

Study on Implementation of  
Integrated Spatial Plan for  
The Mamminasata Metropolitan Area

## SECTOR STUDY (4)

# **AGRICULTURE STUDY**

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## 1. OVERVIEW OF AGRICULTURE SECTOR

### 1.1 Agriculture Sector

#### 1) Gross Regional Domestic Product (GRDP)

South Sulawesi province has been recognized as one of the most important granaries in Indonesia. In particular, the province has provided paddy and other food crops to other provinces in Sulawesi. Moreover, the Mamminasata area has played gateway role to supply agriculture and fishery products to other regions and foreign countries.

In the entire province, the agriculture sector still remain as the largest contributor to GRDP, employing more than 1.83 million people or 57% of labor force in 2003. Except for Makassar municipality, the agriculture sector in three regencies contributes to about 45% to GRDP as shown below.

**Table 1-1 GRDP Share of Agriculture Sector by Regencies (2003)**

	Regional Income from Agriculture Sector (Mil. Rp.)	Percentage to GRDP	GRDP by Regions (Mil. Rp.)
Makassar	74,408	2.2	3,442,520
Maros	183,471	44.2	415,111
Gowa	260,494	45.0	579,436
Takalar	112,659	43.5	259,115
Total	631,031	13.4	4,696,182

Source : BPS, Makassar, Gowa, Takalar and Maros in Figure, 2003

The agriculture sector comprises four sub-sectors: food/non-food, livestock, forestry, and fishery. Table below presents the GRDP structure by sub-sectors in 2002<sup>1</sup>. In both Maros and Takalar, food/non-food sub-sector and fishery sub-sector account for more than 95%, while the food/non-food sub-sector contributes nearly 95% in Gowa.

**Table 1-2 Agriculture Structure by Sub-sector (2002)**

Type of Sub-Sector	Percentage to Agriculture Sector Income			
	Makassar	Maros	Gowa	Takalar
Food/Non-Food Crop Sub-Sector	N/A	48.4	94.9	48.9
Livestock Sub-Sector	N/A	4.7	4.3	4.2
Forestry Sub-Sector	N/A	0.2	0.03	0.04
Fishery Sub-Sector	N/A	46.7	0.7	46.9
Total	-	100.0	100.0	100.0

Source : BPS, Makassar, Gowa, Takalar and Maros in Figure, 2002 and 2003

<sup>1</sup> The data on structure by sub-sector for 2003 has not been available in the source document.

The land holding size is assessed to be 1.28 ha/household on a provincial average, of which paddy field occupies about 0.55 ha (43%), while households with less than 0.5 ha accounts for 29%, of the total land holdings<sup>2</sup>.

## 2) Land Use

Current land use in Mamminasata is estimated as summarized in the table below.

**Table 1-3 Current Land Use in Mamminasata**

(Unit: ha)

Categories	Makassar	Maros	Gowa	Takalar	Total
<b>Urban Area</b>	<b>9,090</b>	<b>1,280</b>	<b>3,780</b>	<b>780</b>	<b>14,930</b>
Residential Area	7,310	1,280	3,780	770	13,140
Commercial	810	0	0	10	820
Business/Office	470	0	0	0	470
Industrial Area	500	0	0	0	500
<b>Agricultural Area</b>	<b>3,980</b>	<b>36,900</b>	<b>38,670</b>	<b>26,490</b>	<b>106,050</b>
Irrigated Mixed Crops	100	0	7,070	3,320	10,500
Irrigated Rice Field	830	0	18,870	8,450	28,140
Mixed Crops	830	7,580	8,040	8,540	24,990
Rice Field	2,220	29,290	1,690	6,190	39,390
Plantation	0	30	3,000	0	3,030
<b>Green Area</b>	<b>430</b>	<b>46,610</b>	<b>14,300</b>	<b>10,440</b>	<b>71,780</b>
Grassland	0	1,180	0	1,000	2,180
Bushes	0	3,830	470	0	4,300
Forest	430	41,600	13,830	9,440	65,310
<b>Water</b>	<b>2,690</b>	<b>8,760</b>	<b>5,480</b>	<b>3,620</b>	<b>20,550</b>
River	750	1,990	1,430	850	5,020
Wetland/Fish Pond	1,840	6,770	0	2,670	11,280
Water Reservoir	90	0	4,050	110	4,250
<b>Others</b>	<b>1,790</b>	<b>11,030</b>	<b>9,980</b>	<b>13,640</b>	<b>36,440</b>
Dryland	850	10,300	9,970	13,610	34,730
Sand Dune	70	0	0	0	70
Open Space	870	730	10	30	1,640
<b>Total</b>	<b>17,980</b>	<b>104,860</b>	<b>72,210</b>	<b>54,980</b>	<b>250,030</b>

Source: National Land Agency

Agricultural land area in Mamminasata is estimated to be 106,050 ha, accounting for 42% of total land area. The area for irrigated mixed crops and irrigated rice field are mainly under the technical irrigation system of Bili-Bili Irrigation Project. The areas for mixed crops, rice field, and plantation are considered as semi-technical, non-technical, and rainfed agricultural land.

Substantial area are used for fish ponds in Maros, Takalar, and Makassar, where inland fish pond culture are intensively developed. Green areas (grassland, bushes, and forest) dominantly extend in Maros, where wooden products and honey-base products are produced.

<sup>2</sup> The Study on Capacity Development for Jeneberang River Basin Management, JICA March 2004.

### 3) Agriculture Production

Major food crops in the province are paddy, maize, sweet potato, cassava, soybean, mungbean and groundnut. Among them, the province has contributed for about 40% to national paddy stock.<sup>3</sup> Major paddy producing areas are Bone, Wajo, and Pinrang districts, accounting for more than 30% of the total provincial production in volume.

**Table 1-4 Area and Production of Paddy**

	Harvested Area (ha)		Production (thousand ton)		Yield (ton/ha)	
	1999	2003	1999	2003	1999	2003
South Sulawesi	902,286	847,305	3,870.0	4,003.1	4.29	4.72
Makassar	4,139	2,269	19.5	11.5	4.71	5.07
Maros	39,757	38,590	218.6	213.2	5.50	5.52
Gowa	45,953	49,060	205.9	232.5	4.48	4.74
Takalar	23,857	21,374	124.0	118.7	5.20	5.55
4 Regions Total	113,706	111,293	568	575.9	5.00	5.17
Percentage to the Province	12.6%	13.1%	14.7%	14.4%	-	-

Source : BPS, South Sulawesi, Makassar, Gowa, Takalar and Maros in Figure, 2003

As shown in the table above, the Mamminasata area accounts for 14.4% of paddy production in the province, which is relatively small. However, unit yield in Mamminasata reaches 5.17 ton/ha, exceeding the provincial average of 4.72 ton/ha in 2003. Paddy cultivation under irrigated condition accounts for 89% and remaining 11% is under rain-fed condition.

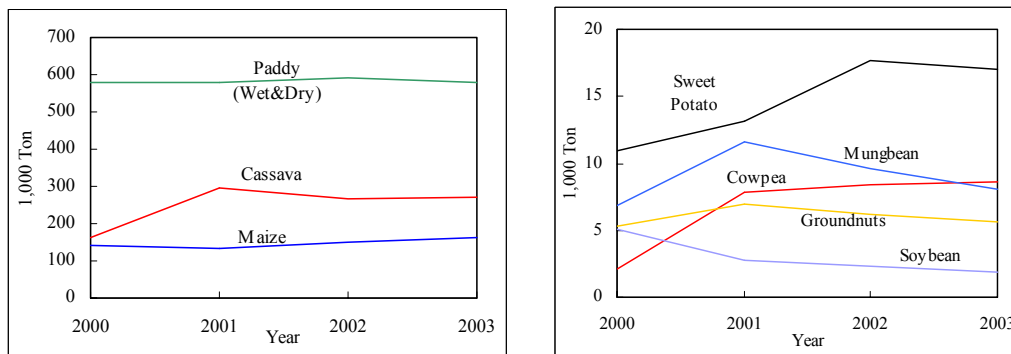
Maize production is becoming popular in last five years, particularly in Gowa and Takalar, with the increasing demand for poultry feed milling. More than 90% (150,000tons) of maize was produced in Gowa and Takalar in 2003. Gowa district is one of the largest cassava producers contributing more than 33% of provincial production and 46% of Mamminasata production. (See also Annex 1).

**Table 1-5 Production of Other Food Crops (2003)**

Crop	Harvested Area (ha)			Production (ton)		
	Province	Mamminasata (%)		Province	Mamminasata (%)	
Maize	213,818	34,818 (16%)		650,832	161,578 (25%)	
Cassava	40,808	14,927 (37%)		590,717	271,319 (46%)	
Sweet Potato	5,748	768 (13%)		61,789	16,967 (27%)	
Groundnuts	43,385	3,867 (9%)		52,763	5,650 (11%)	
Soybean	16,992	1,327 (8%)		24,140	1,890 (8%)	
Mungbean	33,180	11,180 (34%)		38,608	8,055 (21%)	

Source : BPS, South Sulawesi, Makassar, Gowa, Takalar and Maros in Figure, 2003

<sup>3</sup> Direktori Sulawesi Selatan, Pemerintah Propinsi Sulawesi Selatan, 2004.



Source : BPS, South Sulawesi, Makassar, Gowa, Takalar and Maros in Figure, 2001, 2002, 2003

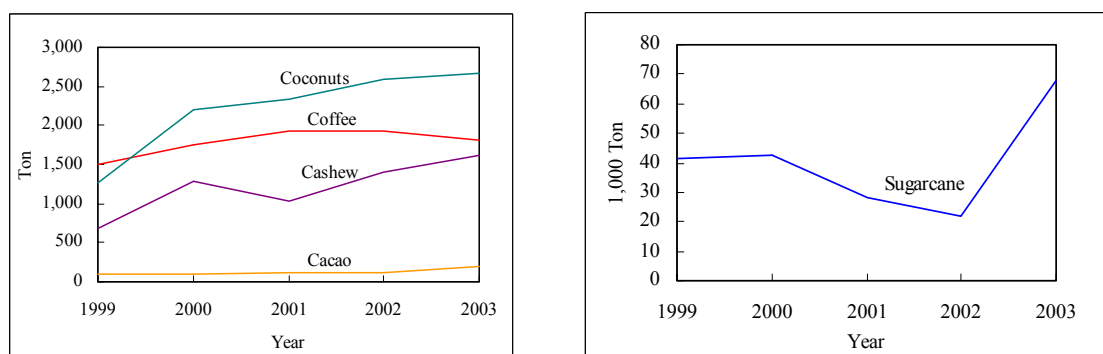
**Figure 1-1 Production Trend of Food Crops in Mamminasata**

Figure above shows a production trend of major food crops during 2000-2003. Paddy, maize and cassava have achieved relatively stable production, while soybean and mungbean have been declining in production.

Estate crop production is extensively practiced, e.g., coffee in Gowa, sugarcane, coconuts, cashew and kapok in Gowa and Takalar. However, most of the estate crop productions have been managed on a fragmented small-scale, and a large-scale plantation observed only for sugarcane cultivation in Takalar.

One of the priority commodities in the province is cacao, though the production scale within Mamminasata is small, as compared to the northern part of the province (e.g., Mamuju, Luwu Utara, Polmas and Bone).

Figure below presents the production trends of major estate crops. Coconuts, coffee, cashew and cacao have slightly increased since 1999. Sugarcane production dropped in 2000-2002.



Source: BPS, South Sulawesi, Makassar, Gowa, Takalar and Maros in Figure, 2001, 2002, 2003

**Figure 1-2 Trend of Major Estate Crop Production in Mamminasata**

Fruit production is also active in Mamminasata, e.g., mango, papaya, citrus, and banana, as well as markisa (passion fruit in Gowa). Tana Toraja and Gowa (Malino area) are major fruit producers (see also Annex 1).

Vegetable production is intensive in Gowa, followed by Maros. Vegetables are normally cultivated at subsistence level for farmers, however, production surplus is marketed in urban centers in particular Makassar municipality.

## 1.2 Livestock Sub-sector

The major livestock grazed in Mamminasata are cattle, buffalo, goat, duck and chicken, while milk cow, horse, sheep and pig are raised in relatively small number as shown in the table below.

**Table 1-6 Livestock Population (2003)**

(Unit: head)

	Milk Cow	Cattle	Buffalo	Horse	Goat	Sheep	Pig	Duck	Broiler Chicken	Domestic Chicken
Makassar	29	1,322	665	126	4,152	0	3,247	36,669	9,058	300,567
Maros	0	40,488	10,465	4,403	17,490	0	60	311,511	318,709	773,304
Gowa	0	70,572	22,568	8,380	17,822	0	5,159	215,913	709,680	831,217
Takalar	0	17,392	5,137	1,079	20,237	7	0	101,867	236,900	359,952
Total	29	129,774	38,835	13,988	59,701	7	8,466	665,960	1,274,347	2,265,040

Source: BPS, South Sulawesi, Makassar, Gowa, Takalar and Maros in Figure, 2001, 2002, 2003

Milk cow is only observed in Makassar and its number is limited to 29 heads. This implies that milk production is not active in Mamminasata. Cattle, buffalo and horse are raised mostly as draft animal for farming practices and transportation.

**Table 1-7 Livestock Production in Mamminasata (2003)**

(Unit: ton)

	Cattle	Buffalo	Horse	Goat	Pig	Duck	Broiler Chicken	Domestic Chicken	Chicken Egg	Duck Egg
Makassar	2,590	1,789	0	59	829	26	186	183	2,927	294
Maros	234	214	0	0	0	199	221	472	1,466	1,930
Gowa	1,953	427	10	9	0	149	512	531	829	1,220
Takalar	199	210	76	0	0	18	137	270	762	281
Total	4,976	2,639	85	68	829	392	1,057	1,457	5,984	3,725

Source: BPS, South Sulawesi, Makassar, Gowa, Takalar and Maros in Figure, 2001, 2002, 2003

Production of cattle, buffalo, pig and egg (chicken) products concentrates in Makassar, while chicken, duck and duck egg products are produced intensively in Maros and Gowa. Live goats, chicken, duck and eggs are marketed locally used for home consumption.

## 1.3 Fishery Sub-sector

Fishery production of the province is ranked at the third largest in Indonesia and the second largest sub-sector in Mamminasata. Marine fishery accounts for 20.4% of regional production volume, followed by brackish water pond culture. Total fishery production in the province increased by approximately 8 % in 2000-2003. The total production was 468,000 tons. Takalar is the major fishery production area having a long coastline. Inland fishery, excluding brackish water pond culture, is not popular. This indicates that the regional demand for marine fish is higher than inland fresh

water fish.

**Table 1-8 Fishery Production in Mamminasata (2003)**

Administrative Unit	Marine Fishery	Inland Fishery						Total (ton)
		Brackish Water Pond	Fresh Water Pond	Paddy Field	Lake	River	Swamp	
South Sulawesi	354,425	122,571	2,301	3,925	14,252	2,102	6,057	505,633
Makassar	17,958	373	0	0	0	0	0	18,331
Maros	14,743	9,219	9	16	0	0	0	23,986
Gowa	0	60	88	119	0	101	77	444
Takalar	39,544	7,540	0	0	0	0	0	47,083
Mamminasata Total	72,244	17,192	96	135	0	101	77	89,844
Percentage to the Province	20.4%	14.0%	4.2%	3.4%	0.0%	4.8%	1.3%	17.8%

Source: Statistical Report of Fishery, South Sulawesi, 2003.

Marine fish products are diversified; e.g., flying fish, tuna, bonito, squid, crab and so on. Makassar city has a regulation to limit marine fish catch for conservation of marine resources by establishing various rules and supporting programs, though ineffective as they are. Brackish water pond culture is intensively practiced in Maros and Takalar. Mozambique tilapia production is most popular, accounting for 33.8% of the provincial production.

**Table 1-9 Brackish Water Fish Culture Production (2003)**

Administrative Unit	Mozambique Tilapia	Milk Fish	Mullet	Giant Seaperch	Others	Total (ton)
South Sulawesi	3,073	59,128	201	82	3,668	66,151
Makassar	5	158	7		33	203
Maros	725	5,933	0		229	6,887
Gowa	0	36	0		5	41
Takalar	309	1,796	0		228	2,333
4 Regions Total	1,040	7,923	7	0	495	9,464
Percentage to the Province	33.8%	13.4%	3.3%	0.0%	13.5%	14.3%

Source: Statistical Report of Fishery, South Sulawesi, 2003.

Prawn/shrimp culture is growing intensively along the west coast of the province, with Pinrang District as a center. Giant tiger prawn culture is relatively active in Maros. Recently, shrimp culture production has been reduced due to an outbreak of diseases. Provincial government has launched some supporting programs for shrimp culture, providing manuals for proper management of fish culture.<sup>4</sup>

<sup>4</sup> Formulation of Cultivation Area Development Planning (Giant Tiger Prawn), Fishery and Marine Service, South Sulawesi Province, 2003.



**Table 1-10 Brackish Water Crustacean Culture Production (2003)**

Administrative Unit	Giant Tiger Prawn	Banana Prawn	Metapenaeus Shrimp	Mysid	Mud Crab	Total (ton)
South Sulawesi	14,840	1,184	3,185	129	2,092	21,430
Makassar	134	7	0	0	30	170
Maros	1,830	0	503	0	0	2,332
Gowa	15	0	0	0	4	19
Takalar	98	79	56	0	0	233
4 Regions Total	2,077	86	559	0	33	2,755
Percentage to the Province	14.0%	7.2%	17.6%	0.0%	1.6%	12.9%

Source: Statistical Report of Fishery, South Sulawesi, 2003.

Seaweed production is significantly increasing in last five years. Takalar produced nearly 5,000 ton in 2003. Cultivation in Maros is also noticeable. In districts outside of Mamminasata, Bantaeng, Selayar, Sinjai, and Mamuju Districts are producing 30,000 ton of seaweed in 2003. Seaweed growing and harvest is increasing with favorable for export as raw material for gelatin and cosmetic additives.

