\quad=\quad$ yield
$\quad$ g $\quad=\quad$ growth

For commodity which can be harvested more than once per year, e.q. rice, harvested area can be computed as arable land size times cropping intensity. The sources of production growth can be further decomposed into arable land size, cropping intensity, and yield:

$$gQ = gLS + gCI + gY ....(2)$$

$\quad$ LS $\quad=\quad$ arable land size
$\quad$ CI $\quad=\quad$ cropping intensity

Production constraints, therefore, can be related to either harvested area or yield (equation 1). The harvested area constraints can be further decomposed into arable land size or cropping intensity related factors (equation 2). Due to data limitation, harvested area growth decomposition is only feasible for paddy. A commodity is said being plaqued with supply constraints if any of its sources of production growth has declining growth rate. The next step then is to identify the determinants of declining growth of the production growth components (Figure 1).

Distribution constraints will be proxied with price margin of the respective commodity. Large and increasing price margin can be interpreted that the commodity is plaqued with distribution constraints. This may caused by market failures, policy failures, or limitations of some marketing related infrastructure. Discussion will be continued on strategy and policy options to deal with the identified constraints.

DOES THE AGRICULTURAL SECTOR FACE SUPPLY CONSTRAINTS?

Aggregate Production (Gross Domestic Product)

Let us first check agricultural production profile at aggregate level based on the trend of GDP and aggregate production index as shown in Table 1. Agricultural GDP and aggregate production have consistent trend. Both were having increasing growth during the 1967 – 1986 and then experienced an accelerated declining growth rate. Their peak were in 1978–1986. This was the period when the government had sufficient resources (from both oil revenue and foreign assistant). The government was wisely spent a large portion of its budget to support agricultural development especially for large investments in estate and food crop subsectors. The government developed extensive infrastructure and land development. This huge investment was also complemented with development of massive supporting institutions, such as extension service and rural cooperatives, concessional credits and price incentives.

Table 1. Growth Rates of Agricultural GDP and Aggregate Production, 1967-2001 (%/Year)

	Periods			
	1967-78	1978-86	1986-97	1997-01
Agricultural GDP	3.39	5.72	3.38	1.57
- Food crops	3.58	4.95	1.90	1.62
- Estate crops	4.53	5.85	6.23	1.29
- Livestock	2.02	6.99	5.78	-1.92
- Fisheries	3.44	5.15	5.36	5.45
Agricultural Production	3.57	6.76	3.99	-0.47
- Land productivity	2.08	4.13	1.83	-1.45
- Labor productivity	2.32	5.57	2.03	-0.47

Source: Arifin (2003)

Trend reversal occurred in 1986 when Indonesia have to launch massive structural adjustment policies. As argued by Arifin (2003), the sharp drop and continous declining of GDP growth rate since 1986 was largely due to government policy deconstruction. The government reduced its investment expenditure on agriculture, and in the same time also gradually reduced its incentives and facilities for production promotion.

Consistent with GDP, the aggregate agricultural production growth rate was increasing during the 1967 – 1986 period and reached its peak in 1978 – 1986. Since 1986, the growth rate declined sharply and even was negative in 1997 – 2001. The accelerated declining of both GDP and aggregate production growth rates can be considered as strong indication that the agricultural sector has been facing an increasingly tighter production constraints. We suspect that the agricultural sector is now at the edge of persistent low growth or muddle through situation.

The persistent very low agricultural growth rate is really an alarming problem. Of in particular is food crops subsector which grew less than 2 percent per year since 1986-97 period. Estate food crop subsector growth rate that suddenly dropped from its astonishing record at 6.23 percent per year in 1986-1997 to only 1.29 percent per year in 1997-2001 period should also be of our great concerned. Worst yet, the livestock subsector that achieved the historical highest ever growth rate among the agricultural subsectors experienced contraction in 1997-2001. This past five years may be the worst record of agricultural performance since early 1970's. What is wrong in the agricultural sector ?.

From Table 1 we can also see that the main source of production growth during the 1967-1986 period was productivity. This is especially true during the peak growth period in 1978-1986. Productivity growth rate dropped drastically during the 1986-1997 and was even negative during the 1997-2001. We may say that the present persistently low agricultural growth rate was due to declining productivity, both land and labor productivity. Why the agricultural sector plaque with land productivity regression syndrom? This can happen because agricultural resource base has been degradating while technology was saturated.

A more rigorous study conducted by Fuglie (2003) confirms the growth pattern. During the 1990-2000 period, land productivity contracted by 0.9 percent per year, dropped from growing at 2.6 percent per year during the 1968-1992 period. Labor productivity growth dropped from 3.1 percent per year during the 1993-2003. He found that the sharp dropped in agricultural growth rate during the 1993-2000 period was due to sharp dropped of both total utilized input, slowed down from 2.4 percent per year in the 1968-1992 periode to 1.0 percent per year during the 1993-2000 period, and total factor productivity that slowed down from growing at 2.2 percent per year during the 1968-1992 to only at 0.1 percent per year during the 1993-2000 period.

It can be concluded that technological innovation in Indonesia's agriculture has been stagnant since early 1990's. In addition, Fuglie (2003) also presumed that the decline in total factor productivity was due to the downward trend in public spending for agricultural development since mind-1980's. Public spending for agricultural development, is critically important for Indonesia's, particularly because of the dominant roles of government in both research and extension services (Fuglie, 1999). On the vital roles of public infrastructure for agricultural growth rate was also confirmed by Mundlak, Larson and Butze (2002).

Commodity Production

Some more revealing explanations about the seemingly persistent stagnation of the agricultural production can be obtained by analyzing commodity production growth profiles. Since agricultural commodities are numerous, it is too burden some to cover all commodities in this review. Some major commodities representing food crops, vegetables, fruits and estate crops have been chosen. Our focus is land based agriculture, excluding livestock and fisheries.

Paddy (rice), maize and soybean are chosen to represent food crops. The growth production patterns of the three major food crops were very much similar, just like the food crop sub sector GDP, they accelerated during the second half of the 1970's to the first half of the 1980's and then decelerated rapidly. Since mid 1980's the food crop production has been trapped in a peristently low growth rate (Table 2). Rice only grew at rate of less than one percent per year, far below the population growth rate at 1.63 percent per year. Maize production growth rate was about equal to the population growth rate. The worst was soybean performance which has been contracting rapidly since early 1990's. Clearly, food crop productions have been growing far behind their demand. They must have been facing stiff supply constraints since mid 1980's.

Table 2. Trend of Harvested Area (Ha), Yield (Ton/Ha) and Production (Ton) for Food Crops in Indonesia, 1970-2003[1]

Description	1970-1975	1976-1980	1981-1985	1986-1990	1991-1995	1996-2000	2001-2003
Paddy							
- Harvested area	8,311,790	8,693,225	9,439,727	10,214,553	10,914,041	11,602,427	11,495,509
	(0.96)	(1.98)	(1.91)	(1.59)	(1.79)	(0.78)	(-0.13)
- Yield	2.88	2.95	3.78	4.13	4.35	4.33	4.43
	(-4.58)	(4.02)	(2.87)	(2.07)	(-0.01)	(-0.48)	(1.06)
- Production	23,870,032	25,650,723	35,741,831	42,241,262	47,431,835	50,257,539	50,981,489
	(-3.62)	(6.00)	(4.77)	(3.66)	(1.79)	(0.30)	(0.93)
Maize							
- Harvested area	2,711,693	2,602,947	2,708,956	3,055,367	3,261,029	3,580,655	3,204,475
	(-1.17)	(5.44)	(0.21)	(1.24)	(2.63)	(-1.05)	(-1.22)
- Yield	1.06	1.32	1.65	1.98	2.16	2.61	2.96
	(4.14)	(4.80)	(3.92)	(3.02)	(1.38)	(2.69)	(2.90)
- Production	2,862,704	3,447,395	4,470,312	6,055,492	7,040,058	9,353,792	9,495,566
	(2.96)	(10.24)	(4.13)	(4.26)	(4.01)	(1.64)	(1.68)
Soybean							
- Harvested area	721,275	708,411	762,543	1,213,578	1,478,427	1,094,344	610,923
	(2.22)	(4.43)	(5.48)	(2.15)	(-0.21)	(-8.53)	(-5.54)
- Yield	0.75	0.84	0.88	1.06	1.13	1.19	1.20
	(1.49)	(2.63)	(2.62)	(2.99)	(-0.05)	(0.54)	(0.08)
- Production	541,593	597,913	678,020	1,284,872	1,667,421	1,304,501	731.994
	(3.71)	(7.06)	(8.10)	(5.14)	(-0.26)	(-7.98)	(-5.46)

1) Figure in parenthesis are the annual growth rate of harvested area, yield or production.
Sources: Basis data from CBS, Jakarta (various years).

If we look at the sources of the food crop production growths, we clearly see that the common reasons for the emerging decelerating growth phenomenon since early 1990's are: (1) deceleration leading to contraction of harvested area, and (2) yield deceleration leading to stagnation of land productivity (yield). For food crops that have short age to maturity, the harvested area arises from both arable land size and cropping intensity. The decelerating harvested area, thus, can be due to both arable land size or cropping intensity deceleration. Unfortunately, we do not have data available to compute cropping intensity except for wetland (sawah) rice. Further decomposition of the rice production produced from the wetland rice field (sawah) should give more revealing explantions about the production constraints (Table 3).

Table 3. Sources of Wetland Rice Production Growth in Indonesia, 1981-2000

Region	1981-1985	1986-1990	1991-1995	1996-2000
Java				
a. Land size	-0.32	-0.15	-0.42	-1.04
b. Cropping intensity	1.89	0.86	0.88	2.78
c. Yield	2.80	2.29	1.37	-1.29
Total	4.37	3.30	1.83	0.45
Outside Java				
a. Land size	0.74	2.56	1.46	-4.04
b. Cropping intensity	2.23	0.34	1.32	.5,47
c. Yield	2.66	1.75	0.38	-0.27
Total	5.63	4.65	3.16	1.16
Indonesia				
a. Land size	0.22	1.40	0.70	-2.83
b. Cropping intensity	1.94	0.30	0.88	4.41
c. Yield	2.66	1.93	0.79	-0.83
Total	4.82	3.63	2.37	0.75

It is interesting to note that the wet land rice field (sawah) in Java has been decelerating since early 1980's. The whole source of the growth of rice harvested area in Java came from cropping intensity that increased rapidly, out compensate the declining land size. In outside Java, the wetland paddy field accelerated in 1980's, and then decelerated in 1990's. Since mid 1990's, arable wetland paddy field has been declining both in Java and outside Java. Since the 1990's, the sole source of rice production growth has been cropping intensity.

It can be concluded therefore, that the most stringent rice production constraints are: (1) declining arable land, and (2) declining yield (land

productivity). The sole source of rice production growth since mid 1990's has been cropping intensity. This conclusion may very well be valid for many other food crops with short age to maturity, such as, maize, beans, peanuts, etc., since they also mostly planted in wetland paddy field.

This is really an alarming problem. The cropping intensity potential is quite limited and very difficult to expand. It can be saturated very fast. Since both land size and productivity continue declining, it is realistic to predict that the present persistent stagnation of food crop production will be worsening in the future. This may cause devastative blow not only to the agricultural sector, but also to rural economies and to the whole Indonesian economy as well. This very critical problem calls for an immediate and decisive policy response from the government.

Production performance of vegetable crops was really spectacular during 1970 to mid 1990's. Some crops even enjoyed double digits production growth rate. But in second half of the 1990's, the growth rates of all the vegetable crops dropped drastically and continued decelerating. During the 2000 – 2001 the vegetable production growth rates almost all negative, except for cucumber. Again, the unmediate causes of the decelerating production growth phenomen are either stagnant or declining of both harvested area and yield (Table 4).

The fruit production growth rates are generally highly fluctuative. Like vegetable production, fruit productions declined significantly in the second half of 1990's (Table 5). The best performance of fruit production was in the first half of the 1990's. The fruit production performance in recent years was generally poor. Again, the main reasons are either stagnation or decelerating of both harvested area and yield.

Estate crops production performance varies by commodities. The best performance achieved by palm oil and cocoa which grew consistent at double digits rates during the 1970-1995 period. The major source of the production growth was harvested area. As a whole, the estate crop productions decelerated since early 1990's (Table 6). The primary reasons are the sharp declining of harvested area growth rates combined with stagnant or declining yield.

It should be noted that estate crops are perennial with long age to maturity and their productions require large investment with long gestation period. Availability of long-term investment credits with reasonable interest rate is the key for expanding the estate crop production base, harvested area in particular. The persistent decelerating estate crop production since early 1990's may be largely due to internal capital and external credit constraints.

Table 4. Trend of Harvested Area (ha), Yield (ton/ha) and Production (ton) for Vegetables in Indonesia, 1970-2002[1]