#### 1.4 Forestry Sub-sector

Forest resources are located in the mountainous area of Maros and Gowa as shown in the table below.

**Table 1-11 Forestry Resources (2003)**

(Unit: ha)

Administrative Unit	Protected Forest	Limited Production Forest	Ordinary Production Forest	Hutan PPA	Converted Forest	Total
South Sulawesi	1,928,597	811,105	203,816	208,301	102,073	3,253,892
Makassar	0	0	0	0	0	0
Maros	25,817	7,886	25,765	9,041	0	68,509
Gowa	24,226	13,445	22,100	3,309	0	63,080
Takalar	86	0	3,482	4,696	0	8,264
4 Regions Total	50,129	21,331	51,347	17,046	0	139,853
Percentage to the Province	2.6%	2.6%	25.2%	8.2%	0.0%	4.3%

Source : BPS, South Sulawesi, Makassar, Gowa, Takalar and Maros in Figure, 2003

It is noted that nearly one-fourth of the ordinary production forest is concentrated in Maros and Gowa, where forestry products are developed e.g., timber, resins, rattan and bee-culture (honey)<sup>5</sup>.

#### 1.5 Irrigation Sub-Sector

The potential irrigation area in South Sulawesi province is estimated to be 503,748 ha, consisting in 320,907 ha under 250 government-developed irrigation schemes and 182,841 ha under 1,287 village irrigation schemes. The government-developed

<sup>5</sup> Beekeeping activities are under the jurisdiction of Forestry Service and honey-oriented products in Maros are selected as one of the priority commodities for People Economic Development Movement (*Gerakan Pembangunan Ekonomi Masyarakat: Gerbang Emas*), which is jointly sponsored by private sector and Governors Office of the province.

irrigation schemes consist in 57 technical irrigation schemes with potential irrigation areas of 237,657 ha, 132 semi-technical irrigation schemes with potential irrigation areas of 72,981 ha, and 61 simple irrigation schemes having potential areas of 10,269 ha<sup>6</sup>

In Mamminasata, the multi-purpose Jeneberang river basin development project has been implemented with the financial assistance of OECF (currently, JBIC) since 1983. The Bili-Bili multipurpose dam was constructed in 1986-1997, followed by construction and rehabilitation of the Bili-Bili irrigation system. The Bili-Bili irrigation is composed of three sub-systems, namely Bili-Bili (existing), Bissua (new) and Kampili (existing).

The areas of Bili-Bili irrigation project lie on the downstream reaches of the Jeneberang River, mostly in Takalar and Gowa, and partly in Makassar. The gross and net irrigation service areas are 45,500 ha and 23,602 ha, respectively<sup>7</sup>, as shown below.

**Table 1-12 Gross Area and Irrigation Service Area of Bili-Bili Project**

Scheme	Gross Area (ha)	Irrigation Service Area (ha)
Bili-Bili (existing)	7,050	2,369
Bissua (existing and new)	20,000	10,686
Kampili (existing)	18,450	10,547
Total	45,500	23,602

Source : (i) Final Design Report on Detail Design and Construction Supervision of Bili-Bili Irrigation Project, December 1999, and (ii) The Study on Capacity Development for Jeneberang River Basin Management, JICA 2004



**Figure 1-3 Existing Technical Irrigation System (Bili-Bili Irrigation Project) in Mamminasata**

<sup>6</sup> The Study on Capacity Development for Jeneberang River Basin Management, JICA 2004

<sup>7</sup> According to the Bili-Bili irrigation project office, the actual areas are slightly more than that due to introduction of pump irrigation in the tertiary blocks.

The average net farm size under the Bili-Bili irrigation project is estimated to be 0.3~0.5 ha, while 50% of farmers are less than 0.45 ha size<sup>8</sup>. Most farmlands are owned by owner-farmers. The owner-farmer ratio is estimated to be 88 % (1993) on average, varying from 91 % in Gowa to 73 % in Makassar.

A cropping pattern applied to the Bili-Bili irrigation project is three irrigated crops a year, namely two paddy crops of wet and dry (200 %) and partly palawija crops (40 %). Palawija crops are soybeans (15 %), mungbeans (10 %), groundnuts (8 %) and maize (7 %). The anticipated yields of paddy are estimated to be 5.5 tons/ha of wet season paddy and 6.0 tons/ha of dry season paddy. The gross return and net benefit (not considering family labor cost) have been assessed to be about Rp. 13.2 million/ha (US\$ 1,833/ha equiv.) in the feasibility (1999).

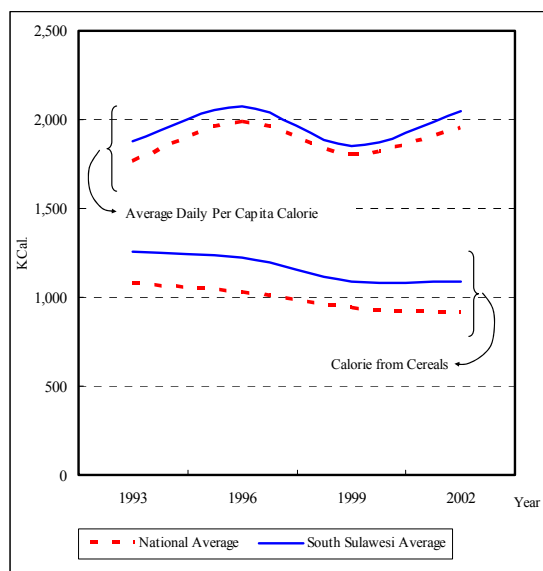
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<sup>8</sup> Based on the hearing at Bili-Bili irrigation project office in June 2005.

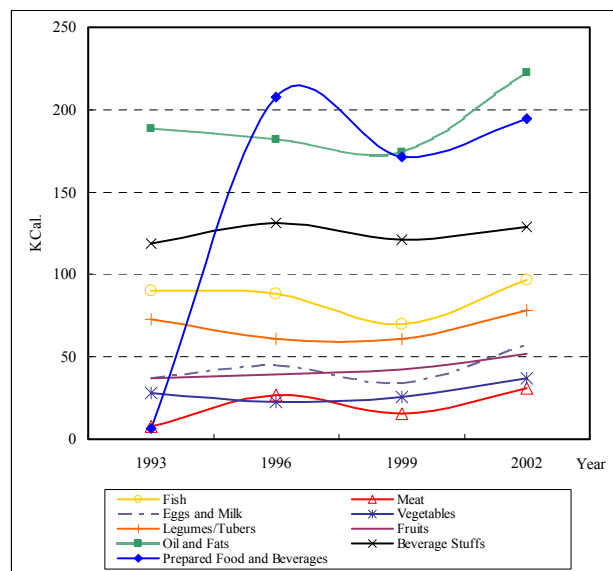
## 2. AGRICULTURE SECTOR ISSUES

### 2.1 Trend of Demand for Agriculture and Fishery Products

Figures 2-1 and 2-2 present the daily per capita calorie intake in urban areas of South Sulawesi province during 1993-2002.



**Figure 2-1 Daily Per Capita Calorie Intake from Cereals (Urban Area) in Indonesia and South Sulawesi**



**Figure 2-2 Daily Per Capita Calorie Intake from Other Sources of Food (Urban Area) in South Sulawesi**

Source: Consumption of Calorie and Protein of Indonesia and the Province (National Socio-Economic Survey), 1999 and 2002, BPS.

It is observed that calorie intake from cereals (rice) is decreasing, while average total daily per capita calorie intake is increasing. The above figures indicate that per capita demand for food is on an upward trend, except for cereals, and this trend would be applicable to Mamminasata. Food consumption in Mamminasata would be diversified, shifting to less rice, and more meat, vegetables, fruits, oils and ready-made processed foods. The table below shows in general trend of food demand in South Sulawesi and Mamminasata.

**Table 2-1 Demand Trend by Type of Food**

Type of Food	Trend
Cereals	↘
Fish	↗
Meat	↗
Eggs and Milk	↗
Vegetables	↗
Legumes/Tubers	↗
Fruits	↗
Oil and Fats	↗
Beverage Stuffs	↗
Prepared Food and Beverages	↗
Total (Kcal./capita/day)	↗

## 2.2 Outlook of Agricultural Products

South Sulawesi province is abundant in agriculture, fishery, and forestry resources. Most commodities have a variety of uses and processing as presented in Annex 2. However, levels of their utilization are still lower than that expected in the province<sup>9</sup>.

### 1) Food Crops

**Rice** is the most important staple food in Indonesia. Harvested paddy is normally dried and milled at a rice mill, where urban traders purchase to market for consumers. Rice bran produced during the milling process is used for animal feeds. As ready-to-consume products, rice is also processed into noodle and snack. A few rice-base noodle companies are operated in Makassar and Maros.

**Maize** is cultivated for both human and animal consumption. Around 50% of provincial production is processed for poultry feeds. In Mamminasata, there are two feed processing factories (US capital of Japfa Comfeed and Cargill). Recently, IFC (International Finance Corporation) initiated the Agribusiness Linkage Programs on maize/poultry and cocoa in collaboration with PENSA (Program for Eastern Indonesian SME Assistance). The maize program aims at strengthening the agribusiness value chain through giving technical assistance to smallholder maize farmers and small-scale poultry industry. IFC is pointed out that marketing loss is relatively high due to improper drying as well as loss in transportation process.

**Cassava** is utilized for various types of processed products, e.g., tapioca, dried chip for snack, starch for mosquito coil, dried tuber for cattle feed, glucose, maltose syrup, alcohol and acetone. Demand for cassava is potentially high as food commodity and chemical commodity.

**Soybean** is well known as a raw material for tofu, tempe, soymilk, and cooking oil. Soybean straw and soybean legumes can also be used as organic fertilizer and animal feed. There is a tofu/tempe processing company and a soy sauce processing firm. Soybean-based oil mill is not operated in Mamminasata.

### 2) Estate/Fruit Crops

**Cacao** is exported mainly as cacao beans. There are about 20 exporters in the province. A few enterprises are processing cacao bean to cacao butter as powder. Generally, quality of South Sulawesi cocoa is said to be low in flavor due to variety of Malaysian origin poor post-harvest treatment (fermentation) at a farm level as well as in the transportation process. Undifferentiated prices between fermented and unfermented beans are offered by traders, giving negative impacts on farmers' incentives for quality improvement. The central government has just released a

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<sup>9</sup> In 2003, Agriculture Service of South Sulawesi Province launched Development Program for Horticulture Agribusiness for selected crops. Its detail activities and progress condition have not been identified.

national standard on cacao for cocoa producers, and extension services, are provided to disseminate the standard in the province.

**Coconut** cultivation and integrated coconut industry is recommended by the study conducted by Hasanuddin University<sup>10</sup>. The study recommends to develop the coconut industry for crude coconut oil (CCO), coconut fiber, coconut syrup, coconut shell, nata de coco, coconut lumber and other various supplemental products particularly in Polewali, Mamuju, North Luwu and Selayar. The study also suggests that downstream industry of coconut be developed in Pare-Pare and Makassar for urban consumer-oriented products, such as fat-free acid, car seat, active carbon, frozen coconut milk, coconut powder, handcraft and various ready-to-consume coconut products.

**Sugarcane:** Sugar factory (3,000 tons per day) is located in Takalar. Due to shortage in sugarcane supply, the factory is operated only for 70 days a year or 50 a year. The factory owns some of 6,000 ha of sugar plantation area, of which 4,000 ha is cultivated. Irrigated cultivation is only limited to around 400 ha. Various problems are observed in sugar factory management. Some contract farmers are willing to shift to maize cultivation because of less benefit from unirrigated sugarcane cultivation.

**Markisa** (passion fruit) is a traditional commodity in South Sulawesi province. There is number of small-scale enterprises for markisa juice production. The quality of markisa produced in Gowa is lower than products in Tana Toraja in terms of a taste balance between sweetness and sourness. There are high domestic (Java) and export demands to Europe, Middle East, and Australia (semi-processed markisa of scooped contents including seeds).

**Cashew** is one of the high value products if properly processed. Usages of cashew-related products are diversified into cashew nuts, industrial oil milled from cashew shell, cashew fruit (cashew apple) as animal feed and organic fertilizer. Six cashew nuts processing companies have been operated in Makassar until recent years. However, only two of them are currently in operation. One of the reasons for survival is that these companies cooperated with cashew producers so that they could procure unshelled cashew nuts from producers, reducing the processing costs. Cashew nut products are generally low in quality as ready-to-consume products, and cashew shells are either disposed or applied as organic fertilizer. In addition, some traders collect unshelled cashew and export it to India, where cashew shells are milled into industrial oil and cashew nuts are nicely processed contributing to enhance the India's global market share.

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<sup>10</sup> Draft Final Report on Blue Print of Agro-Industry Development Plan for Excellent Commodity in South Sulawesi, July 2004. Research Center of Hasanuddin University. According to Provincial Trade and Industry Service, coconuts oil companies exists in Bulukumba, Luwu, Polmas, Soppeng, Majene, and Selayar.

### 3) Livestock Products

Intensive cattle grazing areas are found in Bone, Gowa and Polmas, and live cattle are transported to East and South Kalimantan from Pare-pare harbor. Goats are used for multiple products, (leather and milk). Chicken and duck are useful small livestock for fresh/frozen meat, grinded meat, instant food, spices, first food, and feather for cloth. In particular, cattle and chicken meat consumptions are high in urban area, and around 8 ton of meat per day is required for Makassar people. It is reported, however, that only 3-4 ton per day of meat supply has been achieved<sup>11</sup>. This may attributable to weak production capacity in and around the urban area, small-scale production unit, and the improper marketing system.

### 4) Fishery Products

There are a number of cold storage enterprises in Mamminasata. Most of them are frozen prawn/shrimp and fish exporters to European countries, USA, Japan, China (Hong Kong), Taiwan, Korea, Singapore, Malaysia Thailand and Australia. Fresh tuna is also exported to Hong Kong and Japan. It is reported that about 50% of total fishery production in the province are marketed in Makassar, of which 60% are consumed locally and 40% are exported.

Marine/inland fish can also be processed into various types of products such as fish meatball, fish powder, salted fish and so on. Small portion of marine/inland fish and shrimp products are diverted for breeding fry fish and shrimp as a pond culture. In fact, there is a hatchery for prawn and milk fish in the coastal area of Takalar. However, their activities are not so extensive due to lack of management and horizontal linkage. Thus, production flexibility and processing diversity in Mamminasata still remains low. There is no cannery to produce ready-to-consume products.

There are two seaweed processing enterprises in Mamminasata; one in Maros and another in Takalar. Since the most export demands are raw materials for gelatin and cosmetic additives, processing method is simple (only producing flake or powder). There remain much rooms to produce more value-added finished products for exports. Seaweed collection generates higher income (300-500,000 Rp./capita/month depending on the season) to farmers or fishermen, and it is easy to enter into this business. Some mango producers near the coastline in Takalar rushed to this business, while growing their mango trees un-seriously.

In 2001, the National Marine Fish Stock Assessment<sup>12</sup> was conducted in Makassar Strait and Flores Sea. The survey revealed that 72% of potential overall fish

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<sup>11</sup> Makassar Regional Development 2002-2003.

<sup>12</sup> Fish Stock Assessment in Indonesia Marine, Marine and Fishery Research Agency of Marine and Fishery Ministry Centre for Oceanology Research and Development Indonesia Science Institution, 2001.

resources were exploited in 2001, an increased from 67% in 1997. The survey is also pointed out that some fish species are exploited more than estimated sustainable yields.

There are also infrastructure issues in fisheries:

- (a) There are two major fish markets with no cold storage in Galesong village in Takalar: north market and south market. There is a relatively new fishery port constructed by the government near the north market, but it is not intensively used by fishermen. The provincial government is planning to upgrade and integrate two existing fish markets by building a large-scale cold storage.
- (b) There are two fishery ports in Makassar: Paotere and Rajawali. Because of the limited capacity of these ports, the provincial government planned to construct a new fishery port in Barambong and released a budget for feasibility study. However, because of conflicts with a preceding plan for commercial and residential land use in Barambong, the port plan has to be re-studied.

#### 5) Forestry

Forestry products are diversified, like pine resins for chemical industry, bamboo/rattan furniture, wood-base handicrafts, honey-base products such as nutritional supplements (propolis, royal jelly). Timber quality, however, is relatively low, if compared with Kalimantan timber due to soils and poor quality of seedlings. A research center is expected for a scientific certification of seed/seedling potentials. Wood/rattan furniture industry in the province is sluggish because of inferior design and low quality, due mainly to poor skill and deteriorated machineries.

### 2.3 Issues to be Addressed

The underlying issues/problems in the agriculture and fishery sector are summarized as follows:

#### (1) Demand and Supply Trend for Agricultural Products

- (a) Demand for cereals, rice in particular shows a decreasing trend over the past decade and it would continue for the next decades.
- (b) Source of protein intake is likely to shift from cereals to meat (beef and poultry), fish, and milk.
- (c) Demands for vegetable, processed food and beverages are increasing, and it would continue for the next decades.
- (d) Food consumption in Mamminasata is likely to follow the typical pattern of urban area, a diversified food consumption pattern implying that diversified production (supply) of agricultural products are required to meet the urban



demand.

(2) Producer side

- (a) Lack of post harvest facilities, particularly dry yard and storage for grains deteriorates the quality of harvested products and causes harvest loss at the farm level.
- (b) There is no organized marketing system of products. Most producers sell their harvests to traders off-gate at lower price. (price incentive for producers is low).
- (c) Market information to producers is lacking and prices are determined by the intermediaries.
- (d) Farmers are unconcerned about the quality of fruits, vegetables, and estate crops and likely to satisfy with occasional cash income.
- (e) Seed/seedling varieties are inferior, stagnating the unit yield and product quality.
- (f) There is no organized livestock breeding system, and production scale is too small.
- (f) Marine fishery can be intensive only if excessive fishing is properly regulated to maintain the sustainable yields.
- (g) Inland fishery can also be intensive only if pond culture is properly managed not to allow outbreak of disastrous diseases, and sufficient and timely supply of fry is maintained.