Description	1970-75	1976-80	1981-85	1986-90	1991-95	1996-00	2000-02
Shallot							
- Harvested area	41,391	46,715	58,370	65,718	75,372	89,931	88,553
	(0.82)	(5.81)	(7.78)	(-0.62)	(3.73)	(-1.09)	(2.53)
- Yield	4.47	4.27	4.41	6.30	7.50	8.17	8.75
	(-5.31)	(-0.34)	(6.61)	(5.48)	(1.17)	(5.57)	(-2.58)
- Production	184,867	199,178	261,545	413,738	565,600	736,955	773,190
	(04.49)	(5.48)	(14.39)	(4.86)	(4.91)	(4.49)	(-0.05)
Potato							
- Harvested area	17,393	22,902	29,305	38,357	51,608	64,205	66,335
	(4.35)	(3.81)	(6.06)	(5.58)	(10.46)	(3.11)	(-13.91)
- Yield	6.93	9.33	9.17	12.54	15.15	15.10	13.93
	(4.56)	(2.27)	(13.36)	(5.43)	(5.31)	(-4.37)	(5.39)
- Production	122,463	213,912	273,753	484,307	790,057	964,473	918,647
	(8.90)	(6.08)	(19.42)	(11,02)	(15.77)	(-1.26)	(-8.52)
Cabbage							
- Harvested area	18,238	26,140	38,487	62,783	65,791	96,134	86,049
	(10.37)	(4.58)	(5.47)	(-14.92)	(13.14)	(1.43)	(-27.11)
- Yield	11.05	11.66	12.16	16.08	20.58	17.14	18.00
	(0.26)	(1.63)	(14.52)	(16.79)	(1.54)	(-3.83)	(14.87)
- Production	201,683	305,587	474,478	939,402	1,355,228	1,646,422	1,508,003
	(10.63)	(6.21)	(19.99)	(1.87)	(14.96)	(-2.40)	(-12.25)
Tomato							
- Harvested area	11,909	18,584	34,427	54,255	46,752	46,392	45,272
	(9.39)	(16.66)	(14.30)	(3.47)	(3.21)	(-1.36)	(0.09)
- Yield	3.15	4.95	3.61	3.80	6.95	11.87	13.13
	(26.28)	(-4.55)	(-4.82)	(3.51)	(19.95)	(3.41)	(-0.35)
- Production	40,150	90,672	122,685	198,076	328,797	551,039	594,571
	(35.67)	(12.11)	(9.47)	(6.99)	(23.16)	(2.06)	(-0.26)
Carrots							
- Harvested area	2,621	4,198	6,248	12,074	16,127	19,154	19,688
	(14.13)	(18.90)	(5.30)	(10.83)	(6.58)	(0.73)	(-1.48)
- Yield	7.22	7.76	9.09	12.17	13.36	15.02	15.52
	(6.50)	(5.70)	(0.66)	(2.18)	(0.62)	(5.41)	(-2.81)
- Production	19,399	32,089	56,781	147,557	216,007	288,647	305.642
	(20.63)	(24.59)	(5.96)	(13.01)	(7.20)	(6.14)	(-4.28)
Chilli							
- Harvested area	103,329	106,899	181,734	235,086	178,671	172,931	185,060
	(1.38)	(0.13)	(21.45)	(-7.35)	(-2.48)	(2.98)	(1.24)
- Yield	2.35	1.97	1.63	1.94	3.46	5.43	5.41
	(7.93)	(1.39)	(-6.69)	(8.04)	(25.59)	(-1.55)	(-4.37)
- Production	244,192	210,267	269,879	451,838	624,379	940.375	1,000,003
	(9.32)	(1.52)	(14.76)	(0.69)	(23.11)	(1.43)	(-3.13)
Cucumber							
- Harvested area	24,704	32,418	47,293	75,831	55,624	52,182	51,667
	(6.43)	(16.44)	(10.68)	(-0.92)	(0.72)	(-3,63)	(3.92)
- Yield	5.09	5.38	3.85	3.97	7.58	9.52	9.10
	(9.82)	(-14.21)	(-1.60)	(0.06)	(23,21)	(-3.85)	(-0.70)
- Production	128,786	165,786	182,786	289,504	423,193	498,563	470,046
	(16.25)	(2.24)	(9.07)	(-0.86)	(23.92)	(-7.48)	(3.23)

1) Figure in parenthesis are the annual growth rate of harvested area, yield or production.
Source: Basis data from CBS, Jakarta (various years).

Table 5. Trend of Harvested Area (ha), Yield (ton/ha) and Production (ton) for Fruits in Indonesia, 1970-2002[1]

Description	1970-75	1976-80	1981-85	1986-90	1991-95	1996-00	2000-02
Avocade							
- Harvested area	6,383	11,994	16,936	19,420	28,877	37,576	36,558
	(9.35)	(-5.95)	(5.38)	(11.25)	(4.28)	(-8.62)	(5.13)
- Yield	6.46	3.96	3.46	3.52	3.72	3.68	4.10
	(4.30)	(3.10)	(-6.96)	(-6.98)	(8.15)	(8.72)	(-3.46)
- Production	41.367	46.798	58.060	67,223	108,685	135,266	149,529
	(13.65)	(-2.84)	(-1.57)	(4.27)	(12.43)	(0.10)	(1.67)
Banana							
- Harvested area	289,600	174,284	176,977	147,190	208,113	264,535	284,002
	(10.33)	(-0.03)	(-2,14)	(-4.41)	(19.34)	(3.19)	(-0.35)
- Yield	6.76	9.24	11.07	15.82	14.63	12.37	13.06
	(-7.22)	(9.07)	(0.41)	(4.40)	(-9.19)	(2.09)	(-0.51)
- Production	1,889,383	1,584,470	1,955,221	2,303,153	2,931,713	3,276,026	3,708,730
	(3.12)	(9.04)	(-1.73)	(-0.01)	(10.15)	(5.28)	(-0.86)
Manggo							
- Harvested area	53,300	73,436	87.000	110,838	150.966	161.764	164,657
	(3.22)	(-2.88)	(2.47)	(5.57)	(3.79)	(0.65)	(1.19)
- Yield	6.34	3.86	4.68	4.36	4.14	5.12	5.29
	(-3.06)	(9.84)	(3.97)	(-2.48)	(597)	(-1.15)	(-0.31)
- Production	335.267	278.453	407,638	481.370	628.521	834,711	870,607
	(0.16)	(6.96)	(6.44)	(3.09)	(9.76)	(-0.50)	(0.88)
Orange							
- Harvested area	30,683	33,477	60,010	67,443	64,413	111.369	98,657
	(1.64)	(4.90)	(10.78)	(-14.12)	(11.28)	(-8.91)	(9.52)
- Yield	4.83	6.44	7.92	6.17	7.13	5.51	5.81
	(7.33)	(8.30)	(-5.78)	(-11.05)	(9.58)	(3.06)	(-7.97)
- Production	148,067	216,238	467,602	429,041	481,428	612,364	573,409
	(8.97)	(13.20)	(5.00)	(-25.17)	(20.86)	(-5.85)	(1.55)
Papaya							
- Harvested area	31,383	22,636	30,935	31,674	32,244	34,199	37,131
	(4.04)	(10.55)	(-5.37)	(-7.38)	(9.28)	(1.98)	(3.61)
- Yield	8.72	11.27	8.96	10.62	13.25	12.34	12.84
	(-10.84)	(-2.88)	(-0.24)	(9.54)	(-0.03)	(2.57)	(3.16)
- Production	269,483	253,278	276,533	330,874	427,825	422,308	477,205
	(-6.80)	(7.66)	(-5.61)	(2.16)	(9.25)	(4.55)	(6.76)
Pineapple							
- Harvested area	22,517	27,068	44,788	46,903	46,862	40.865	43,069
	(10.65)	(3.25)	(16.47)	(-6.73)	(6.95)	(0.01)	(2.56)
- Yield	4.85	6.38	7.19	7.23	9.47	9.40	10.10
	(-1.73)	(11.35)	(-1.51)	(2.16)	(4.78)	(-6.83)	(5.56)
- Production	107,517	171,433	318,858	339,451	451,850	384,781	435,307
	(8.92)	(14.60)	(14.96)	(-4.57)	(11.72)	(-6.82)	(8.12)

1) Figure in parenthesis are the annual growth rate of harvested area, yield or production.
Source: Basic data from CBS, Jakarta (various years).