(3) Agro-processing side

- (a) Procurement of raw materials is insufficient. Homogenous quality of raw materials is necessary, with a high level of quality control and labor cost management.
- (b) Processing technology is stagnant, and most products are processed at a primary level. Meat processors are small in scale with poor hygiene management. Lack of appropriate technology is a major constraint in developing export oriented agriculture and aquaculture.
- (c) Lack of cold chain (marketing system with cold storage) is one of bottlenecks for fish and meat processing and marketing.
- (d) The level of by-products utilization is low. Most primary products generate more than a kind of by-products, which would give additional commercial value if further processed properly.
- (e) As observed in retail stores in Makassar, packaging quality and design are inferior to those produced in Java. This is applicable to most consumer goods such as cocoa, cashew, peanuts, markisa juice, and frozen fish-related products.

### 3. AGRICULTURAL DEVELOPMENT PLAN FOR MAMMINASATA

#### 3.1 Basic Concept for Agriculture and Fishery Development

The basic concept of agriculture and fishery development in Mamminasata is to address to socio-economic aspect of development, as well as to coordinate with other sector development. It will include the following:

- (a) To increase farmers' income by increasing agricultural productivity through (i) improving crop yield, (ii) applying intensive land use, (iii) introducing mixed and integrated farming with fish pond culture and livestock grazing, and (iv) developing and introducing improved varieties for major crops,
- (b) To utilize existing land and water resources, transferring marginal lands to productive use.
- (c) To supply proper level of food to meet the increasing urban demand, and enhance production of export oriented commodities,
- (d) To supply sufficient quantity and quality of raw materials to agro-/fishery-based processing industry, whereby strengthening linkage with those industry.
- (e) To strengthen commodity marketing system, including dissemination of market information to producers and empowerment of producers' associations/organizations.
- (f) To achieve sustainable marine/inland fishery through promoting proper management and regulation.
- (g) To attain a stable growth in value-added, contributing to a balanced regional development in Mamminasata.

#### 3.2 Strategic Agricultural Land Use

##### 1) Assumption for Reduction of Agricultural Land

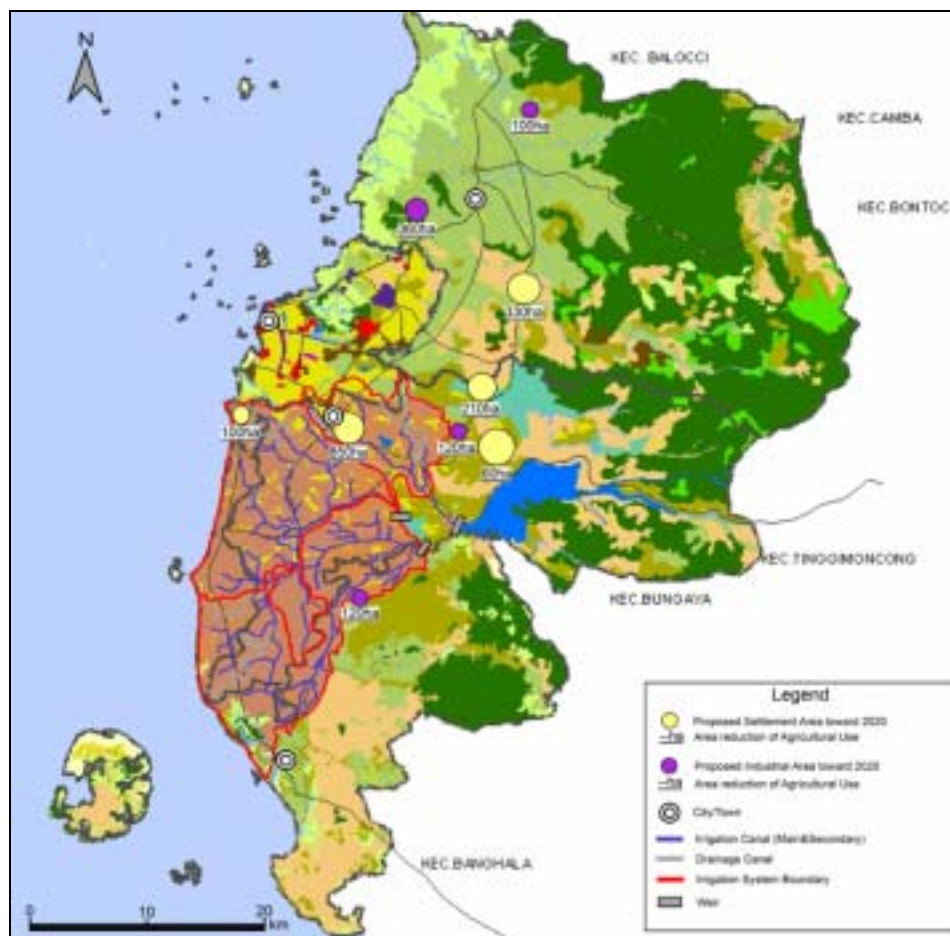
It is planned that new industrial and settlement areas are to be developed for urbanization and industrial development in Mamminasata. Some of the existing agricultural land will have to be transferred for alternative use. The area to be reduced for such purposes is estimated as summarized in the following table and figure.

**Table 3-1 Reduction of Agricultural Land by Year 2020**

(Unit: ha)

	Irrigation Area (Bili-Bili Irrigation)	Mixed Crops	Rice Field	Total
Makassar	100	0	0	100
Maros	0	30	760	790
Gowa	850	390	0	1,240
Takalar	10	30	80	120
<b>Total</b>	<b>960</b>	<b>450</b>	<b>840</b>	<b>2,250</b>

Source: Estimation by JICA Study Team



**Figure 3-1 Area Reduction of Agricultural Land by Year 2020**

In the technical irrigation system of Bili-Bili Irrigation Project, the area will have to be reduced by 960 ha. The semi-technical, non-technical irrigation and rainfed area will also be reduced by 1,290 ha. In total, about 2,250 ha of agricultural land will be shifted for urbanization and industrial uses.

## 2) Land Use Strategy<sup>13</sup>

With a given condition of reduced agricultural land as mentioned above, the following strategic land use policy should be applied to (a) Bili-Bili Irrigation Project, (b) other agricultural land, (c) Pamukkulu dam irrigation project, d) dry land and, (e) highland agriculture. Each land use classification is discussed in the following.

### (a) Bili-Bili Irrigation Project

Bili-Bili Irrigation Project has nearly completed, except for some tertiary and quaternary developments (as of September 2005). The project benefit will be reduced due to reduction in irrigated area by 960 ha. The reduction in production value is estimated in the table below.

<sup>13</sup> The detail calculation regarding this section is shown in Annex 3.

**Table 3-2 Estimate of Reduced Production Value in Bili-Bili Irrigation Project<sup>14</sup>**

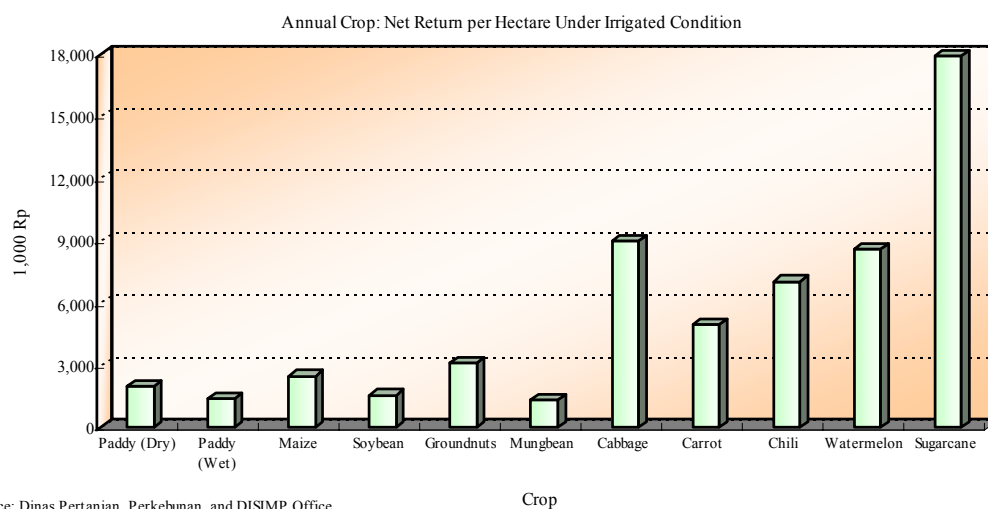
Estimated Present Condition (2005)				Initial Plan toward Full Development in 2008				Future Condition in 2020				Reduction in Annual Production Value (Mil. Rp.)
Irrigation Area	Type of Crop	Area Planted (ha)	*Annual Production Value (Mil. Rp.)	Irrigation Area	Type of Crop	Area Planted (ha)	Annual Production Value (Mil. Rp.)	Irrigation Area	Type of Crop	Area Planted (ha)	Annual Production Value (Mil. Rp.)	
Bili Bili Area (2,369ha)	Dry Paddy	2,369	3,993	Bili Bili Area (2,369ha)	Dry Paddy	2,369	4,698	Bili Bili Area (1,519ha)	Dry Paddy	1,519	3,012	-1,686
	Wet Paddy	2,369	2,886		Wet Paddy	2,369	3,395		Wet Paddy	1,519	2,177	-1,218
	Palawija	2,369	1,675		Palawija	2,369	1,675		Palawija	1,519	1,074	-601
	Subtotal	7,107	8,554		Subtotal	7,107	9,768		Subtotal	4,557	6,263	-3,505
Kampili Area (10,547ha)	Dry Paddy	10,547	17,777	Kampili Area (10,547ha)	Dry Paddy	10,547	20,915	Kampili Area (10,447ha)	Dry Paddy	10,447	20,716	-198
	Wet Paddy	10,547	12,847		Wet Paddy	10,547	15,114		Wet Paddy	10,447	14,971	-143
	Palawija	10,547	7,459		Palawija	10,547	7,459		Palawija	10,447	7,389	-71
	Subtotal	31,641	38,084		Subtotal	31,641	43,488		Subtotal	31,341	43,076	-412
Bissua Area (10,686ha)	Dry Paddy	10,686	18,012	Bissua Area (10,686ha)	Dry Paddy	10,686	21,190	Bissua Area (10,676ha)	Dry Paddy	10,676	21,171	-20
	Wet Paddy	10,686	13,016		Wet Paddy	10,686	15,313		Wet Paddy	10,676	15,299	-14
	Palawija	10,686	7,558		Palawija	10,686	7,558		Palawija	10,676	7,551	-7
	Subtotal	32,058	38,585		Subtotal	32,058	44,061		Subtotal	32,028	44,020	-41
<b>Total</b>			<b>85,223</b>	<b>Total</b>			<b>97,317</b>	<b>Total</b>			<b>93,358</b>	<b>-3,958</b>
	<b>Annual Production Value/ha</b>		<b>3.61</b>		<b>Annual Production Value/ha</b>		<b>4.12</b>		<b>Annual Production Value/ha</b>		<b>4.12</b>	
					<b>% Change in Production Value</b>		<b>14.19%</b>		<b>% Change in Production Value</b>		<b>-4.07%</b>	

\*85% less than Full Development Level

The project benefit at the full development level is expected in 2008, and this level is taken as a basis for comparison with the condition in 2020. The reduction in production value is thus estimated to be Rp. 4,000 million or 4.1% compared with what could have been achieved without a change in land use.

In order to recover the reduced benefit by area reduction, two seedlings of tree crops (e.g., coconut, mango, orange, lime, cashew, pepper) are proposed. Further, the cropping pattern would be shifted from a paddy oriented pattern to a pattern of diversified high-value crops such as fruits, vegetables in order to meet the increasingly diversified food demands.

The following figure presents a comparison of net returns per hectare under the irrigated condition for selected crops. The figure implies that vegetables and fruits are more profitable than paddy. Profitability of sugarcane appears high as it requires longer period in harvesting.



**Figure 3-2 Net Returns per Hectare per Harvest under Irrigated Condition for Selected Crops**

<sup>14</sup> The net returns per hectare are based on the updated crop budgets since the feasibility study. Since the sources of data are different, the production values in the table also differ from GRDP value shown in BPS statistics.

Although it is understood that paddy is still important crop for farmers, some shifts in cropping pattern should be gradually promoted to attain maximum profit from the land of farmers. The following table shows a simulated cropping intensity under irrigated condition in Bili-Bili.

**Table 3-3 Alternative Cropping Intensity of Bili-Bili Irrigation Project (2020)**

Type of Crop	Zoning (Bili-Bili Irrigation)	
	Diversified Irrigated Urban Agriculture	Other Diversified Irrigated Agriculture
Dry Paddy	94%	94%
Wet Paddy	94%	94%
Palawija	40%	45%
Vegetables	10%	0%
Annual Fruits Crops	0%	5%
Perennial Tree Crops	1%	1%
Total	239%	239%
Net Return per ha	5.1 Million Rp./ha	4.8 Million Rp./ha

The table above presents the future cropping intensity, maintaining the unit yields constant at the anticipated level under feasibility study on the Bili-Bili Irrigation Project. Such a shift in cropping pattern will maintain the same level of return as originally envisaged under Bili-Bili Irrigation Project.

It is further noted that, in combination with the shift in cropping pattern, fish pond culture within paddy fields would greatly contribute to improve farmers' income or returns from the irrigated land.

In connection with the irrigation water demand reduced by decrease in paddy cropping intensity, reduced irrigation water would be diverted to promote sugarcane production in Takalar. Currently, Takalar sugar factory has a shortage in water for irrigation though it plays an important role in providing employment opportunities for more than 5,000 workers. If irrigation water is secured and if factory management is improved, Takalar sugar factory would be able to get a chance to revive.

#### (b) Other Agricultural Land

For other agricultural lands under semi-technical, non-technical irrigation and rainfed conditions, the following cropping intensity and zoning would be adopted toward 2020.

**Table 3-4 Cropping Intensity in Other Agricultural Land (2020)**

Type of Crops	Zoning (Other Agricultural Land)		
	Diversified Urban Agriculture	Other Diversified Agriculture	Dry land Agriculture
Wet Paddy	89%	70%	0%
Dry Paddy	0%	0%	0%
Palawija	40%	55%	37%
Vegetables	10%	0%	3%
Annual Fruits Crops	0%	5%	10%
Perennial Tree Crops	1%	0%	20%
Total	140%	130%	70%
Net Return per ha	3.2 Million Rp./ha	2.9 Million Rp./ha	1.5 Million Rp./ha

The current cropping intensity is estimated to be about 130%<sup>15</sup> on an average, while the future intensity would be increased by 10% in the diversified non-irrigated urban agriculture. This would be achieved by pumping water from closest water source such as rivers, lakes and ponds, or development of groundwater to supplement the water demand.

### (c) Pamukkulu Dam/Irrigation Project

A plan for technical irrigation in the southern part of Takalar, called Pamukkulu Irrigation Project has been conceived and proposed previously, to increase the cropping intensity from 123% to 220% (paddy: 200%, palawija: 20%) by expanding irrigated area from 3,000ha to 6,430ha. If implemented, it would increase the agricultural production in the region. However, the project cost is estimated to be more than US\$11,000 per hectare including construction of Pamukkulu dam and irrigation infrastructures. This is too costly. Alternative uses for this land area should be planned for fruit orchards, livestock breeding and other purposes.



Figure 3-3 Existing Plan of Pamukkulu Irrigation Project

### (d) Dry Land

A substantial area of dry land (about 35,000ha) extends in Mamminasata. Out of such dry lands, 3,000ha would be newly developed for productive use. Such a land will be utilized for mixed-culture with livestock grazing (as an integrated livestock grazing area), by applying drip irrigation or groundwater development. Livestock will become more important as per capita demand for daily/poultry products is increasing. The following table shows the livestock population growth outlook toward 2020.

Table 3-5 Livestock Population Growth

(Unit: head)

Type of Livestock	2005	2010	2015	2020
Cow	136,885	156,414	194,279	214,500
Buffalo	40,963	46,807	58,138	64,189
Horse	14,754	16,859	20,941	23,120
Goat	62,972	71,956	89,376	98,678
Pig	8,930	10,204	12,674	13,993
Duck	702,451	802,667	996,981	1,100,746
Broiler Chicken	1,344,174	1,535,942	1,907,771	2,106,332
Domestic Chicken	2,389,151	2,730,003	3,390,896	3,743,821

Source: Based on Makassar, Maros, Gowa, and Takalar in Figure, 2002, 2003. BPS

<sup>15</sup> Based on Final Design Report on Detail Design and Construction Supervision of Bili-Bili Irrigation Project, December 1999, and Detailed Design of Irrigation and Feasibility Study of Dam for Pamukkulu Irrigation Project.