Table 6. Trend of Harvested Area (ha), Yield (ton/ha) and Production (ton) for Estate Crops in Indonesia, 1970-2000[1]

Description	1970-75	1976-80	1981-85	1986-90	1991-95	1996-00
Tea						
- Harvested area	103,383	103,866	114,035	126,102	142,350	150,451
	(-2.04)	(3.38)	(3.38)	(1.15)	(3.19)	(2.49)
- Yield	0.63	0.87	0.99	1.07	1.06	1.08
	(4.19)	(5.49)	(2.82)	(2.39)	(-2.20)	(-2.85)
- Production	64,629	90,439	113,218	135,334	150,290	162,696
	(2.15)	(8.87)	(6.21)	(3.53)	(0.99)	(-0.36)
Palm Oil						
- Harvested area	158,800	247,424	432,779	859,701	1,644,158	2,740,844
	(7.37)	(8.35)	(16.94)	(15.27)	(10.76)	(8.57)
- Yield	1.77	2.21	2.39	2.09	2.16	2.02
	(5.43)	(5.32)	(-5.55)	(-1.02)	(1.73)	(-2.72)
- Production	284,142	550,462	1,012,097	1,789,417	3,566,606	5,504,993
	(12.81)	(13.67)	(11.39)	(14.26)	(12.49)	(5.84)
Rubber						
- Harvested area	2,333,074	2,355,402	2,597,705	2,973,087	3,367,288	3,600,959
	(-0.01)	(1.06)	(3.45)	(2.48)	(2.47)	(1.76)
- Yield	0.35	0.39	0.38	0.40	0.43	0.46
	(0.33)	(3.64)	(-0.25)	(0.91)	(1.61)	(1.37)
- Production	805.628	915,889	991,399	1,180,223	1,454,957	1,650,980
	(0.31)	(4.70)	(3.20)	(3.39)	(4.08)	(3.13)
Sugar Cane						
- Harvested area	153,820	270,211	355,224	349,574	416,158	378,674
	(8.83)	(12.10)	(0.95)	(2.88)	(3.01)	(-6.64)
- Yield	7.03	5.12	4.62	5.98	5.49	4.73
	(-2.91)	(-14.37)	(10.70)	(-2.18)	(-4.19)	(-1.48)
- Production	1,068,800	1,324,411	1,637,128	2,084,486	2,280,484	1,791,677
	(5.91)	(-2.27)	(9.75)	(0.70)	(-1.17)	(-8.12)
Cocoa						
- Harvested area	15,702	27,137	64,528	239,648	534,897	584,250
	(6.68)	(22.59)	(20.23)	(32.01)	(7.94)	(-1.41)
- Yield	0.15	0.24	0.34	0.34	0.45	0.67
	(8.93)	(1.87)	(2.96)	(4.33)	(5.78)	(4.75)
- Production	2.412	6,506	22,067	83,343	242,797	391,067
	(15.61)	(24.46)	(23.19)	(36.34)	(13.72)	(3.34)
Coffee						
- Harvested area	395,892	557,996	848,040	1,005,837	1,141,843	1,152,936
	(-0.45)	(11.76)	(4.19)	(3.44)	(0.89)	(-0.57)
- Yield	0.43	0.42	0.36	0.39	0.39	0.42
	(-2.85)	(0.13)	(-3.27)	(-0.21)	(0.74)	(4.46)
- Production	169,181	235,738	305,717	390,080	442,407	484,750
	(-3.30)	(11.89)	(0.92)	(3.23)	(1.63)	(3.89)

1) Figure in parenthesis are the annual growth rate of harvested area, yield or production.
Source: Basic data from CBS, Jakarta (various years).

Distribution Constraints

In this review, although it might not be perfect the distribution constraints of agricultural products are identified through consumer – producer price margin. The price margin can be considered reflecting marketing efficiency which in turn

reflective distributional efficiency. More stringent distribution constraints should be reflected in higher or increasing price margin. Price margin in percentage is comparable between commodities, whereas its real value is comparable overtime for the same commodity. The price margin for some agricultural commodities are presented in Table 7.

Table 7. Price Margin of Agriculture Commodities in Indonesia, 1986 - 2002 (Rp/kg)

Year	Paddy	Maize	Soy-bean	Potato	Cab-bage	Shal-lot	Papaya	Bana-na	Orange	Coffee
1986-1990										
- Nominal	150	96	144	160	144	361	30	253	433	2233
- Real *)	260	169	251	282	253	632	50	443	764	3970
- Percentage	38.4	32.2	16.3	32.6	52.6	36.2	10.0	56.3	39.3	51.9
1991-1995										
- Nominal	265	172	323	263	296	759	15	371	605	2585
- Real *)	311	199	384	307	345	857	17	435	722	3095
- Percentage	41.4	35.7	24.1	32.8	58.5	40.4	3.5	55.6	34.5	48.7
1996-2000										
- Nominal	722	831	1649	1467	1014	3481	109	1136	809	10604
- Real *)	387	440	840	772	547	1812	57	623	433	5404
- Percentage	43.7	52.9	37.8	42.5	59.2	49.9	13.0	63.7	21.5	61.1
2000-2002										
- Nominal	1095	784	1116	575	662	4618	188	1172	1571	18332
- Real *)	432	311	445	232	266	1822	74	464	618	7336
- Percentage	45.5	39.8	28.0	18.4	28.8	46.0	16.0	53.8	29.3	73.7

Source: Producers and Consumers Statistics (various year)
*) Deflated by consumer price index.

During the 1986-2000 period, the price margins were large (except for papaya). Not only large, the price margins grew with an accelerating rate. The growing price margins, then showed reversal trend or decelerated in 2000 – 2002 period. The real value and the percentage price margins declined significantly for some commodities such as maize, soybean, potato, cabbage and banana. Although continued increasing, the growth rates of the price margins were declining for those commodities.

Based on the size and trend of the price margins, we may conclude that during the 1990's, marketing distribution constraints were stringent. This may be one of the reasons why agricultural production performance during the period drastically dropped and continued worsening. There is also an indication that the distribution systems has been improving since 2000. We must remind the readers, however, this conclusion is tentative. The agricultural commodity distribution is quite complex, better understanding of which requires a comprehensive study.

WHAT ARE THE ROOTS OF THE PROBLEMS ?

We have find that the agriculture has, indeed, been facing some stringent supply constraints both in production and distribution systems. The general production constraints are land availability and land productivity stagnation. Distribution systems remain inefficient as shown by large price margins, and for some commodities the margins tend increasing. This reflects a high transaction cost of the agricultural commodities. These conclusions are too general for formulating appropriate and workable policy responses. We must identify the root causes of the constraints

Declining arable land

The fact that available land availability is the most stringent constraint for Indonesian agriculture should not be a surprise. Available potential agricultural land is fixed by nature, its conversion to arable land is costly whereas its conversion to non agriculture functions continues accelerating due to both high population growth, income growth and rapid development of hand demanding infrastructures, economic and social facilities.

Overall for Indonesia, total agriculture land still continued increasing, except in 1991 – 1995 period. But this was only true for outside Java. Total agricultural land in Java has been declining with an increasing rate since early 1990's, while in outside Java is accelerating except in 1991 - 1995 period. Agricultural land in Java is known best for food crops. Land productivity and land use intensity in Java are higher than in outside Java. This regional pattern of growth of agricultural land must imply significant change in regional structure of Indonesia agriculture. The future growth of Indonesian agriculture will be in outside Java. The historical dominant role of Java in food production will be fading gradually.

The decelerating trend of total agriculture land is fairly reasonable. In one hand, potential agricultural land for new land expansion is only available in outside Java. On the other hand, agricultural land conversion to other functions will continue accelerating both in Java and outside Java. The pace of the agricultural land conversion is much faster in Java particularly due to its faster expansion of land demanding infrastructure development, urbanization and industrial complexes. These can be considered natural forces that will always be there as long as the economy grows and expands and the population increases (Simatupang and Irawan, 2002; Simatupang, *et al*., 2002). Agricultural land conversion, particularly in Java, will continue accelerating.