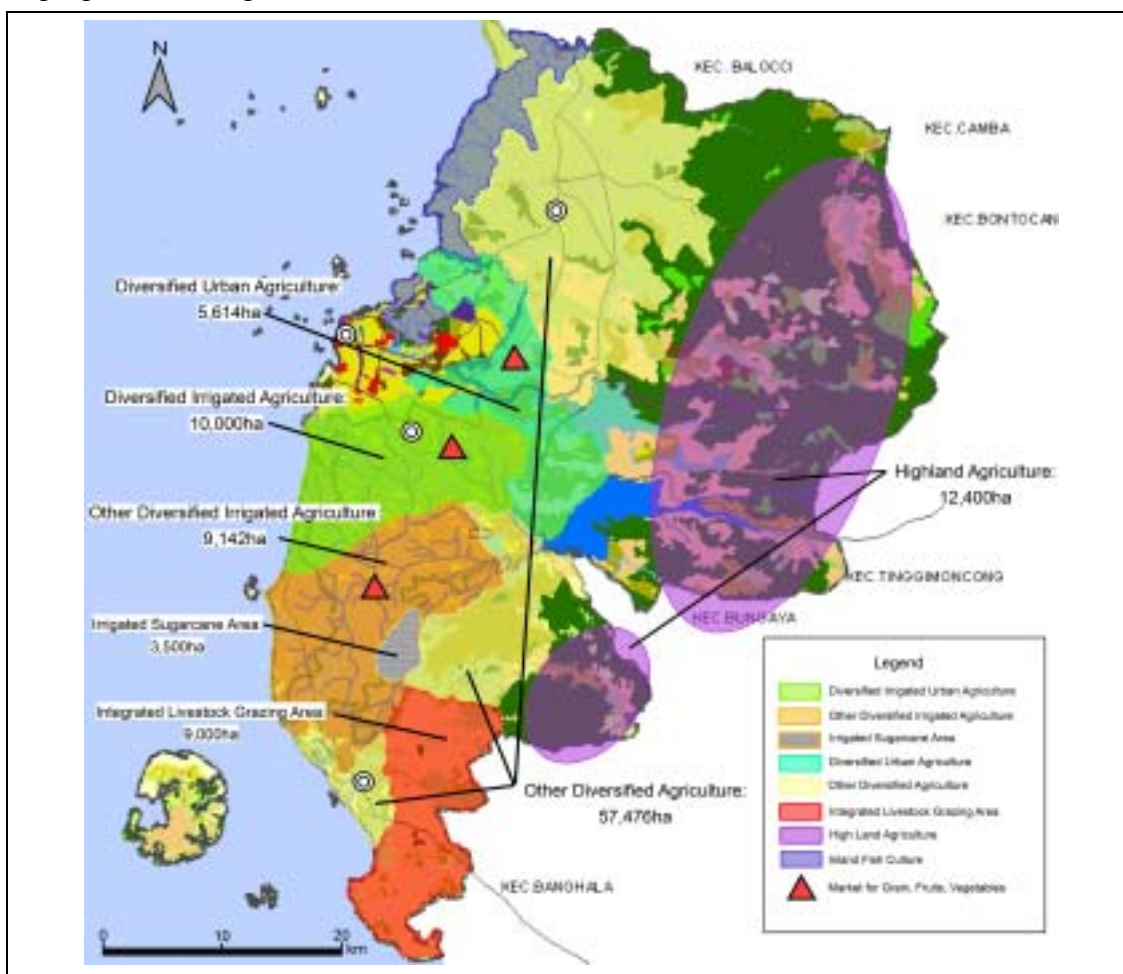
Livestock grazing in combination with upland crop cultivation (mixed-culture) would be an alternative land use in the area contemplated under the Pamukkulu Irrigation Project. In this connection, production of fodder crops should be accelerated to meet the animal feed demand.

(e) Highland Agriculture

Highland agriculture extends to the mountainous area in Gowa, Maros and part of Takalar. In this area, production of highland vegetables, high value-added crops such as tea, coffee, kapok, vanilla, cocoa, and bee culture will be promoted. For the production increase, development and dissemination of superior varieties should be promoted by the government initiative, while farmers are expected to pay more attention to quality control at the farm level. Small-scale pump and sprinkler irrigation would greatly improve unit productivities.

### 3) Agricultural Land Use Zoning

In summary, the following agricultural land use zoning in Mamminasata will be proposed for implementation.



Type of Irrigation Condition	Zoning	Cropping Intensity	Area (ha)	Net Production Value (Mil.Rp.)**
Technical Irrigation*	Diversified Irrigated Urban Agriculture	239%	10,000	50,735
	Other Diversified Irrigated Agriculture	239%	9,142	44,117
	Irrigated Sugarcane Area	100%	3,500	62,767
	Sub-Total		22,642	157,619
Semi/Non-Technical Irrigation and Rainfed Area	Diversified Urban Agriculture	140%	5,614	18,185
	Other Diversified Agriculture	130%	57,476	164,537
	Dry Land Agriculture	70%	3,000	4,593
	High Land Agriculture	130-160%	12,400	--
	Integrated Livestock Grazing Area	--	9,000	--
	Sub-Total		87,490	187,315
	Total		110,132	344,934

Note: \*The area for technical irrigation is net area, while the remaining area is gross area.

\*\*The net production values from high land agriculture and integrated livestock grazing are not accounted.

**Figure 3-4 Agricultural Land Use Zoning in 2020**

The net production value from the proposed zoning in 2020 is expected to be about Rp. 345 billion, which is more than 1.5 times of the net production Rp. 225 billion in 2005.



### 3.3 Fishery and Livestock Development

Fishery production will be increased to meet the demand of increasing urban population with targets in as presented in the table below.

**Table 3-6 Fishery Production Target in Mamminasata**

(Unit: ton)

Type of Fishery		2005	2020
Marine Fishery		76,203	119,410
Inland Fishery	Brackish Water Pond	18,134	28,416
	Fresh Water Pond	102	159
	Paddy Field	142	222
	Lake	0	0
	River	106	166
	Swamp	81	126
Total		94,767	148,501

Source: Estimated from the data in Sulawesi Selatan in Figure 2003, BPS, and Laporan Statistik Perikanan Sul-Sel, 2003

Production of marine fishery will be the largest, followed by brackish water pond fish. In fact, marine fish is much more popular than inland fish in Mamminasata. Fishery development, therefore, will put emphasis on marine fishery.

Inland fishery, on the other hand, productivity is high in Maros and Gowa as shown in the table below.

**Table 3-7 Unit Productivity of Inland Fishery (2003)**

Region	Production Area (ha)	Production (ton)	Value (1,000 Rp.)	Productivity (1,000 Rp./ha)
Makassar	1,360	373	9,929,150	7,301
Maros	8,068	9,219	157,328,030	19,500
Gowa	321	443	4,621,790	14,398
Takalar	4,100	7,540	25,903,800	6,318
Total	13,849	17,575	197,782,770	

Source: Sulawesi Selatan in Figure 2003

Productivity per hectare in Maros is recorded to be Rp. 19 million. This high productivity is attributable to an intensive shrimp culture in pond/wetland along the coastal area and in Bantimurung area. An alternative target for inland fishery would be set to attain this level of productivity in other regions.

#### (a) Fishery Resource Management

Given the condition that more than 70% of potential fishery resources in the coastal area have been exploited as of 2001, a considerable portion of potential fish resources is assumed to have been exploited by 2005. Therefore, resource management of coastal fishery should be implemented to prevent over-exploitation maintain sustainable marine yields (SMY). To this end, a reliable marine stock assessment should be conducted so that the information on SMY in the coastal area is updated to define a guideline for marine fishery. In addition, appropriate law

enforcement should be introduced including fishing licenses, penalty, regulations of type of fishing gears, mesh sizes, and closed seasons.

#### (b) Offshore and Deep-Sea Fishery Development

Since current marine fishery is limited to the coastal area due to small and old vessels, it is preferable to encourage a controlled expansion of offshore fishery by modern vessels. Some credit programs and training for offshore fishery will be required.

#### (c) Hatchery Development in the Coastal Area

One of the major issues in fishery development is poor marketing and production control. Establishment of various fish hatcheries along the coastal area will have to be programmed to produce and provide fry or fingerlings at right times and in sufficient volume. Therefore, the existing hatcheries should be strengthened and expanded to meet the diversified fry demand. Possible location for new hatchery development is shown in Figure 3-5.



Figure 3-5 Future Hatchery Development Area

#### (d) Capacity Building in Inland Fishery

In line with hatchery development, capacity building for fishermen in inland fishery for shrimp and fish culture will be promoted. Capacity building programs focus on proper fish pond culture management, such as maintenance of water quality, appropriate feeding and harvesting. Such training for fishermen would avoid vicious circle that excessive fish density and over-feeding would cause a high risk of disease outbreaks.

### 3.4 Agro-/Fishery-Based Industrialization

A development plan has been discussed so far from the viewpoint of production side. The agriculture sector, on the other hand, is expected to contribute more and more to the manufacturing sector through agro-industrial development. Key factors to promote agro-industrial development are:

- a) Strengthening linkages between production and processing formulating industrial clusters.
- b) Establishment of a stable supply system of raw materials for industrialization.

(a) Formulation of Industrial Clusters

Agro-/fishery-based industrial development is a key to create employments and enhance the economy in Mamminasata. By making use of resource available in Mamminasata, or broadly in South Sulawesi province, it is desirable to formulate and strengthen industrial clusters. A concept of agro-industrial clustering is shown in the following figure.

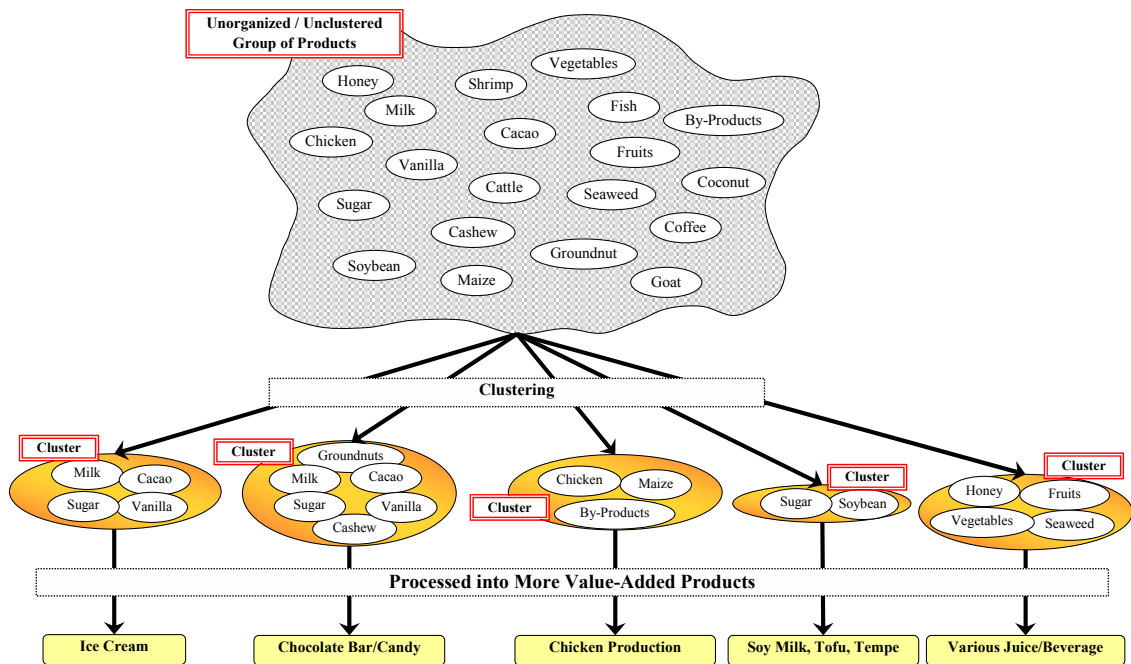


Figure 3-6 Concept of Agro-Industrial Clustering

Through clustering, more than one product or a group of individual would be combined to produce more value-added commercial products. For example, production of milk, sugar, vanilla, cacao (for chocolate taste) and many kinds of fruits and nuts will be combined to form an ice cream cluster, stimulating a positive demand for such raw materials. Another type of cluster is a linkage with mechanization such as seeding machine, harvester and other equipment that would substitute for labor intensive activities. Clustering with the packaging industry is also recommendable. Wooden and/or plastic box for marketing of vegetable and fruits can be easily developed in Mamminasata.

Such clusters should not necessarily be limited to Mamminasata and South Sulawesi. They could be expanded more widely to Sulawesi Island to form a Sulawesi Island Cluster. Promotion of linkages within these clusters should be further elaborated, but it could be facilitated through development of transportation network by land, sea and air. If the proposed shift of processing center functions from Surabaya to Mamminasata is realized, gradually but steadily, such a shift would in turn be transferred to South Sulawesi and Sulawesi Island in medium and long terms.

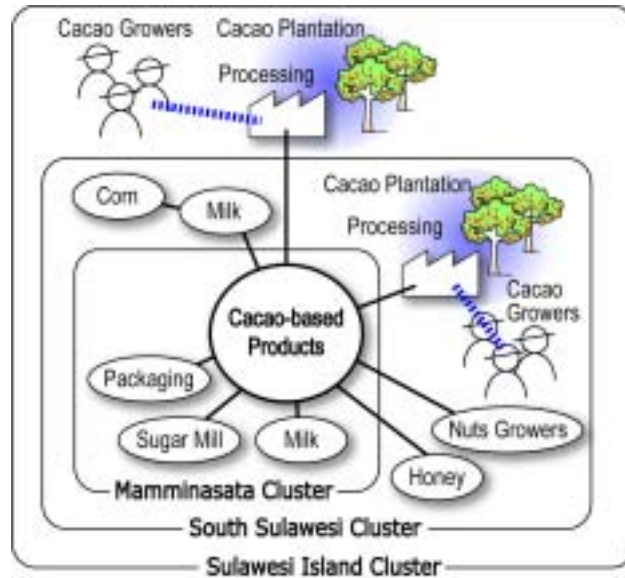


Figure 3-7 An Image of Cacao-based Cluster in South Sulawesi

Clustering would first be promoted for domestic market in order to encourage entrepreneurs or new industrial cluster to enhance competitiveness. It would gradually go into internationally marketed products clusters making full use of marketing know-how such as required quality, product varieties, attractive packages, cost management and so on. A concept of marketing promotion of agro-based products is shown in the following figure.

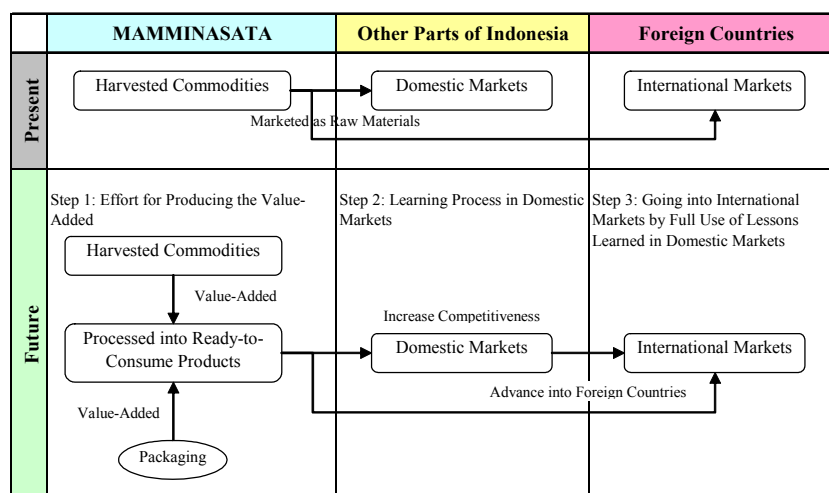
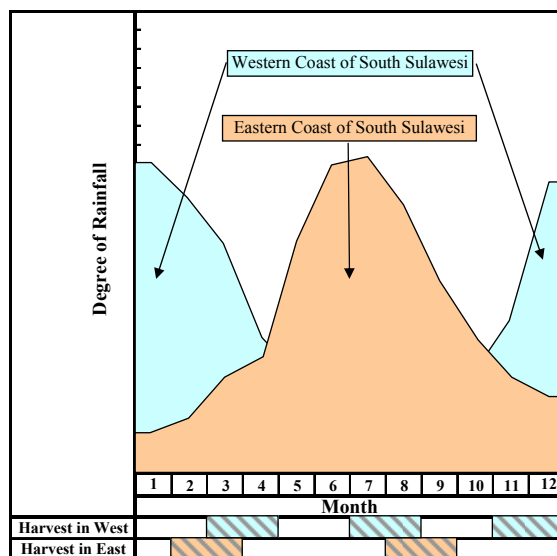


Figure 3-8 Concept of Marketing Strategy for Agro-based Cluster

For instance, passion fruits (Markisa) in Mamminasata is reputed for its deliciousness, and its processing into Markisa juice is promising for more domestic consumption and exports. Its processing, quality testing, bottling, labeling, and packaging should be modernized for marketing in other parts of Indonesia and foreign markets. Since its harvest season is relatively short, the processing facilities should also be utilized for other fruits and products. In relation to the marketing strategy, it is added to note that an agricultural market should better be set up in Mamminasata in order to facilitate wholesale marketing of agricultural products for domestic markets.

(b) Stable Supply of Raw Materials

In order to operate an agro-processing factory, a constant and stable supply of raw materials is indispensable. Agriculture is greatly dependent on climate, and a control of production and/or supply becomes a major concern. Fortunately, South Sulawesi province is in a position to take advantage of different agro-climatic conditions in the western and eastern coasts, and to produce same crops at different seasons. If properly managed, constant or prolonged supply of raw materials will be put into practice. The figure shows annual rainfall patterns and harvest periods under the irrigated condition in the western and eastern coasts of South Sulawesi province. In view of the harvest period in the west and east, more constant and stable supply of agricultural raw materials would be realized in Mamminasata.



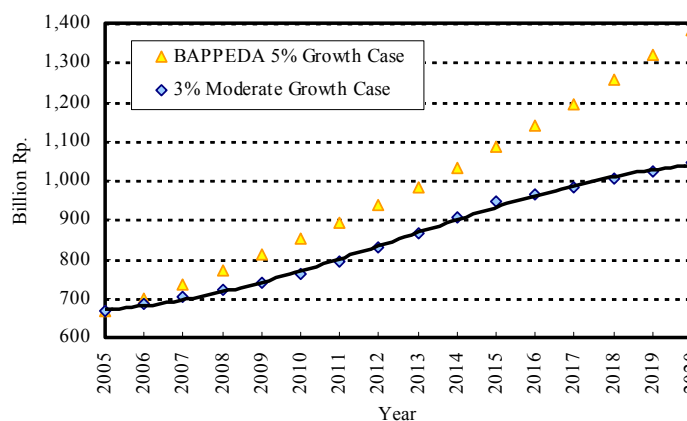
Note: Harvesting period in the west is based on cropping pattern in Bili Bili Irrigation Project, while in the east on cropping pattern in Salomekko Irrigation Project. Source: Feasibility Study Report on Bili Bili Irrigation Project, and Data from DISIMP (Decentralized Irrigation System Improvement Project) Office.