Of the most alarming one is the decelerating growth of wet paddy field (sawah) both in Java (since the data coverage in early 1980's) and in outside Java (since mid 1990's). Wet paddy field, the irrigated in particular, is the best type of

land for rice farming. It can also be used for other food and vegetable crops. It can be used for multiple cropping per year. The declining wet land area is the main reason for the decelerating growth of harvested area of rice, and other food crops, and some horticultural crops which can also be planted in that land.

Table 8. Trend of Agriculture Land Size in Indonesia, 1981 – 2001 (Ha)[1]

Year	Dryland for garden	Grazing land	Brackish water pond	Fresh water pond	Tempo-rary fallow	Estate plan-tation	Wet paddy field (sawah)	Total
Java								
1981-1985	3081287	64074	91661	33867	89478	596982	3465827	7423175
	(1.12)	(-7.80)	(3.97)	(-5.76)	(0.73)	(0.47)	(-0.3)	(0.30)
1985-1990	3138582	58489	104158	33123	104494	659472	3440319	7538636
	(0.27)	(-5.60)	(6.56)	(0.47)	(-2.20)	(1.06)	(-0.15)	(0.16)
1991-1995	3090222	44470	116398	33533	81630	627971	3406591	7400815
	(-0.48)	(-1.57)	(0.73)	(3.19)	(-1.16)	(-0.64)	(-0.42)	(-0.42)
1996-2000	3091928	41163	129581	35990	66316	624106	3302807	7291890
	(0.34)	(-1.31)	(0.72)	(-1.23)	(-0.83)	(-1.33)	(-1.04)	(-0.42)
2000-2001	3109630	39181	127560	37757	66148	598116	3144272	7122662
	(-0.18)	(-6.29)	(-7.54)	(13.18)	(-2.22)	(-0.82)	(-0.45)	(-0.43)
Off Java								
1981-1985	8692962	3515795	105297	126564	8749942	7897812	4033948	33122320
	(5.31)	(1.43)	(0.89)	(1.16)	(3.47)	(4.62)	(0.74)	(3.58)
1985-1990	9701186	2902970	149869	94644	9497377	9470088	4623099	36439233
	(2.20)	(-1.46)	(11.08)	(3.22)	(-0.61)	(6.66)	(2.56)	(2.45)
1991-1995	8687990	2087170	231930	142657	7485896	11799276	4999672	35434590
	(-3.46)	(-8.26)	(14.35)	(4.38)	(-6.48)	(4.91)	(1.46)	(-0.78)
1996-2000	8791678	2090793	336875	142750	8436616	15226920	4553616	39579247
	(4.17)	(4.22)	(2.52)	(1.79)	(8.72)	(4.08)	(-4.04)	(4.09)
2000-2001	9947388	2147790	342392	153971	9465221	17729752	4530306	44316818
	(2.46)	(-1.93)	(-10.62)	(6.23)	(-4.01)	(17.92)	(-4.96)	(7.20)
Indonesia								
1981-1985	11774249	3579868	196958	160431	8839420	8494794	7499775	40545495
	(4.05)	(1.25)	(2.11)	(-0.42)	(3.44)	(4.32)	(0.22)	(2.94)
1985-1990	12839768	2961459	254027	127767	9601871	10129559	8063418	43977869
	(1.73)	(-1.54)	(8.98)	(2.52)	(-0.63)	(6.30)	(1.40)	(2.06)
1991-1995	11778211	2131640	348328	176189	7567526	12427247	8406263	42835405
	(-2.69)	(-8.12)	(9.79)	(4.13)	(-6.40)	(4.63)	(0.70)	(-0.72)
1996-2000	11883606	2131956	466455	178740	8502932	15851026	7856422	46871137
	(3.20)	(4.11)	(2.01)	(1.18)	(8.66)	(3.87)	(-2.83)	(3.40)
2000-2001	13057017	2186971	469952	191728	9531369	18327868	7674577	51439480
	(1.83)	(-2.01)	(-9.78)	(7.60)	(-3.97)	(17.30)	(-2.74)	(6.15)

1) Figure in parenthesis are the annual growth rate.
Source: Statistical Year Book (various year).

The total dry land for gardening was decelerating during the 1985 – 1990, contracting during the 1990 – 1995 period, but then and retaining its high growth

in mid 1990's. In Java, however, the dry land has been declining since early 1990's, due to conversion for other types or agricultural land and non-agriculture functions. Significant portion of the dry land expansion in outside Java has been the results of agricultural development through transmigration program.

Total land allocated for estate crops continued increasing with a very high growth rate. The growth rate was slowing down during the 1990's but it was seeming accelerated again in early 2000's. Regionally, the gain in land plantation wholly occurred in outside Java. In fact in Java, land for plantation has been continuously declining sice early 1990's. The rapid development of estate crops area in outside Java was largely the results of heavy government investments through its Nuclear Estate development program and private corporate investment with concessional credit facilities from the government.

For the future, agricultural land in Java will continue decelerating. For one hand, new agricultural land development is impossible because the potential has been exhausted. On the other hand, land conversion to non agriculture will continue accelerating along with population and economic development. This can be considered as natural phenomenon which can not be stopped, but may be control able to slow the pace of its deceleration and to smoothen its impacts.

The remaining hope is expansion of agricultural land development in outside Java where the potential for new land development is still quite large. The most stringent obstacles are lacking of infrastructures, transportation systems, electricity, etc., and capital investments. Government direct involvement and facilitation for private investment is necessary for reversing the decelerating trend of agriculture land.

Lacking of technological innovations

Most agricultural crops have faced either land productivity deceleration or stagnation since the second half of the 1980's. This can be explained by either lacking of land enhancing technological innovation and or land quality degradation. The lacking of land enhancing technological innovation can be further broken down to either lacking of technological break through at research and development (R & D) level, technological dissemination bottleneck between R & D institutions and farmers, and sub-optimal technological practice.

Research and development (R & D)

Lacking of new technological creation at the R & D institution may be the most critical restraint for most agricultural crops. Indonesia R & D systems is heavily dominated by the government (Fuglie, 1999). The government R & D programs have been heavily biased for food crops. As we can see from Table 9, most of the released high yielding varieties (HYV) are food crops, rice in particular. The inexistent or limited research and development may be the main

reason why land productivity of almost all non food crop productions remain low and tend decelerating (Table 9).

Even for food crops, the main focus of the public R & D, there has been seemingly saturation in technological break through. Based on yield potential, there has been no significant R & D break through since mid 1990's. This is true for all agricultural crops. We may conclude, recession in R & D systems is one of the critical bottleneck of the agriculture supply.

Table 9. Average Yield Potential of New High Yielding Varieties (NHYV) in Indonesia, 1970-2003 (ton/ha)

Crops	1970-1975	1976-1980	1981-1985	1986-1990	1991-1995	1996-2000	2001-2003
A. Food Crops							
1. Wetland Rice	5.00(3)	4.80(11)	4.80(21)	5.00(7)	5.70 (8)	6.50(14)	6.20(13)
2. Dryland Rice	n.d.a	3.80 (2)	3.30 (6)	3.50(6)	3.60 (6)	4.00 (2)	3.20 (2)
3. Maize	n.d.a	4.00 (3)	5.00 (8)	5.90(5)	5.20(11)	8.80(26)	8.10 (2)
4. Soybean	1.80(1)	n.d.a	1.40 (6)	1.50(8)	1.80(13)	1.80 (5)	1.80 (5)
B. Fruits							
1. Avocade	n.d.a	n.d.a	n.d.a	5.00(3)	n.d.a	n.d.a	n.d.a
2. Orange	n.d.a	n.d.a	n.d.a	n.d.a	n.d.a	n.d.a	n.d.a
3. Manggo	n.d.a	n.d.a	4.60 (3)	n.d.a	2.00	n.d.a	n.d.a
4. Pineapple	n.d.a	n.d.a	n.d.a	n.d.a	6.30(1)	3.50(5)	n.d.a
5. Papaya	n.d.a	n.d.a	n.d.a	n.d.a	n.d.a	5.40(2)	n.d.a
6. Banana	n.d.a	n.d.a	n.d.a	n.d.a	19.00(1)	16.20)2_	n.d.a
C. Vegetables							
1. Shallot	n.d.a	n.d.a	9.20(4)	n.d.a	n.d.a	15.50 (2)	n.d.a
2. Chilli	n.d.a	n.d.a	n.d.a	n.d.a	19.30(7)	21.00(12)	n.d.a
3. Potato	n.d.a	n.d.a	26.70(2)	25.00(1)	26.50(1)	22.00 (2)	n.d.a
4. Cabbage	n.d.a	n.d.a	n.d.a	n.d.a	n.d.a	54.90 (5)	n.d.a
5. Tomato	n.d.a	n.d.a	14.50	n.d.a	n.d.a	55.00(16)	n.d.a
6. Cucumber	n.d.a	n.d.a	n.d.a	n.d.a	n.d.a	n.d.a	40.0(17)
D. Estate Crops							
1. Tea	n.d.a	n.d.a	n.d.a	n.d.a	n.d.a	5.00(11)	n.d.a
2. Palm Oil	n.d.a	n.d.a	n.d.a	n.d.a	n.d.a	n.d.a	27.90 (4)
3. Rubber	n.d.a	n.d.a	n.d.a	n.d.a	1.40(12)	n.d.a	1.80 (3)
4. Sugar Cane	n.d.a	n.d.a	n.d.a	113.80(14)	99.40(12)	27.00 (4)	n.d.a
5. Cocoa	n.d.a	n.d.a	n.d.a	n.d.a	n.d.a	2.40 (7)	n.d.a
6. Coffee	n.d.a	n.d.a	n.d.a	n.d.a	2.00 (2)	1.60 (5)	2.20(10)

Source: National Seeds Agency (various year)
Figure in parenthesis is the number of varieties.

Technology delivery systems

Technology delivery systems, that links the R & D systems in the upstream and the farmers in the downstream of the innovation systems may be another critical bottleneck. This includes seeds and other input embodied technology multiplication and dissemination. The technology delivery systems has been very much dominated by the government. Just like R & D, the government has been very much focused on food crops, rice in particular, farming technologies.

The government has developed an integrated rice technology delivery systems during the 1970 to late 1980's period. For seed multiplication, the government built seed production centers at provincial level. An integrated national extension service was also developed by building field extension offices (*Balai Penyuluhan Pertanian*) in all sub districts (*kecamatan*) and asssigning field extension servants (*Penyuluh Pertanian Lapangan*) for all villages. The government also developed village cooperatives to distributes all farm inputs in village level. The overall system is centrally coordinated by the so called Mass Guidance Coordinating Board (*Bimbingan Massal* = BIMAS), headed by the President at national level, Governor at provincial level, *Bupati* at district level, *Camat* at sub-district level and Village chief at village level. This centralized command system was proven quite effective in delivering input embodied technologies from research institutes to farmers.

But now, the technology delivery systems has been deconstructed and become disarrayed. Extension service system decentralized and handed out to the district governments. This should theoretically good, but in reality the district governments are not all very supportive or capable of facilitating effective extension service. The Mass Guidance Organization was liquidated. Without government supports, the village cooperatives are mostly closed down. The government seed enterprises are losing their vitalities.

It can be said that the agricultural technology delivery systems are in disarrayed. This may be the reason why some newly developed technologies in the research institutes have never reached the farmers or it takes so long time to reach the farmers. Although there have been many newly released HYV of food crops, only few of them significantly used by the farmers. In fact, most farmers remain using the very old HYV's (Table 10). For rice, IR-64 which was released in 1986 is still the most widely used by the farmers. For maize, the most widely used is Arjuna which was released in 1980. For soybean, the most widely used is Wilis which was released in 1983.

In addition to restraining innovation flows from R & D institutions to farmers, the disarrayed technology delivery systems may have caused declining supply of new knowledge and information at farm level which in turn causes sub optimal farm management. These technology, knowledge and information supply bottlenecks deserve immediate response from the government.

Perhaps the biggest mistake is that the policy for reducing government involvement in technology delivery system is not managed properly. For one thing, some elements of the technology delivery systems are private goods for which government involvement is necessary. Even if the government reduces its involvement, it should have been in the same time promoting private business involvement to substitute the government roles. The lacking of government involvement in the technology delivery system may explain the disarrayed technology delivery systems.

Table 10. Adoption Rate (planted area shaw) and Potential Yield of 1980 – 2002

Year	Dominant Varieties	Proportion (%)	Potential yield (ton/ha)	Year of Released
Paddy				
1980	1. PB 36	36.2	4.5	1978
	2. PB 38	9.4	4.5	1978
	3. PB32	8.0	4.5	1977
1985	1. PB 36	28.9	4.5	1978
	2. Cisadane	22.8	4.5 – 5.5	1980
	3. PB 42	5.2	5.5	1980
1990	1. IR 64	15.7	5	1986
	2. Cisadane	13.3	4.5 – 5.5	1980
	3. PB 36	10.3	4.5	1978
1995	1. IR 64	47.1	5	1986
	2. Cisadane	6.4	4.5 – 5.5	1980
	3. PB 42	4.1	5.5	1980
2000	1. PB 42	43.1	5	1986
	2. Way Apo Boru	6.2	5.0 – 8.0	1998
	3. IR 66	4.6	4.5 – 5.0	1989
Maize				
1995	1. Arjuna	31.1	5.0 – 6.0	1980
	2. Hibrida C-1	9.1	6.2 – 7.0	1983
	3. CPI-1	8.4	6.0 – 7.0	1985
2000	1. Arjuna	16.5	5.0 – 6.0	1980
	2. Bisma	6.9	7.0 – 7.5	1995
	3. Hibrida C-1	2.8	6.2 – 7.0	1983
2002	1. Arjuna	11.2	5.0 – 6.0	1980
	2. Bisma	4.1	7.0 – 7.5	1995
	3. Hibrida C-1	1.8	9.0 – 12.0	1997
Soybean				
1995	1. Wilis	54.7	1.1 – 2.1	1983
	2. Orba	4.3	1.0 – 2.0	1974
	3. Lokon	7.4	1.2 – 2.2	1982
2000	1. Wilis	20.4	1.1 – 2.1	1983
	2. Orba	4.2	1.0 – 2.0	1974
	3. Lokon	1.7	1.2 – 2.2	1982
2002	1. Wilis	12.0	1.1 – 2.1	1983
	2. Orba	1.2	1.0 – 2.0	1974
	3. Lokon	1.1	1.2 – 2.2	1982

Source: National Seeds Agency (various years)

Over intensification syndrome

Another explanation for the decelerating land productivity (yield) is resource quality degradation due to excessive use of external input as well as over intensive land use. This is especially true for wetland paddy field (sawah). Modern rice HYVs requires high external inputs (particularly inorganic fertilizers and pesticides), perfect soil preparation, continuous irrigation which cause long-term negative impacts on soil quality. This problem is aggravated by the high land use intensity through year-round multiple cropping.