**Figure 3-8 Rainfall Patterns and Harvest Period of Annual Crops (Irrigated Condition) in South Sulawesi**

This advantage is applicable not only to annual crops (e.g., paddy, maize, soybean, groundnuts, mungbean, watermelon) but also to tree crops (e.g., cocoa, cashew, pepper, mango). For fishery-based processing, hatchery and cold storages development would also ensure stable supply of raw materials. To this end, strengthening of inter-coastal marine or land transport should be promoted to support a supply chain and clustering.

**3.5 Contribution to GRDP Growth**

A macro-economic framework for the Mamminasata Spatial development plan has been set in term of GRDP. While Bappeda has projected 5% annual growth rate, a more moderate growth at the average rate of 3% has been envisaged by this Study.



**Figure 3-9 GRDP Growth Curves of Two Cases**

Agricultural production as proposed in the foregoing section for food/non-food, livestock, forestry and fishery output in total will be increased by more than 1.5 times toward 2020 from the level in 2005. This achievement will be equivalent to the GRDP growth rate of 3% per annum in the agriculture sector, productivities, and utilizing existing unused land for productive use. Thus projected GRDP as estimated in the table below.

**Table 3-8 GRDP Projection in Agriculture Sector (1993 Constant Price)**

(Unit: Million Rp.)

By Districts	2005	2010	2015	2020
Makassar	74,910	85,597	106,319	117,385
Gowa	273,519	312,541	388,203	428,607
Maros	197,267	225,410	279,978	309,118
Takalar	119,912	137,020	170,190	187,903
Total	<b>665,608</b>	<b>760,568</b>	<b>944,690</b>	<b>1,043,014</b>

Source: Estimation based on Makassar, Gowa, Takalar and Maros in Figure, BPS, 2003

## 4. ACTION PROGRAMS AND RECOMMENDATION

### 4.1 Short-Term Actions

Based on the development strategies discussed in the preceding section, specific programs are formulated and recommended for implementation.

The short-term actions are proposed for implementation in 2006-2010, including the programs as listed in the table below.

**Table 4-1 Short-Term Actions for Agriculture Development**

No.	Program	Description	Main Actor	Supportive Actor
(S1)	Commodity-Wise Post Harvest Training	Producers should become fully aware of product quality and market signal. For quality control at production level, commodity-wise training programs on post harvest treatment should be formulated and implemented for producers	Producers (farmers)	Government
(S2)	Study Program of Producers Group	In order to have better understandings on agro-processing industry for selected crop producers, periodic study tours should be arranged. Participants are expected to learn how their harvest products are processed into commercial goods. It will be a trial to raise producers' awareness of product quality.	Producers (farmers)	Government / Manufacturer
(S3)	Inter-Departmental Collaboration Program for Local Government	In order to strengthen linkage between production and processing sides, the cooperative activities between department of agriculture, plantation, fishery and industry, or the program such as Gerbang Emas should be consistently carried out. The aim of the program is to enhance the initiatives of each department as Governor's Office does for Gerbang Emas. For realization, it is recommended that key staff from each relevant department should formulate the new department with strong leadership to focus on such inter-departmental activities of strengthening linkages. The staff of the new department are expected to perform efficiently, logically.	Government	Government
(S4)	Strengthening of R&D Capability	Research and development (R&D) capability for region-specific seed / seedling varieties for agriculture and forestry should be enhanced to accelerate potential unit yields and qualities.	Government	Academic Institutions
(S5)	Stock Assessment of Marine Fishery	Marine fish stock assessment should be conducted in order to create clear guideline and regulation, which stipulates a marine preserve area and closed seasons by species, in guidance with National Fishery Stock Committee. This assessment should be carried out in scientific manner presumably by an academic institute in collaboration with state research institute so that assessment results could be given a strong scientific ground.	Government	Academic Institutions
(S6)	Strengthening Fishery Marketing	Cold storage should be equipped adjacent to major fishery markets, most likely in Makassar and Takalar in order to minimize the loss and enable fishermen to open their marketing opportunities. New storages are expected to absorb the increased fishery production as well.	Fishermen / Government	--

### 4.2 Mid-and Long-Term Actions

The mid-and long-term actions are proposed for implementation in 2010-2015 or thereafter, including the programs as listed in the tables below.

**Table 4-2 Mid-Term Actions for Agriculture Development**

No.	Program	Description	Main Actor	Supportive Actor
(M1)	Integrated Livestock Development Program	The livestock grazing in combination with upland crop cultivation (mixed-culture) should be developed in an exchange with the Pamukkulu Irrigation Project. Local government should conduct on extension activities in animal breeding such as milk cow, buffalo, goat and chicken. This effort should be combined emphasizing on reducing mortality rate. For on-farm land development, production of fodder crops such as maize, cassava should be introduced with pump / drip / groundwater irrigation methods to meet the animal feed demand. Eventually, relevant facilities such as slaughter house, milking farm, poultry house and etc. Also, hides and skins utilization should be planned in medium-term for enhancement of leather product industry.	Producers (farmers) / Government	Academic / State Research Institute of Animal Husbandry
(M2)	Linkage Strengthening Program	In conjunction with the program (S2), Linkage between producers and manufacturers should be strengthened so that manufacturers can obtain a constant supply of agriculture-based raw materials through out the year. It is needed to overcome agriculture's unique characteristic of seasonal production variations. This requires further study on crop rotation and calendar for food crops so as to select and determine the strategic crops to be chosen. This program is to support the beginning of industrial clustering.	Manufacturers / Producers	Government
(M3)	Development and Promotion of By-products Industry	By-products industry should be developed. If by-products are fully utilized as commercial goods, economic value of the primary commodities is expected to be higher. This may contribute to give higher prices for producers thereby more incentives for them. Further study on utilization technique, collection networking, potential markets should be conducted for strategic commodities such as cacao, coconuts, cashew, fish, shrimp, and wood / rattan. Oil mills for maize, soybean, coconuts, cashew, groundnuts and fish may be one of the potential commodities for development.	Manufacturers	Government
(M4)	Advanced Technological Development for Agro-Processing Industry	More advanced processing technology should be enhanced for two purposes: i) targeting at domestic consumers by production of ending consumer goods (ready-to-consume products such as chocolate, candy, various dried chips for snack, canned fish and canned fruits) and ii) further producing the semi-processed products, which are currently exported and processed in the destination countries, instead of exporting as raw materials. This will require technical assistance of private sector from either domestic or foreign enterprises.	Manufacturers	Government
(M5)	Development and Promotion of Packaging Industry	Packaging industry should be strengthened to fairly compete with the outside of the Sulawesi in the country particularly targeting at retail level. In particular, vacuum-packing technology for frozen products, package design techniques will be of great necessity. This will be expected to stimulate surrounding industry such as material and chemical industry. Similarly, it will require technical assistance of private sector from either domestic or foreign enterprises.	Manufacturers	Government
(M6)	Hatchery Development Program	Hatcheries for various types of species should be developed along the Mamminasata coastal area. Possible species could be tiger prawn, milk fish, grouper, mackerel, flying fish, sea horse and etc. At the same time, use of cage nets must be promoted for inland fishermen in order to introduce proper culturing practices.	Government	Academic Institutions
(M7)	Fishery Port Development Study in Mamminasata Area	Fishery port development study should be conducted to assess the optimal scale of fishery port in Makassar and Takalar. For long-term perspective, promotion of offshore fishery should be considered in terms of port capacity for future demand	Government	--



**Table 4-3 Long-Term Actions for Agriculture Development**

No.	Program	Description	Main Actor	Supportive Actor
(L1)	Agribusiness Education Promotion	Agribusiness education in province-wide particularly in Maros, Gowa, Takalar, should be introduced to younger generation, who potentially inherit agricultural land, in order to strengthen the future producers' bargaining power against urban traders.	Producers (farmers)	Government/Academic Institutions
(L2)	Agricultural Enterprises Formulation Program	Given the fact that producers themselves have less power in processing and marketing, it is planned that they will be guided in organizing a Producers' Association (PA) with the primary processing and marketing to be conducted through the establishment of an Agricultural Enterprise (AE). At the initial stage, the farmers' share of AE would be limited but could be gradually increased by their incomes. An information and marketing center will be established to facilitate marketing of products in strategic points in the Study Area. The PA will establish Information & Marketing Centers (IMCs). The IMCs will have the functions of marketing, extension services and financing. For marketing, the IMCs will research and open markets for wholesale distribution to antenna shops in the supermarkets, hotels, local markets and for export.	Producers (farmers)	Government/Private Investors
(L3)	Offshore Fishery Development	Consult with experts, who have comprehensive understanding and experience on offshore fishery, local government should establish offshore fishery development committee, consisting of those from academic institutions. It will be necessary to conduct study on various aspects such as international oceanic law, fishing technique in open sea, sailing technique with nautical chart, fish resource map in open sea and so on. Also, in connection with the program (M7), port capacity should be considered in parallel.	Government	Academic Institutions

## 4.2 Recommendation for Implementation

Based on the review of the existing plans (e.g., Regional Spatial Plan of Mamminasata Metropolitan, Spatial Planning of Sulawesi Island, and Makassar City Spatial Plan 2005-2015), it is recommended that more concrete policy, and strategies on agriculture and fishery development be elaborated and that be indicated for improvements in food centre, infrastructures, processing, and marketing. On the other hand, there are on-going development projects or plans to be implemented in Mamminasata that will have impacts on land and water use. As population grows in the urban area of Makassar City, there must be new settlements, commercial, industrial and road development. In principle, the following should be taken into account for the implementation of future spatial development in Mamminasata:

- (a) Removal of irrigation canals should be avoided or minimized in the future land use in Mamminasata.
- (b) Reduced production values from the reduction in agricultural land (most likely paddy) should be compensated by increased unit productivity in the remaining land, adopting higher value-added crops (e.g., fruits, vegetables and industrial tree crops).

- (c) Technical irrigation development on the newly irrigable lands should be re-examined carefully, comparing investment costs and returns, bearing in mind that rice demand is and will be decreasing.
- (d) Alternative land utilization for livestock grazing, tree crop planting and so on should be promoted in the area where fallow irrigation is not economically and financially justifiable.
- (e) In relation to agro-industrial development, Takalar Sugar Factory should draw special attention. Unless proper actions are taken for a change in management, it would not be able to survive in the future.
- (f) More private investments should be attracted in the agro-/fishery-processing and marketing, with due attention to the protection of the environment in Mamminasata.

## Area and Production Trend of Various Crops in Four Regions

## Food Crops

## Area and Production Trend of Wetland Paddy

Regency	1999		2000		2001		2002		2003		
	Harvested Area (ha)	Production (ton)	Harvested Area (ha)	Production (ton)	Harvested Area (ha)	Production (ton)	Harvested Area (ha)	Production (ton)	Harvested Area (ha)	Production (ton)	Yield (ton/ha)
Makassar	4,139	19,458	2,779	15,962	2,763	14,116	2,172	11,033	2,269	11,468	5.1
Maros	39,534	217,973	41,191	226,960	41,377	226,127	41,123	223,325	38,458	212,676	5.5
Gowa	N/A	N/A	45,323	204,681	45,728	206,912	44,724	229,993	48,445	230,209	4.8
Takalar	22,620	120,449	23,117	120,449	22,760	119,992	20,466	115,975	20,547	116,198	5.7
Total	66,293	357,880	112,410	568,051	112,628	567,147	108,485	580,326	109,719	570,551	5.2

## Area and Production Trend of Dryland Paddy

Maros	231	626	205	103	370	196	134	536	132	516	3.9
Gowa	N/A	N/A	630	1,266	540	1,780	517	2,001	615	2,293	3.7
Takalar	2,284	8,398	740	3,515	893	4,019	943	2,275	827	2,481	3.0
Total	2,515	9,024	1,575	4,884	1,803	5,995	1,594	4,811	1,574	5,290	3.4

## Area and Production Trend of Paddy (Dry and Wet)

Makassar	4,370	20,084	2,984	16,065	3,133	14,313	2,306	11,568	2,401	11,984	5.0
Maros	39,534	217,973	41,821	228,226	41,917	227,907	41,640	225,326	39,073	214,969	5.5
Gowa	N/A	N/A	46,063	208,196	46,621	210,931	45,667	232,268	49,272	232,690	4.7
Takalar	25,135	129,473	24,692	125,333	24,563	125,987	22,060	120,787	22,121	121,488	5.5
Total	69,039	375,929	115,560	577,819	116,234	579,137	111,673	589,948	112,867	581,131	5.1

## Area and Production Trend of Maize

Makassar	103	151	403	598	322	439	205	277	137	185	1.4
Maros	4,384	11,972	6,992	17,581	3,765	6,485	2,537	9,417	3,537	11,163	3.2
Gowa	N/A	N/A	32,485	94,540	26,699	93,767	26,478	115,597	25,706	122,905	4.8
Takalar	6,188	29,313	5,877	29,079	6,457	32,214	4,850	24,905	5,438	27,325	5.0
Total	10,675	41,436	45,757	141,798	37,243	132,905	34,070	150,196	34,818	161,578	4.6

## Area and Production Trend of Cassava

Makassar	351	4,740	323	4,409	199	2,683	409	5,515	502	2,462	4.9
Maros	2,562	75,703	2,882	42,157	5,168	75,278	3,038	44,161	3,712	51,968	14.0
Gowa	N/A	N/A	12,684	103,087	10,377	193,882	10,071	197,893	9,551	195,722	20.5
Takalar	971	12,097	951	11,983	1,387	24,818	864	20,985	1,162	21,167	18.2
Total	3,884	92,541	16,840	161,635	17,131	296,661	14,382	268,554	14,927	271,319	18.2

## Area and Production Trend of Cowpea

Makassar	24	87	29	105	37	147	37	108	11	44	4.0
Gowa	N/A	1,351		546		6,600		6,734		6,903	
Takalar	364	1,274	304	1,414	286	1,135	399	1,585	423	1,675	4.0
Total	388	2,712	333	2,065	323	7,882	436	8,426	434	8,621	

## Area and Production Trend of Groundnuts

Makassar	8	10	4	5	4	5	1	1	4	5	1.3
Maros	2,984	2,984	3,257	2,147	2,130	2,528	2,545	3,790	2,752	3,907	1.4
Gowa	N/A	N/A	1,468	2,693	1,859	3,344	1,180	2,109	953	1,574	1.7
Takalar	395	486	398	486	348	1,126	249	259	158	164	1.0
Total	3,387	3,480	5,127	5,331	4,341	7,003	3,975	6,159	3,867	5,650	1.5

## Area and Production Trend of Mungbean

Makassar	10	11	52	61	153	173	267	302	95	108	1.1
Maros	1,523	381	576	660	1,833	3,059	1,425	2,280	886	1,063	1.2
Gowa	N/A	N/A	4,655	3,353	7,852	5,653	6,266	4,059	5,511	3,605	0.7
Takalar	3,870	2,631	3,981	2,830	3,755	2,677	4,266	2,986	4,688	3,279	0.7
Total	5,403	3,024	9,264	6,905	13,593	11,561	12,224	9,628	11,180	8,055	0.7

## Area and Production Trend of Soybean

Makassar	6	10	8	13	14	22	9	12	7	11	1.6
Maros	2,093	3,205	691	1,008	670	485	876	1,009	583	759	1.3
Gowa	N/A	N/A	1,299	3,022	722	1,609	378	764	335	623	1.9
Takalar	291	383	781	1,017	556	652	412	494	402	497	1.2
Total	2,390	3,598	2,779	5,060	1,962	2,767	1,675	2,280	1,327	1,890	1.4

## Area and Production Trend of Sweet Potato

Makassar	30	202	35	235	21	142	42	283	20	142	7.1
Maros	253	3,036	165	1,980	288	1,257	248	3,338	241	2,958	12.3
Gowa	N/A	N/A	499	4,602	875	7,499	565	5,173	219	4,984	22.8
Takalar	373	3,783	291	4,172	249	4,221	285	8,868	288	8,883	30.8
Total	656	7,021	990	10,989	1,433	13,118	1,140	17,662	768	16,967	22.1

**Estate Crops**

## Area and Production Trend of Coffee

Regency	1999		2000		2001		2002		2003		Yield (ton/ha)
	Harvested Area (ha)	Production (ton)	Harvested Area (ha)	Production (ton)	Harvested Area (ha)	Production (ton)	Harvested Area (ha)	Production (ton)	Harvested Area (ha)	Production (ton)	
Gowa	2,354	1,501	2,512	1,750	2,639	1,926	2,423	1,916	4,410	1,803	0.4
Takalar	6	3	6	3	6	3	6	4	6	4	0.7
Total	2,360	1,504	2,518	1,753	2,645	1,929	2,429	1,920	4,416	1,807	0.4

## Area and Production Trend of Cacao

Gowa	230	69	230	73	256	89	294	103	465	168	0.4
Takalar	34	20	34	21	34	22	34	23	34	23	0.7
Total	264	89	264	94	290	111	328	126	499	191	0.4

## Area and Production Trend of Candlenuts

Gowa	1,065	495	1,260	577	1,340	610	1,286	615	1,928	553	0.3
Takalar	255		255		255		255	52	255	52	0.2
Total	1,320	495	1,515	577	1,595	610	1,541	667	2,183	605	0.3

## Area and Production Trend of Cashewnuts

Gowa	1,157	356	1,656	906	1,844	616	1,656	580	3,003	636	0.2
Takalar	1,721	321	1,721	386	1,790	420	1,790	822	1,790	980	0.5
Total	2,878	677	3,377	1,292	3,634	1,036	3,446	1,402	4,793	1,616	0.3

## Area and Production Trend of Clove

Gowa	271	67	271	76	271	79	275	91	418	93	0.2
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## Area and Production Trend of Coconuts

Gowa	1,044	975	1,139	1,081	1,179	1,121	1,222	1,288	1,654	1,343	0.8
Takalar	1,697	299	1,697	1,114	1,709	1,217	1,709	1,296	1,712	1,319	0.8
Total	2,741	1,274	2,836	2,195	2,888	2,338	2,931	2,584	3,366	2,662	0.8