Many studies have found that Indonesian wetland has been plaqued with the over intensification or soil fatigue syndrome. The soil is now lacking of organic matters and micronutrients. The physical properties of the soil has also been degradating. All of these have caused long-term declining of land productivity.

The over intensification syndrome is not particular for Indonesia. It has been proven well spread in many other countries which widely adopted high input-high output HYVs (Pingali, Hossain, and Gerpacio, 1997). Perhaps, this is the reason why total factor productivity of the rice farming in Indonesia declining as found by Simatupang *et al.* (1995) and Sudaryanto *et al.* (2002). Not only declining land productivity (yield), the over intensification syndrome causes increasing production cost and hence declining farming competitiveness. The over intensification syndrome can be considered as a long-term threat to Indonesian rice farming sustainability.

Large and increasing number of small-scale family farms

Indonesian agriculture is dominated by large and increasing number of small scale family farms. Recent agricultural census indicated that in 2003 there were 25,437 million land-using farm households in Indonesia, 13,663 million or 56.7 percent of which were marginal farmers with less than 0.5 ha of land under their control. In 1993 the number of land-using farm households was 20,518 millions or was increasing at 1.8 percent per year, whereas the number of marginal farmers were 10,804 million or was increasing at 2.6 percent per year during the 1993 – 2003 period. In Java, the numbers of land-using farm households and the marginal farmers were growing at 1.5 percent and 2.4 percent per year respectively. Whereas in outside Java, the numbers of land-using farm households and marginal farmers were growing at 2.1 percent and 3.4 percent per year respectively (Table 11).

Table 11. Number and Growth Rate of Land-Using Household and Marginal Farmers in Indonesian, 1993-2002

Category	1993			2003		
	Java	Outside Java	Indo-nesia	Java	Outside Java	Indo-nesia
1. Number (million)						
a. Marginal farmers	8,067	2,737	10,894	9,989	3,674	13,663
	(69.8)	(30.6)	(52.7)	(74.9)	(33.9)	(56.5)
b. Land-using households	11,564	8,954	20,518	13,336	10,841	24,176
c. Agricultural households	11,671	9,116	20,787	13,964	11,472	25,437
2. Growth rate 1993-2003 (%/year)						
a. Marginal farmers				2.4	3.4	2.6
b. Land-using households				1.5	2.1	1.8
c. Agricultural households				2.0	2.6	2.2

Figures in parentheses are percent of land-using households
Source: Central Bureau of Statistics.

The statistics shows that population or employment pressure on agricultural land continued increasing. The growth rate of agricultural households much higher than the population that indicates the economy structural transformation turning point has not occurred in Indonesia. Consequently, the number of marginal farmers, and perhaps the landless laborers too, continued increasing with an accelerating rate. This trend is really worrisome. First, with very small size or inexistent of operated land, most of the marginal farmers and landless laborers must be poor. The Indonesian agriculture may be plagued with the so called poverty – food insecurity – land degradation triangle syndrome.

Second, a very small size of land operation is not conducive for progressive and efficient farm production. Land size smallness may prevent the farmers to quickly adopting new innovations which generally require high capital and have economies of scale to produce sufficiently large volume of outputs which necessary for efficient marketing as well as to acquire economic scale in input acquisition. Small farmers generally have higher cost of production (all inputs included) and lower output price, and hence lower profitability rate.

The increasing number of marginal farmers can be considered as increasingly stringent supply bottleneck. The root causes are the decelerating growth rate of agricultural land and the failure to reach the structural transformation tuning point of Indonesian macro-economy. The first may be considered as policy failure to promote investment in agricultural land development, whereas the second one is due to the failure of long-term over all economic development policies.

Declining government investments

Perhaps the most critical bottleneck of the Indonesian agricultural supply is declining trend of government expenditure (in constant price) for agricultural development during the 1995/96 – 2000 period for all categories. Total development budget of the Ministry of Agriculture in 2000 was only about one third of its value in 1995/96. The expenditure for agricultural extension has been declining since mid 1980's. The most dramatic one is the fertilizer subsidy which declining very rapidly since mid 1980's and then erased to zero in 1999. It was, however, reviewed again in 2003. Expenditure for agricultural research and development (R & D) was ups and down. It declined during the second half of the 1980's, increased in the first half of the 1990's, but then declined again in late 1990's.

The declining government expenditure for agricultural R & D and extension to some extent may explain the seemingly stagnation of agricultural innovations as reflected by the decelerating yield of most agricultural commodities. The declining government expenditure for irrigation development must also have significant negative effects on agricultural production. Many studies have shown, government expenditures on irrigation, R & D, and extension

are very instrumental for agricultural production (Mundlak, Larson and Butze, 2002, Fuglie, 2003).

Table 12. Government Expenditure for Agricultural Development, 1985/86 – 2000, 1993 Prices (Rp.1000)

Descriptions	1985/ 1986*)	1990/ 1991	1995/ 1996	2000**)	2002
Irrigation	801,790	969,848	982,237	227,330	378,435
Research and development	29,322	21,732	53,474	29,893	27,560
Extension / Training	36,060	35,270	25,956	14,194	12,424
Fertilizer subsidy	1,738,550	330,847	120,946	0	0
Min.Agriculture (excl.Fish, incl.Est)	284,550	314,235	479,130	144,804	424,405

* Budgeted
** 9 months realization
Source: Ministry of Agriculture.

Besides for infrastructures, government expenditures for input subsidies, fertilizer in particular, declined very rapidly since mid 1980's. This was part of the massive economic deregulation policies conducted by Indonesian government since 1983 and expanded and intensified in 1986. Clearly the sharp declining government subsidies also contributed to the sharp decline of agricultural production growth since late 1980's. But, it should be noted since 2001, the allocated budget for agriculture increased dramatically. Is this a sign of sustainable policy reversal? We hope so. The rural value of government expenditures for agricultural R&D and extension, however, continued declining.

Farming incentives

Another agricultural promotion constraint is economic incentive, particularly input provision facilities and output price supports. Up to mid 1980's the government provide many incentives for agricultural producers, rice farmers in particular. The incentives include input subsidies (fertilizers, seeds), price supports, subsidized credits, machineries provision for farmers groups, etc. As mentioned, since mid 1980's the government has gradually reduced its supports for agricultural development. This includes reduction or stopping of its production incentives for farmers.

The reduction or abolishment of input subsidies results in increasing production cost. As an example, fertilizer price has been increasing much faster than of many agricultural commodity prices. This can be seen from the declining paddy – fertilizer price ratio (Table 13). It should be noted the agricultural term of trade was slumped during the 1989-1994 period when the government significantly reduced its price supports. This was coincide with the sharp decline

of agricultural production growth. But since 2001, the terms of trade increased significantly. One of the reasons may be the change in the government policy direction. In this past three years the government has repeatedly pledge to protect and promote the agricultural sector. The government has imposed import tariffs to support paddy and sugar prices. The government also revived the fertilizer subsidy. Effectiveness and sustainability of those policies remain to be seen in some years to come.

Table 13. Trend of farmer Terms of Trade in Java (1983 = 100) and Paddy-Fertilizer Price Ratio 1974-2002

Year	Terms of trade in Java	Paddy fertilizer price ratio	
		Urea	TSP
1974	---	1.01	1.48
1975	---	0.90	1.56
1976	84.87	1.02	1.60
1977	88.21	1.10	1.47
1978	87.40	1.16	1.32
1979	89.44	1.46	1.47
1980	88.66	1.68	1.64
1981	85.88	1.87	1.85
1982	90.41	1.83	1.82
1983	100.00	1.82	1.88
1984	101.51	1.82	1.82
1985	100.94	1.81	1.73
1986	105.27	1.60	1.46
1987	107.25	1.50	1.47
1988	110.00	1.73	1.79
1989	104.28	1.49	1.46
1990	105.00	1.31	1.19
1991	104.85	1.39	1.25
1992	99.75	1.35	1.18
1993	101.37	1.24	1.03
1994	102.99	1.31	1.10
1995	106.48	1.47	1.02
1996	107.17	1.26	0.96
1997	108.57	1.18	0.90
1998	107.56	1.59	1.21
1999	103.95	1.19	0.87
2000	102.57	0.91	0.64
2001	112.48	--	---
2002	118.97	--	---

Source : Producers Price Economics indicators (various year), CBS

CONCLUSIONS

Indonesian agriculture performance is now in danger of being trapped in persistently low and decelerating growth rate. Major food productions, such as rice, maize and soybean, have been growing at a rate below the population growth rate, even some of them has been either stagnant or contracting since mid 1990's. This is the reason why food commodity importations have been increasing in recent years that could endangers national food security.

Worst yet, the seemingly persistent decelerating agricultural production is not particular to major food commodities, but is also true for almost all agricultural commodities. The persistent decelerating growth is the general phenomenon for agricultural commodities. This is really an alarming problem that endangers the livelihood of the majority of Indonesian people, especially those in the poorest segment of the population. Indonesian agriculture is now in urgent need of emergency recovery supports from the government.

The supply constraints are very stringent and extensive. The major ones are the continued declining of wetland paddy field (sawah) area, declining of dry land area in Java, and decelerating growths of all types of agricultural land in outside Java. This land problem is aggravated by the seemingly stagnant or decelerating yield of all agricultural commodities. The root causes include both of natural factors and policy market failures. Our attention must be focused on the policy matters.

The policy related factors include declining of government investment on public infrastructure development, particularly irrigation, R&D, extension, stopping of investment facilities for new agricultural land development, and reduction of farming incentives. These within agricultural sector policy failures are aggravated by the overall economic development failure to achieve structural transformation failure which necessary to reduce population / employment pressure on agriculture.

The agricultural supply bottlenecks can only be eased through completely reversing the previous government policy direction. *First*, government expenditure for development of agricultural infrastructures, particularly irrigation, R&D, and extension, must be increased significantly, to reverse the present declining trend. *Second*, the government should resume its leading involvement on new agricultural development and or provide facilities for private investments in this critically important area. *Third*, the R&D sector should be deregulated to facilitate private sector participation both in R&D and in technology transfer, including through international sources. *Fourth*, the government should resume its provision of farming incentives and facilities (input provision, price supplies, credit facilities) in the spirit of market failure correction. *Fifth*, promoting labor intensive rural industry development to provide employment alternative to rural labor for in order to ease employment pressure on agriculture.

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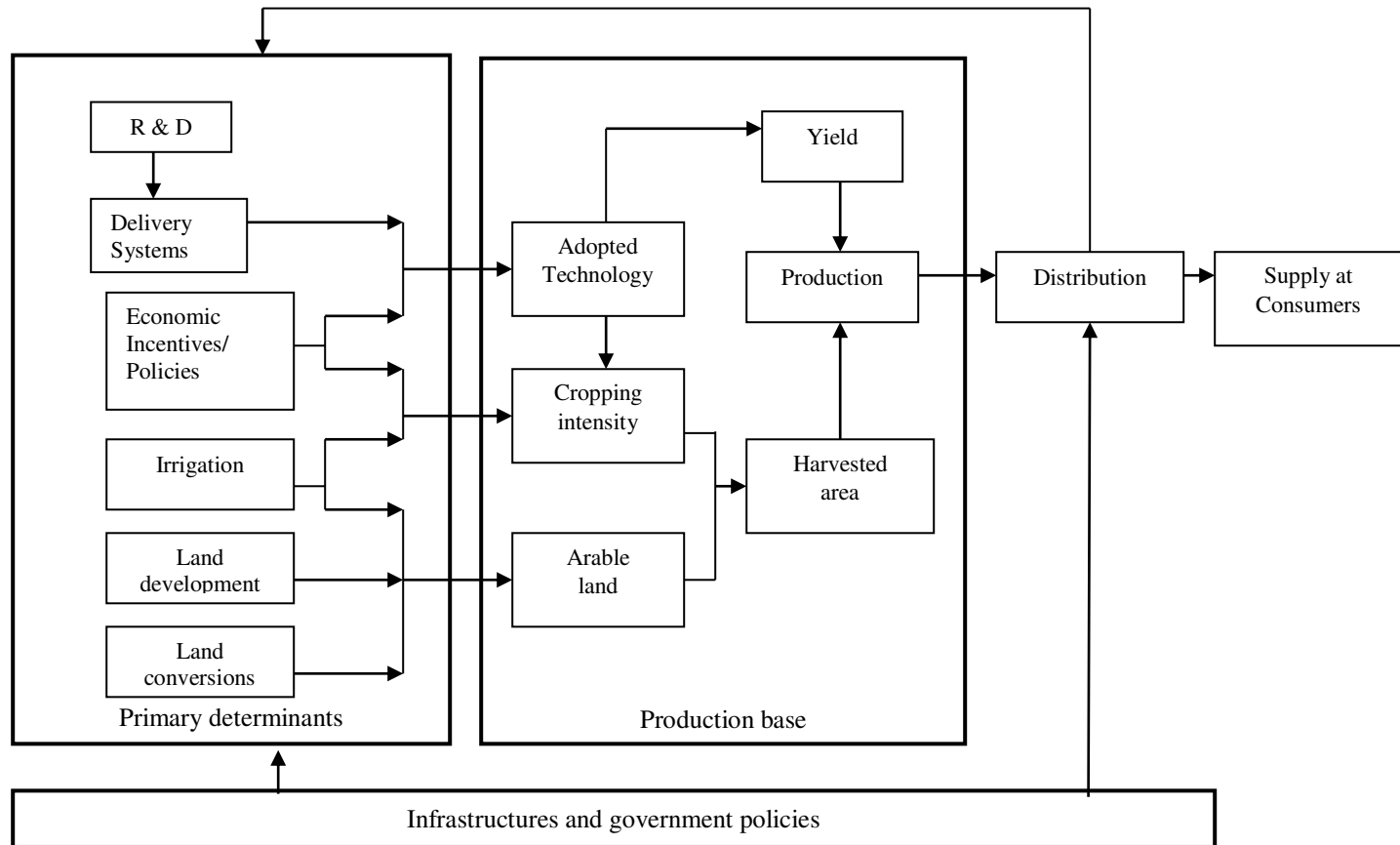
Figure 1. Framework for Identification of Sources of Production Growth and Their Determinants