## Area and Production Trend of Cotton

Gowa	52	16	78	16	47	33,475	262	307	400	7	0.02
Takalar	39	15	73	8	42	71	200	370	70	370	5.3
Total	91	31	151	24	89	33,546	462	677	470	377	0.8

## Area and Production Trend of Kapok

Gowa	759	461	907	530	907	334	907	560	1,262	548	0.4
Takalar	435	198	435	200	435	218	435	229	435	230	0.5
Total	1,194	659	1,342	730	1,342	552	1,342	789	1,697	778	0.5

## Area and Production Trend of Pepper

Gowa					2	1	2	1	36	1	0.01
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## Area and Production Trend of Sugarcane

Gowa	1,455	41,460	1,165	37,531	801	20,959	667	21,495	762	57,543	75.5
Takalar	58		147	4,844	147	7,344	150	270	350	10,500	30.0
Total	1,513	41,460	1,312	42,375	948	28,303	817	21,765	1,112	68,043	61.2

## Area and Production Trend of Tea

Gowa	86	117	97	120	97	110	97	110	131	170	1.3
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## Area and Production Trend of Vanilla

Gowa					5	1	8	3	122	4	0.03
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## Vegetables

Area and Production Trend of Cabbage

Regency	1999		2000		2001		2002		2003		Yield (ton/ha)
	Harvested Area (ha)	Production (ton)	Harvested Area (ha)	Production (ton)	Harvested Area (ha)	Production (ton)	Harvested Area (ha)	Production (ton)	Harvested Area (ha)	Production (ton)	
Makassar	37	175	50	237	63	291	103	484	103	508	4.9
Maros	2	7									
Gowa		7,713		13,878		12,313		1,097		1,123	
Gowa		806		975		2,389		3,279		7,748	
Total	39	8,701	50	15,090	63	14,993	103	4,860	103	9,379	

Area and Production Trend of Carrot

Maros	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Gowa		171		5,460		715		69		2,825	
Total	0	171	0	5,460	0	715	0	69	0	2,825	

Area and Production Trend of Chili

Makassar	31	138	36	161	30	134	25	112	37	165	4.5
Maros	395	227	130	93	415	326	65	145	45	134	3.0
Gowa		2,686		1,557		2,203		19,832		1,728	
Takalar	81	385	121	592	172	753	161	757	187	852	4.6
Total	507	3,436	287	2,403	617	3,415	251	20,845	269	2,881	

Area and Production Trend of Cucumber

Makassar	4	16	5	21	14	57	3	13	1	4	4.1
Maros	35	436			111	73	30	195	16	157	10.1
Gowa		182		280		320		132		11,322	
Takalar	107	2,140	113	2,289	121	2,435	100	1,923	102	1,965	19.3
Total	146	2,774	118	2,590	246	2,885	133	2,262	119	13,449	

Area and Production Trend of Eggplant

Makassar	11	29	6	16	10	34	6	21	4	14	3.5
Maros	108	90	361	199	193	132	29	45	25	43	1.7
Gowa		991		4,732		1,054		16,725		5,144	
Takalar	55	156	94	282	105	516	122	624	124	632	5.1
Total	174	1,266	461	5,229	308	1,737	157	17,415	153	5,833	

Area and Production Trend of Garlic

Maros			117	68							
Gowa		1				2					
Total	0	1	117	68	0	2	0	0	0	0	0

Area and Production Trend of Green Mustard

Makassar	25	126	32	163	32	105	26	85	35	111	3.2
Maros	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Gowa		6,166		7,333		12,313		819		6,883	
Takalar	160	2,433	158	2,433	169	2,497	173	1,816	267	2,786	10.4
Total	185	8,725	190	9,929	201	14,914	199	2,720	302	9,780	

Area and Production Trend of Potato

Maros	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Gowa		10,156		12,916		1,996		1,198		1,985	
Total	0	10,156	0	12,916	0	1,996	0	1,198	0	1,985	

Area and Production Trend of Red Onion

Takalar	14	135	14	135	12	144	38	1,182	13	149	11.4
Maros	29	123	1	2			10	2	13	31	2.3
Gowa		71		127		90		1,940		10	
Total	43	329	15	264	12	234	48	3,124	26	190	

Area and Production Trend of Spinach

Makassar	12	55	41	191	18	83	17	79	32	93	2.9
Gowa		57		132		399		3,465		625	
Total	12	112	41	323	18	482	17	3,543	32	717	

Area and Production Trend of Spring Onion

Makassar	6	19	4	12	3	9	2	6	7	22	3.1
Maros	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Gowa		5,228		13,608		11,873		795		1,978	
Total	6	5,247	4	13,620	3	11,882	2	801	7	2,000	

Area and Production Trend of String Bean

Maros	26	31	63	38	35	20			3	6	2.0
Gowa		4,764		3,212		9,162		392		3,376	
Total	26	4,795	63	3,250	35	9,182	0	392	3	3,382	

**Fruits**

## Production Trend of Avocado

Regency	1999 Production (ton)	2000 Production (ton)	2001 Production (ton)	2002 Production (ton)	2003 Production (ton)
Makassar		1	1	2	1
Maros	51		100	67	170
Gowa	2,828	1,724	8,061	1,352	6,009
Total	2,880	1,725	8,163	1,421	6,180

## Production Trend of Banana

Makassar	145	110	324	945	113
Maros	6,267	5,792	3,305	4,169	6,664
Gowa	22,857	24,522	40,422	68,223	74,553
Takalar	5,528	13,501	1,909	824	14,524
Total	34,797	43,925	45,960	74,161	95,854

## Production Trend of Breadfruit

Makassar		9	-	8	
Gowa	565	13,037	3,825	455	21,379
Takalar	83	360	162	46	52
Total	647	13,406	3,987	508	21,431

## Production Trend of Carambola

Makassar	399	29	71	71	120
Gowa	15	24	17	25	120
Total	414	53	88	97	240

## Production Trend of Citrus

Makassar	52	44	45	23	96
Maros	501		439	2,907	2,732
Gowa	1,421	601	1,074	110	3,605
Takalar	2,419	200	698	1,332	1,881
Total	4,392	845	2,256	4,371	8,314

## Production Trend of Durian

Gowa	174	6,628	9,991	416	47,141
Takalar	11	12	485	262	176
Total	185	6,640	10,476	678	47,317

## Production Trend of Guava

Makassar	75	33	158	144	101
Takalar	21	720	160	14	24
Total	96	753	318	158	125

## Production Trend of Jackfruit

Makassar		362	349	281	336
Gowa	60,703	3,982	16,197	6,010	1,562
Takalar	613	83	2,443	6,866	7,302
Total	61,316	4,427	18,988	13,158	9,200

## Production Trend of Rose Apple (Jambu Air)

Makassar		5	14	8	21
Gowa	21	47	27	10	13
Maros	119		70	600	1,011
Gowa	236	190	219	227	295
Total	377	242	331	845	1,340

## Production Trend of Lanzon

Gowa	11	4,824	6,655	64	26,842
Takalar	2,217	1,927	602	276	685
Total	2,229	6,751	7,257	339	27,528

## Production Trend of Mango

Makassar	2,764	4,912	5,125	5,705	4,607
Maros	1,179		139	6,465	5,712
Gowa	9,132	9,820	2,877	3,296	2,777
Takalar	2,319	5,243	4,443	4,455	4,531
Total	15,394	19,974	12,585	19,921	17,627

## Production Trend of Papaya

Makassar	101	111	104	131	67
Maros	672	662	175	999	2,775
Gowa	631	891	1,487	847	4,770
Takalar	65	22	46	79	163
Total	1,469	1,687	1,812	2,056	7,776

Production Trend of Markisa (Passion Fruit)

	1999	2000	2001	2002	2003
Regency	Production (ton)	Production (ton)	Production (ton)	Production (ton)	Production (ton)
Gowa	7,190	9,591	11,517	22,724	57,135

Production Trend of Pineapple

Makassar	1	3	1	4	2
Maros	84	33	76	71	282
Gowa	160	302	243	133	2,222
Takalar	25	31	77	14	15
Total	270	369	397	221	2,521

Production Trend of Rambutan

Makassar	1	1	4	3	4
Gowa	339	4,760	1,414	110	7,455
Takalar			1	4	
Total	340	4,761	1,419	117	7,459

Production Trend of Apple

Gowa	191	236	1,199	237	295
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Production Trend of Salak

Maros	53	6	38	3	14
Gowa	18	21	27	27	1,651
Total	71	26	64	30	1,665

Production Trend of Sapodila

Makassar			6	32	6
Gowa	1	0		4	5

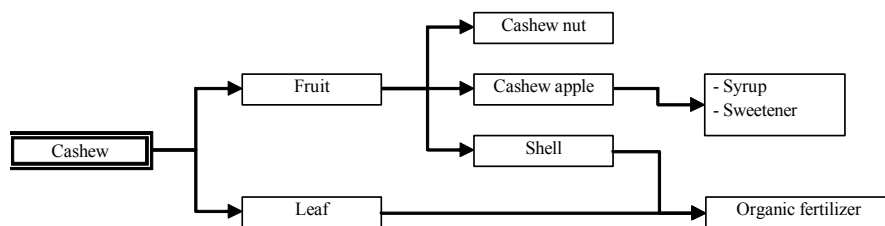
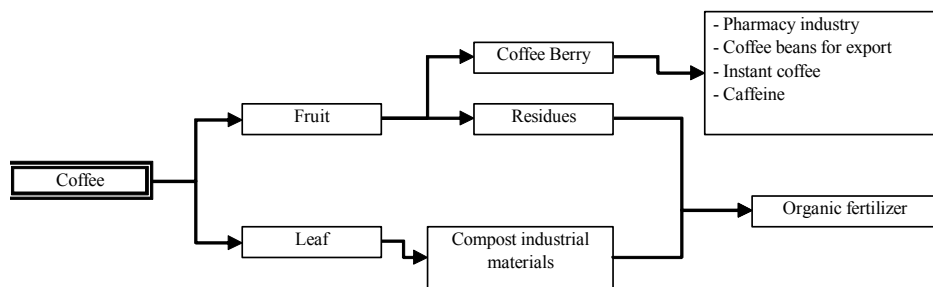
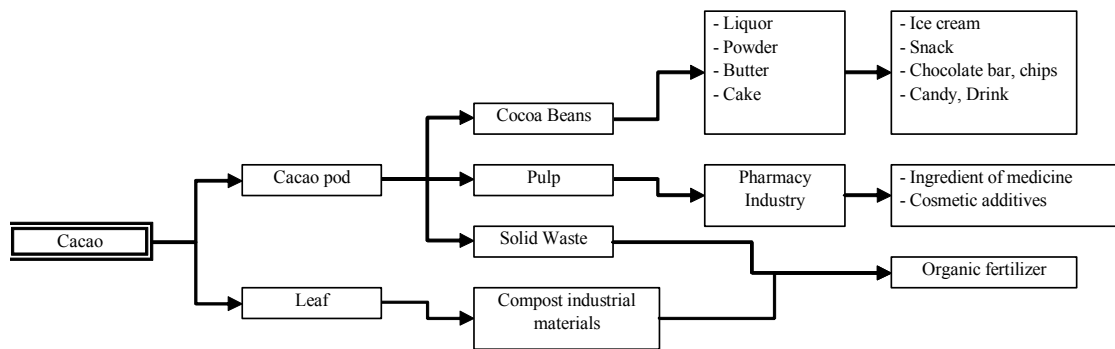
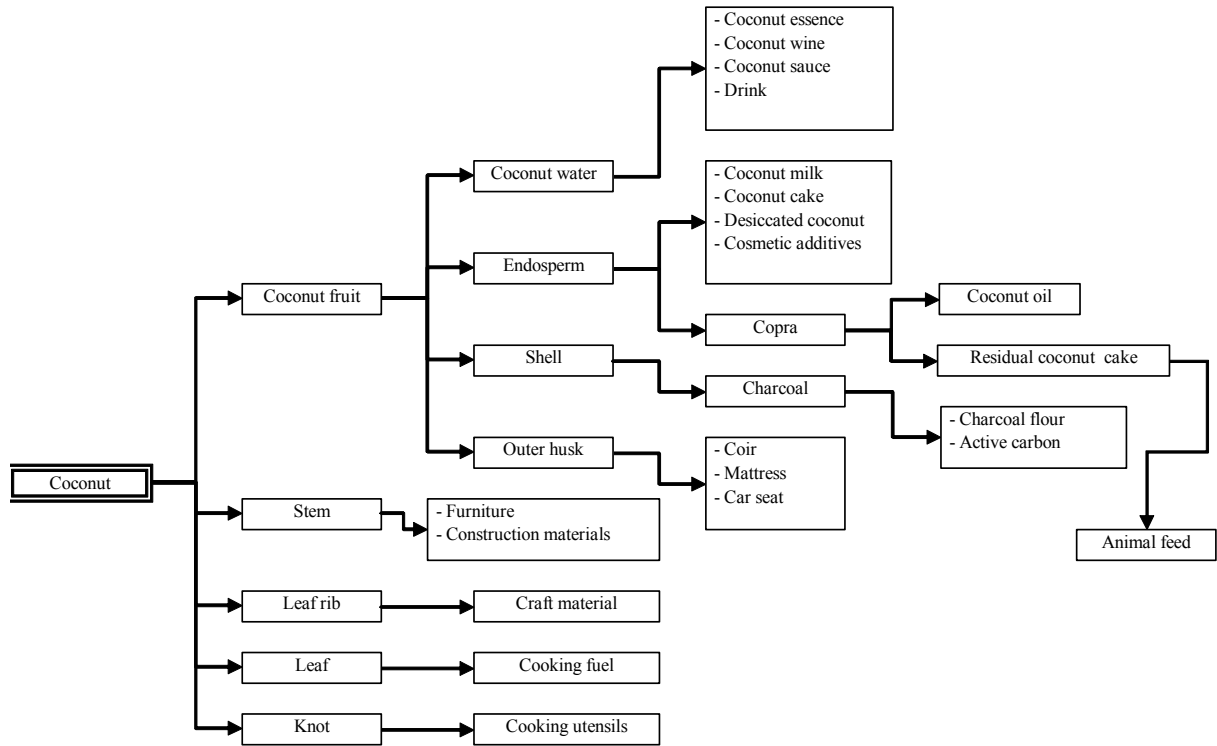
Production Trend of Soursop

Makassar	17	38	30	36	4
Gowa	3,223	1,726	566	6,434	1,274
Takalar	353	28	409	80	127
Total	3,594	1,792	1,005	6,550	1,404

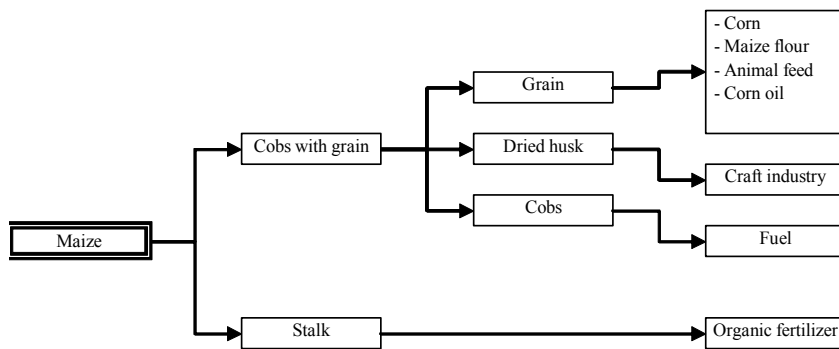
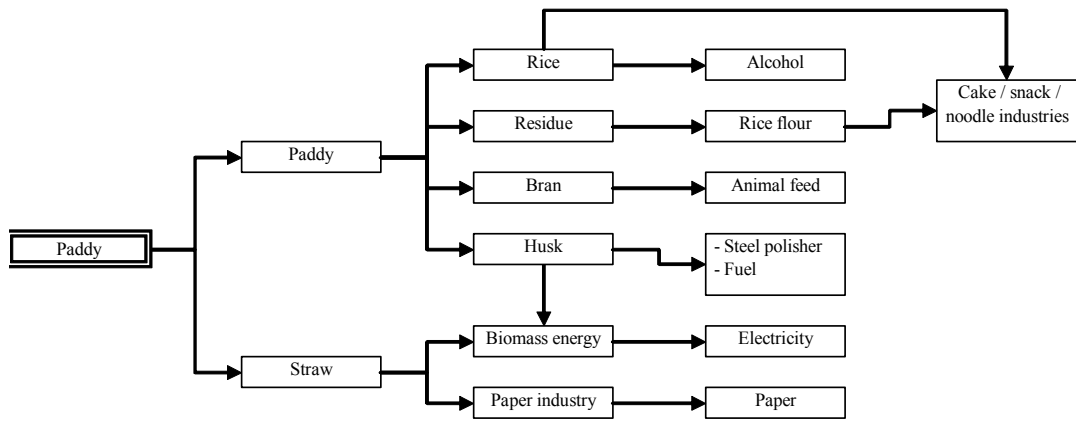
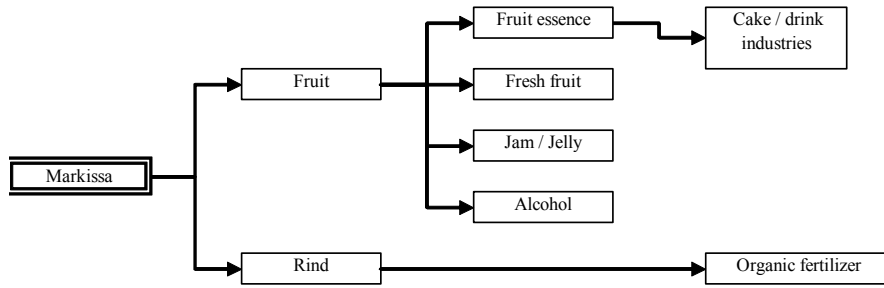
Production Trend of Watermelon

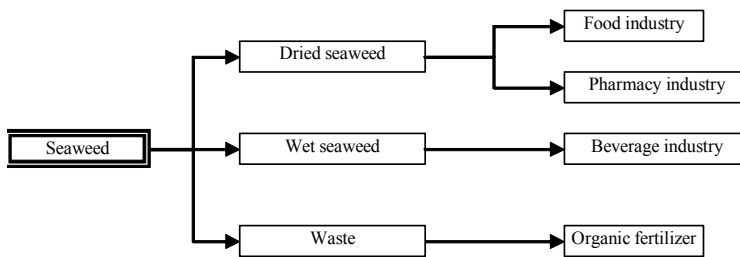
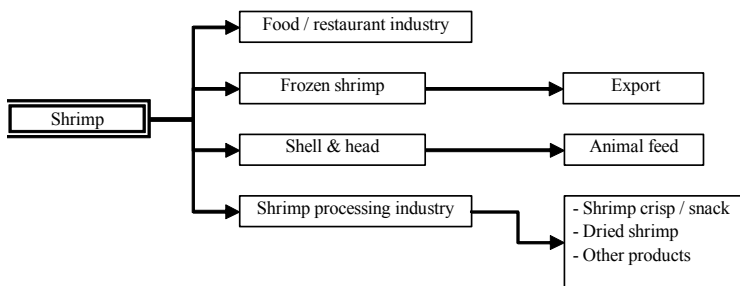
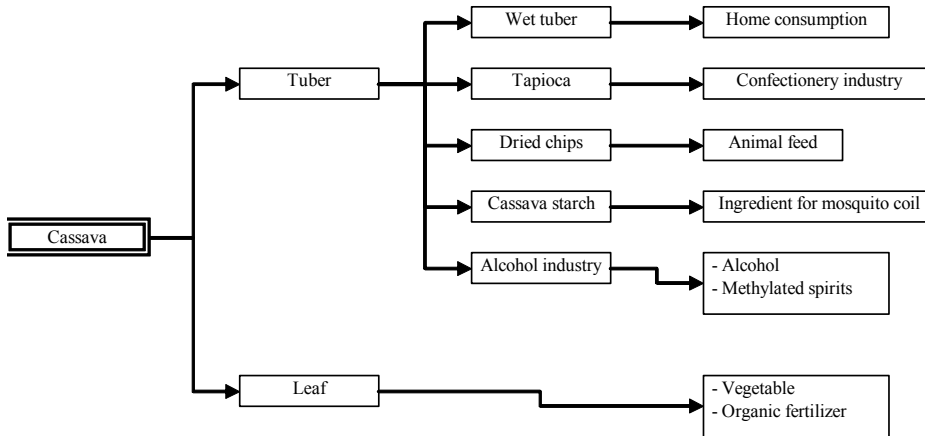
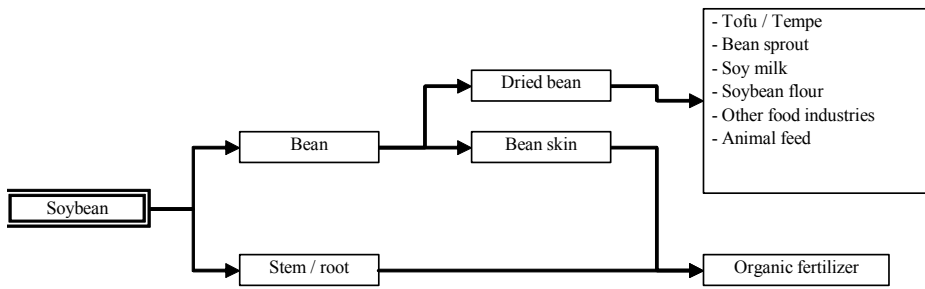
Makassar	60	61	60	90	181
Gowa	1,725	2,376	2,075	22,724	19,774
Takalar	2,493	5,040	5,256	5,197	3,668
Total	4,279	7,477	7,392	28,011	23,622

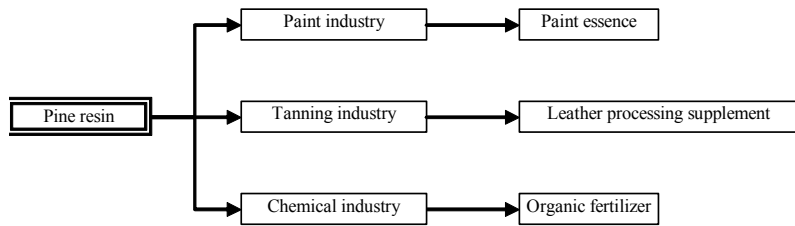
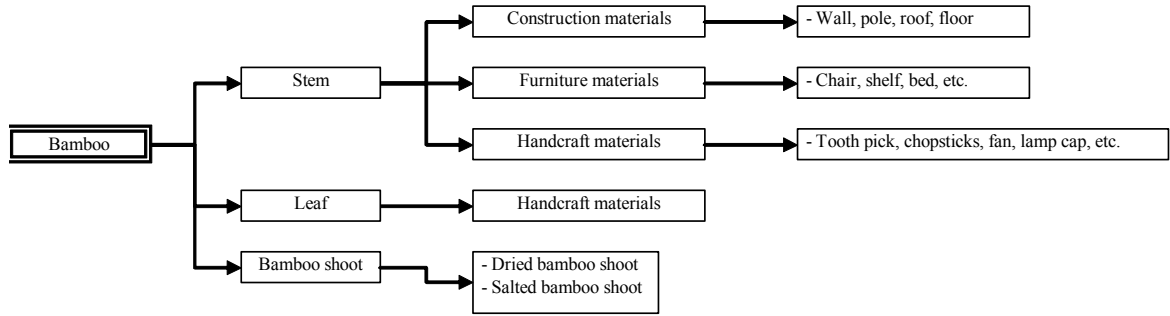
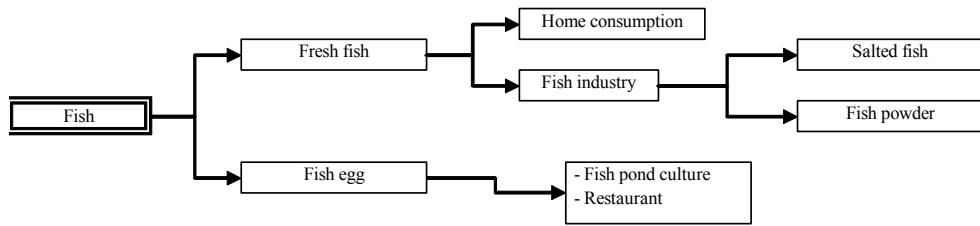
**By-Products Tree Diagrams for Various Commodities**











## Estimation of Crop Budget, Reduced Production Values, Net Returns and Land Use

### Table A3-1 Crop Budget for Irrigated Agriculture

	Paddy (Dry)	Paddy (Wet)	Maize	Soybean	Groundnuts	Mungbean	Cabbage	Carrot	Chili	Watermelon	Sugarcane
Production Cost	4,617,000	4,617,000	1,800,000	2,334,000	3,177,500	1,405,000	6,000,000	7,538,500	8,946,000	3,700,000	10,066,512
Yield (kg)	6,000	5,500	4,300	1,700	1,800	1,200	15,000	5,000	8,000	12,300	80,000
Price	1,100	1,100	1,000	2,300	3,500	2,300	1000	2,500	2,000	1,000	350
Gross Income	6,600,000	6,050,000	4,300,000	3,910,000	6,300,000	2,760,000	15,000,000	12,500,000	16,000,000	12,300,000	28,000,000
Net Return	<b>1,983,000</b>	<b>1,433,000</b>	<b>2,500,000</b>	<b>1,576,000</b>	<b>3,122,500</b>	<b>1,355,000</b>	<b>9,000,000</b>	<b>4,961,500</b>	<b>7,054,000</b>	<b>8,600,000</b>	<b>17,933,488</b>

Source: Dinas Pertanian, Feasibility Study of Bili Bili Irrigation Project and DISIMP Office

### Table A3-2 Crop Budget for Other Agricultural Land (2005)

	Paddy (Wet)	Paddy (Dry)	Maize	Soybean	Groundnuts	Mungbean	Cassava	Cabbage	Carrot	Chili	Watermelon
Production Cost	4,360,500	3,334,500	1,560,000	1,896,375	2,859,750	1,110,000	4,758,750	5,400,000	6,407,725	7,604,100	3,330,000
Yield (kg)	5,500	3,400	3,300	1,400	1,500	800	18,000	11,000	3,500	5,000	8,000
Price	1,100	1,100	1,000	2,300	3,500	2,300	300	1000	2,500	2,000	1,000
Gross Income	6,050,000	3,740,000	3,300,000	3,220,000	5,250,000	1,840,000	5,400,000	11,000,000	8,750,000	10,000,000	8,000,000
Net Return	<b>1,689,500</b>	<b>405,500</b>	<b>1,740,000</b>	<b>1,323,625</b>	<b>2,390,250</b>	<b>730,000</b>	<b>641,250</b>	<b>5,600,000</b>	<b>2,342,275</b>	<b>2,395,900</b>	<b>4,670,000</b>

Source: Dinas Pertanian, Feasibility Study of Bili Bili Irrigation Project and DISIMP Office

### Table A3-3 Crop Budget for Other Agricultural Land (2020)

	Paddy (Wet)	Paddy (Dry)	Maize	Soybean	Groundnuts	Mungbean	Cassava	Cabbage	Carrot	Chili	Watermelon
Production Cost	4,360,500	3,334,500	1,560,000	1,896,375	2,859,750	1,110,000	4,758,750	5,400,000	6,407,725	7,604,100	3,330,000
Yield (kg)	5,800	4,000	3,600	1,500	1,600	1,000	20,000	12,000	4,000	5,500	9,000
Price	1,100	1,100	1,000	2,300	3,500	2,300	300	1000	2,500	2,000	1,000
Gross Income	6,380,000	4,400,000	3,600,000	3,450,000	5,600,000	2,300,000	6,000,000	12,000,000	10,000,000	11,000,000	9,000,000
Net Return	<b>2,019,500</b>	<b>1,065,500</b>	<b>2,040,000</b>	<b>1,553,625</b>	<b>2,740,250</b>	<b>1,190,000</b>	<b>1,241,250</b>	<b>6,600,000</b>	<b>3,592,275</b>	<b>3,395,900</b>	<b>5,670,000</b>

Source: Dinas Pertanian, Feasibility Study of Bili Bili Irrigation Project and DISIMP Office

### Table A3-4 Crop Budget for the Selected Perennial Tree Crops (2005)

Year	Coconuts			Mango			Markissa			Pepper			Cashew		
	1. Investment & Maintenance	2. Production Value	Net (2-1)	1. Investment & Maintenance	2. Production Value	Net (2-1)	1. Investment & Maintenance	2. Production Value	Net (2-1)	1. Investment & Maintenance	2. Production Value	Net (2-1)	1. Investment & Maintenance	2. Production	Net (2-1)
1	6,000,000	0	-6,000,000	4,900,000	0	-4,900,000	7,900,000	0	-7,900,000	10,200,000	0	-10,200,000	3,242,800	0	-3,242,800
2	4,800,000	0	-4,800,000	1,950,000	0	-1,950,000	1,950,000	0	-1,950,000	3,900,000	0	-3,900,000	460,000	0	-460,000
3	2,600,000	0	-2,600,000	1,500,000	0	-1,500,000	1,500,000	0	-1,500,000	3,000,000	0	-3,000,000	620,000	0	-620,000
4	1,800,000	0	-1,800,000	1,500,000	0	-1,500,000	1,500,000	0	-1,500,000	6,300,000	0	-6,300,000	620,000	0	-620,000
5	1,800,000	0	-1,800,000	1,500,000	1,728,000	228,000	1,500,000	1,472,000	-28,000	6,300,000	10,000,000	3,700,000	620,000	1,200,000	580,000
6	1,800,000	4,200,000	2,400,000	500,000	2,592,000	2,092,000	500,000	2,208,000	1,708,000	6,300,000	15,000,000	8,700,000	620,000	1,800,000	1,180,000
7	800,000	6,300,000	5,500,000	500,000	3,456,000	2,956,000	500,000	2,944,000	2,444,000	6,300,000	20,000,000	13,700,000	620,000	2,400,000	1,780,000
8	800,000	8,400,000	7,600,000	500,000	4,320,000	3,820,000	500,000	3,680,000	3,180,000	6,300,000	25,000,000	18,700,000	620,000	3,000,000	2,380,000
9	800,000	10,500,000	9,700,000	500,000	5,184,000	4,684,000	500,000	4,416,000	3,916,000	6,300,000	30,000,000	23,700,000	620,000	3,600,000	2,980,000
10	800,000	12,600,000	11,800,000	500,000	6,048,000	5,548,000	500,000	5,152,000	4,652,000	6,300,000	35,000,000	28,700,000	620,000	4,200,000	3,580,000
11	800,000	14,700,000	13,900,000	500,000	6,912,000	6,412,000	500,000	5,888,000	5,388,000	6,300,000	40,000,000	33,700,000	620,000	4,800,000	4,180,000
12	800,000	16,800,000	16,000,000	500,000	7,776,000	7,276,000	500,000	6,624,000	6,124,000	6,300,000	45,000,000	38,700,000	620,000	5,400,000	4,780,000
13	800,000	18,900,000	18,100,000	500,000	8,640,000	8,140,000	500,000	7,360,000	6,860,000	6,300,000	50,000,000	43,700,000	620,000	6,000,000	5,380,000
14	800,000	21,000,000	20,200,000	500,000	9,504,000	9,004,000	500,000	7,360,000	6,860,000	6,300,000	50,000,000	43,700,000	620,000	6,000,000	5,380,000
15	800,000	21,000,000	20,200,000	500,000	8,640,000	8,140,000	500,000	7,360,000	6,860,000	6,300,000	50,000,000	43,700,000	620,000	6,000,000	5,380,000
Total	26,000,000	134,400,000	25%	16,350,000	63,936,000	22%	19,350,000	54,464,000	15%	92,700,000	370,000,000	35%	11,762,800	44,400,000	25%
Benefit/year	7,226,667	(IRR)		3,172,400	(IRR)		2,340,933	(IRR)		18,486,667	(IRR)		2,175,813	(IRR)	
Benefit/2tree/year	120,444			63,448			33,442			132,048			15,542		

Source: Dinas Perkebunan, 2005

**Table A3-5 Estimation of Reduction of Production Value in Bili Bili Irrigatio Project**

Estimated Present Condition (2005)				Initial Plan toward Full Development in 2008				Future Condition in 2020				Reduction in Annual Production Value (Mil. Rp.)
Irrigation Area	Type of Crop	Area Planted (ha)	*Annual Production Value (Mil. Rp.)	Irrigation Area	Type of Crop	Area Planted (ha)	Annual Production Value (Mil. Rp.)	Irrigation Area	Type of Crop	Area Planted (ha)	Annual Production Value (Mil. Rp.)	
Bili Bili Area (2,369ha)	Dry Paddy	2,369	3,993	Bili Bili Area (2,369ha)	Dry Paddy	2,369	4,698	Bili Bili Area (1,519ha)	Dry Paddy	1,519	3,012	-1,686
	Wet Paddy	2,369	2,886		Wet Paddy	2,369	3,395		Wet Paddy	1,519	2,177	-1,218
	Palawija	2,369	1,675		Palawija	2,369	1,675		Palawija	1,519	1,074	-601
	Subtotal	7,107	8,554		Subtotal	7,107	9,768		Subtotal	4,557	6,263	-3,505
Kampili Area (10,547ha)	Dry Paddy	10,547	17,777	Kampili Area (10,547ha)	Dry Paddy	10,547	20,915	Kampili Area (10,447ha)	Dry Paddy	10,447	20,716	-198
	Wet Paddy	10,547	12,847		Wet Paddy	10,547	15,114		Wet Paddy	10,447	14,971	-143
	Palawija	10,547	7,459		Palawija	10,547	7,459		Palawija	10,447	7,389	-71
	Subtotal	31,641	38,084		Subtotal	31,641	43,488		Subtotal	31,341	43,076	-412
Bissua Area (10,686ha)	Dry Paddy	10,686	18,012	Bissua Area (10,686ha)	Dry Paddy	10,686	21,190	Bissua Area (10,676ha)	Dry Paddy	10,676	21,171	-20
	Wet Paddy	10,686	13,016		Wet Paddy	10,686	15,313		Wet Paddy	10,676	15,299	-14
	Palawija	10,686	7,558		Palawija	10,686	7,558		Palawija	10,676	7,551	-7
	Subtotal	32,058	38,585		Subtotal	32,058	44,061		Subtotal	32,028	44,020	-41
<b>Total</b>			<b>85,223</b>	<b>Total</b>			<b>97,317</b>	<b>Total</b>			<b>93,358</b>	<b>-3,958</b>
	<b>Annual Production Value/ha</b>		<b>3.61</b>		<b>Annual Production Value/ha</b>		<b>4.12</b>		<b>Annual Production Value/ha</b>		<b>4.12</b>	
					<b>% Change in Production Value</b>		<b>14.19%</b>		<b>% Change in Production Value</b>		<b>-4.07%</b>	

\*85% less than Full Development Level

**Table A3-6 Estimation of Per Hectare Net Return in Technical Irrigation (Comparison 2005 and 2020)**

Technical Irrigation Area	Crops	Yield (ton/ha)	Net Return per crop (Rp./ha)	Present Condition in 2005			Diversified Irrigated Urban Agriculture		Other Diversified Irrigated Agriculture	
				Intensity	% to Full Dev. Level	Net Return from 1ha Plot	Intensity	Net Return from 1ha Plot	Intensity	Net Return from 1ha
	Dry Paddy	6.0	1,983,000	100%	85%	1,685,550	94%	1,864,020	94%	1,864,020
	Wet Paddy	5.5	1,433,000	100%	85%	1,218,050	94%	1,347,020	94%	1,347,020
	Maize	4.3	2,500,000	7%	85%	148,750	10%	250,000	15%	375,000
	Soybean	1.7	1,576,000	15%	85%	200,940	8%	126,080	8%	126,080
	Groundnuts	1.8	3,122,500	10%	85%	265,413	15%	468,375	15%	468,375
	Mungbean	1.2	1,355,000	8%	85%	92,140	7%	94,850	7%	94,850
	Vegetable (Cabbage)	15.0	9,000,000	0%		0	5%	450,000	0%	0
	Vegetable (Chili)	8.0	7,054,000	0%		0	5%	352,700	0%	0
	Annual Fruit Crop (Watermelon)	12.3	8,600,000	0%		0	0%	0	5%	430,000
	Sugarcane	80.0	17,933,488	0%		0		0		0
	Tree Crop (Coconut) per 2 trees	-	120,444	0%		0	1%	120,444	1%	120,444
				<b>240%</b>		<b>3,610,843</b>	<b>239%</b>	<b>5,073,489</b>	<b>239%</b>	<b>4,825,789</b>

**Table A3-7 Estimation of Per Hectare Net Return in Semi/Non-Technical Irrigation Area/Rainfed Area (Comparison 2005 and 2020)**

Semi/Non-Technical Irrigation Area/Rainfed Area	Crops	Present Condition (130%)				Future Condition in 2020		Urban Agriculture (140%)		Other Area (130%)		Dryland Area (70%)	
		Yield (ton/ha)	Net Return per crop (Rp./ha)	Intensity	Net Return from 1ha Plot	Yield (ton/ha)	Net Return per crop (Rp./ha)	Intensity	Net Return from 1ha Plot	Intensity	Net Return from 1ha Plot	Intensity	Net Return from 1ha Plot
	Wet Paddy	5.5	1,689,500	100%	1,689,500	5.8	2,019,500	89%	1,797,355	70%	1,413,650	0%	0
	Dry Paddy	3.4	405,500	0%	0	4.0	1,065,500	0%	0	0%	0	0%	0
	Maize	3.3	1,740,000	7%	121,800	3.6	2,040,000	10%	204,000	15%	306,000	10%	174,000
	Sovbean	1.4	1,323,625	5%	66,181	1.5	1,553,625	7%	108,754	7%	108,754	0%	0
	Groundnuts	1.5	2,390,250	10%	239,025	1.6	2,740,250	15%	411,038	15%	411,038	12%	286,830
	Mungbean	0.8	730,000	5%	36,500	1.0	1,190,000	3%	35,700	8%	95,200	0%	0
	Cassava	18.0	641,250	3%	19,238	20.0	1,241,250	5%	62,063	10%	124,125	15%	96,188
	Vegetable (Cabbage)	11.0	5,600,000	0%	0	12.0	6,600,000	5%	330,000	0%	0	0%	0
	Vegetable (Chili)	5.0	2,395,900	0%	0	5.5	3,395,900	5%	169,795	0%	0	3%	71,877
	Annual Fruit Crop (Watermelon)	8.0	4,670,000	0%	0	9.0	5,670,000	0%	0	5%	283,500	10%	467,000
	Sugarcane	40.0	4,772,364	0%	0	50.0	8,272,364	0%	0	0%	0	0%	0
	Tree Crop (Coconut) per 2 trees	-	120,444	0%	0	-	120,444	1%	120,444	0%	120,444	0%	0
	Tree Crop (Cashew) /ha/year	-	2,175,813	0%	0	-	2,175,813	0%	0	0%	0	20%	435,163
				<b>130%</b>	<b>2,172,244</b>			<b>140%</b>	<b>3,239,148</b>	<b>130%</b>	<b>2,862,711</b>	<b>70%</b>	<b>1,531,057</b>

**Table A3-8 Present Agriculture Land Area and Estimated Net Production Value**

Type of Land Use	Area	Net Production Value (Mil. Rp.)
Technical Irrigation Area	23,602	85,223
Semi-/Non-Technical Irrigation, Rainfed Area	64,380	139,849
Total	87,982	225,072

**Table A3-9 Agricultural Land Use and Estimated Net Production Value Toward 2020**

Zone	Area	Net Production Value (Mil. Rp.)
Diversified Irrigated Urban Agriculture	10,000	50,735
Other Diversified Irrigated Agriculture	9,142	44,117
Irrigated Sugarcane Area	3,500	62,767
Diversified Urban Agriculture	5,614	18,185
Other Diversified Agriculture	57,476	164,537
Dryland Agriculture	3,000	4,593
Total	88,732	344,934

Study on Implementation of  
Integrated Spatial Plan for  
The Mamminasata Metropolitan Area

## SECTOR STUDY (5)

# **INDUSTRIAL DEVELOPMENT STUDY**

KRI International Corp.

Nippon Koei Co., Ltd

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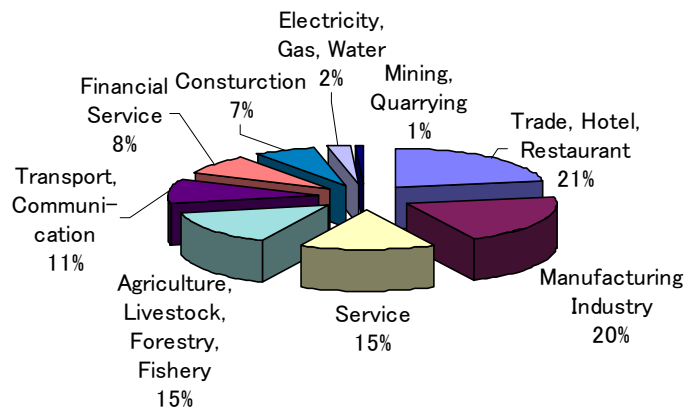


## 1. PRESENT CONDITION

### 1.1 Overview

#### 1) GRDP Contribution

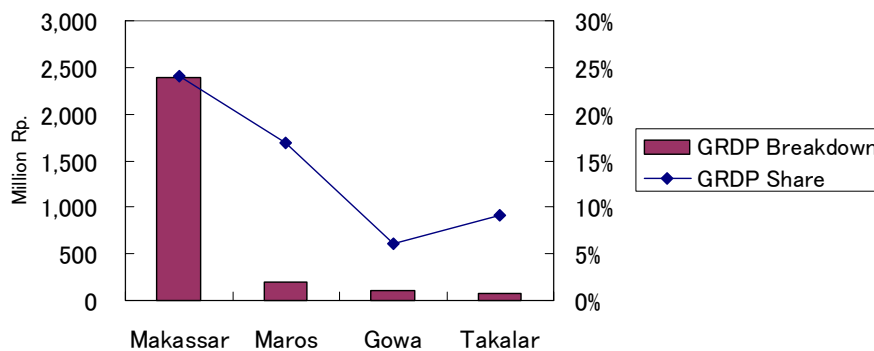
GRDP contribution from the manufacturing sector in Mamminasata<sup>1</sup> (20% in 2003) is much higher than the average in South Sulawesi (12%), but it is still relatively low compared to that in Indonesia (31%).



Source: Produk Domestik Regional Bruto (2003) of Makassar, Maros, Gowa, and Takalar

**Figure 1-1 GRDP Contributions in the Study Area (2003)**

This relatively high concentration of the manufacturing sector is mostly from Makassar since contribution from other three regencies is only 16% of that from Makassar.



Source: Produk Domestik Regional Bruto (2003) of Makassar, Maros, Gowa, and Takalar

**Figure 1-2 GRDP Contribution from the Manufacturing Sector (2003)**

<sup>1</sup> "Mamminasata" in this paper refers to Makassar City, Maros, Gowa, and Takalar regencies in aggregate.

2) Sectoral Share

Although 71% of the laborers belong to small and micro enterprises, GRDP contribution from the small and micro enterprises is only 12% in the manufacturing sector. The two major sectors, food/beverages and wood products/furniture by the large and medium enterprises dominate 83% of GRDP in the manufacturing sector in 2003. The remaining sectors by the large and medium enterprises contribute only 4% of GRDP.

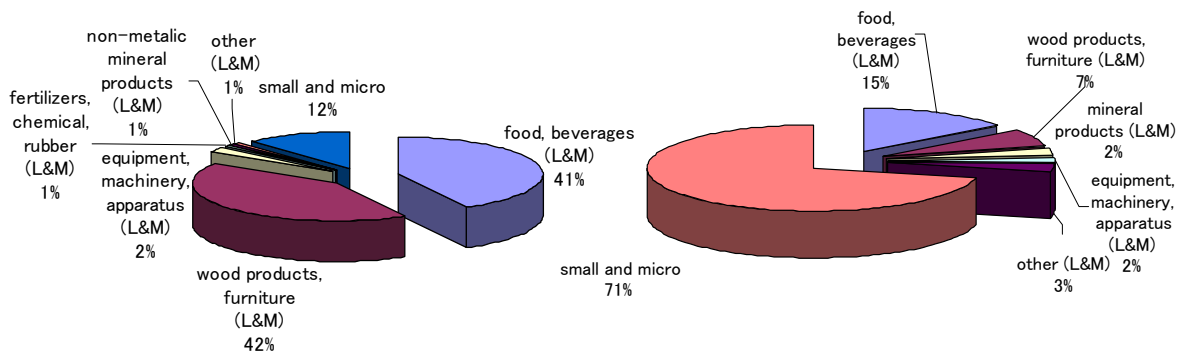


Figure 1- 3 GRDP Share in the Study Area (2003)

Figure 1- 4 Labor Distribution in the Study Area (2003)

In addition, except for the two dominant sectors (food/beverages and wooden products/furniture), labor productivity of the manufacturing sector in Mamminasata is much lower than the national average (See Figure 1-5).

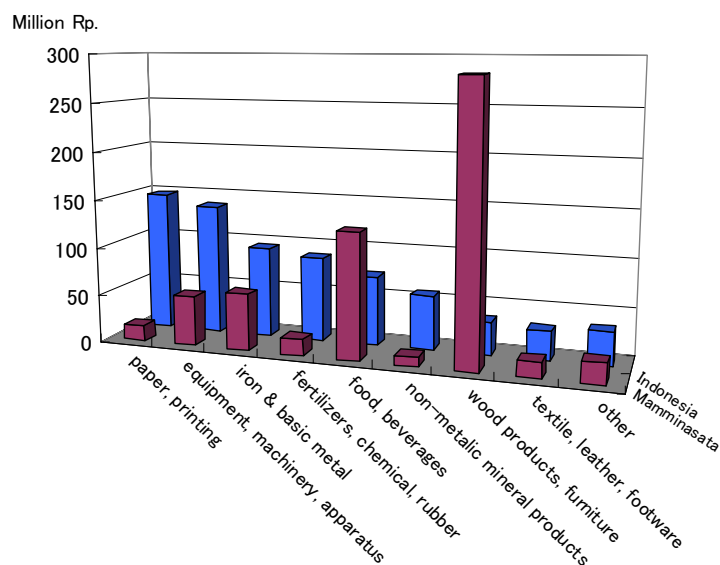


Figure 1- 5 Value Added per Employee in the Large and Medium Enterprises (2003)

### 3) Trend

Marked by establishment of PT Semen Bosowa Maros, a large-scale cement manufacturer, GRDP of the manufacturing sector grew by 13% in 1999; however, its growth rate is downward since then. The average growth rate in the manufacturing sector from 2000 to 2003 is less than 5% both at the national and the local levels. Under the increasing global competition, a future trend cannot be seen optimistic unless proper counter-measures are taken.

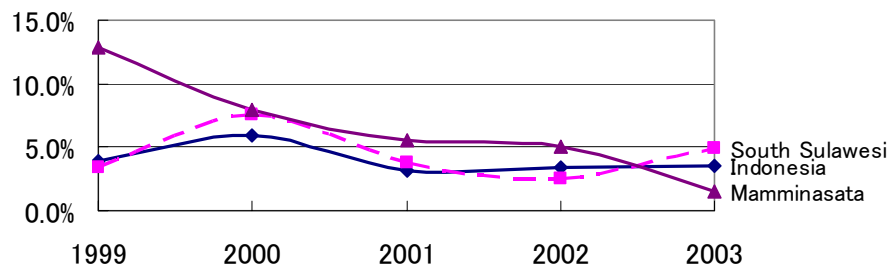
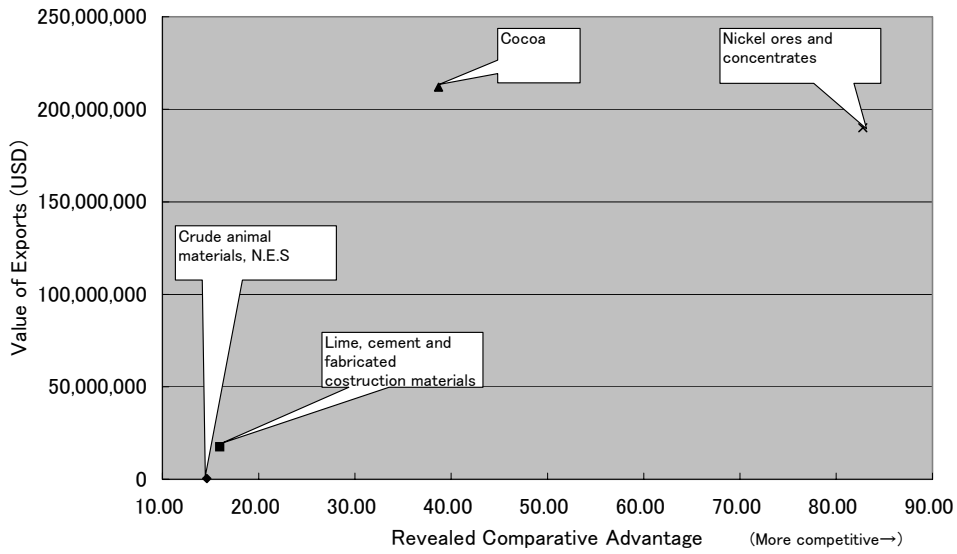


Figure 1- 6 Growth Rate of the Manufacturing Sector

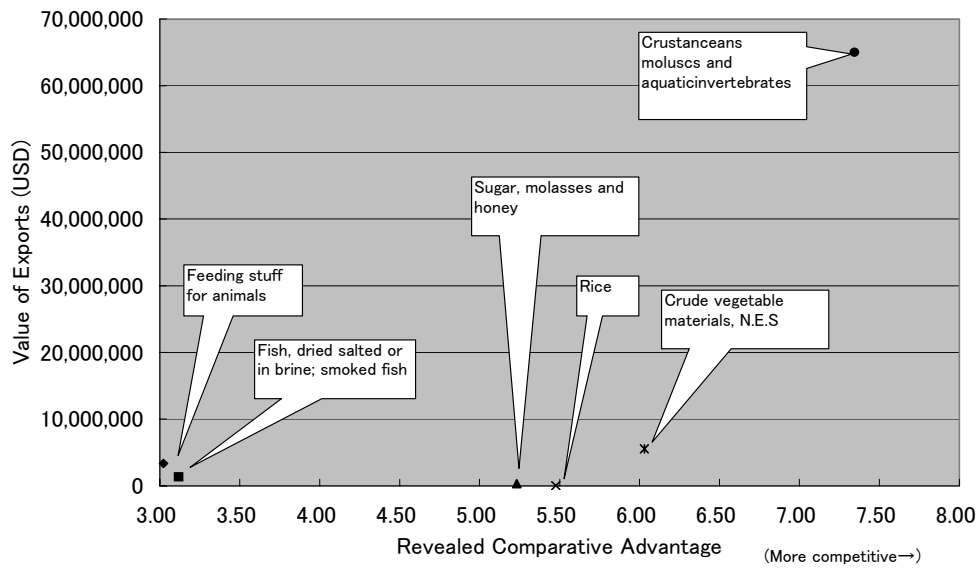
## 1.2 Competitiveness

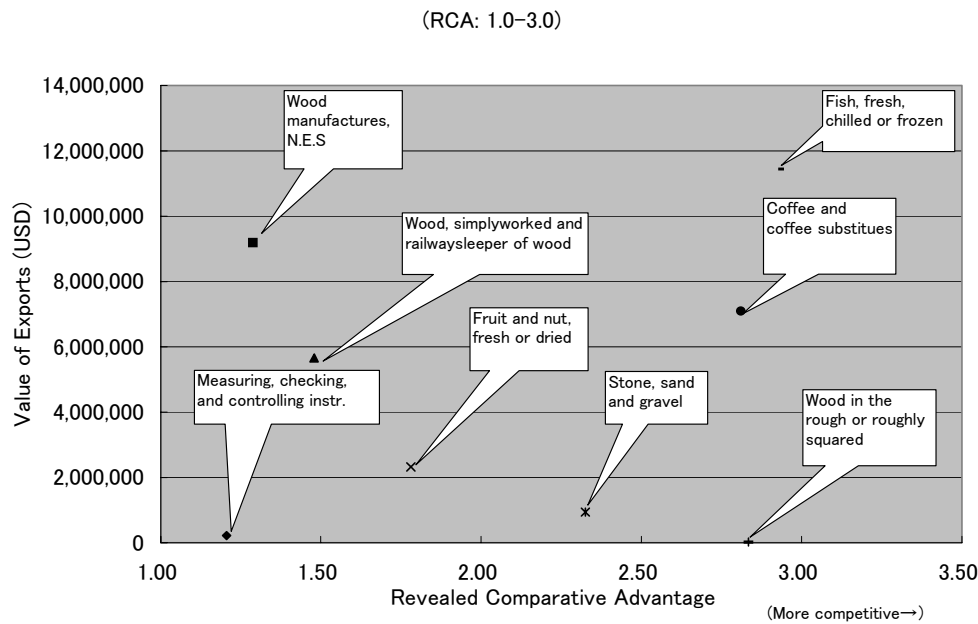
Revealed Comparative Advantage (RCA) is a measure to identify exported goods which have comparative advantage in particular area. Figure 1-7 shows RCA of exported commodities from South Sulawesi against the national average. The higher the value along x-axis, the more competitive the commodity is within Indonesia. However, the most competitive commodity, nickel, which contributes more than 50% of the total export in South Sulawesi, is produced in Luwu by PT Inco and has no any industrial linkage with Mamminasata. Statuses of other major commodities are discussed in the following section.

(RCA: 10.1-100.0)



(RCA: 3.1-10.0)





Note:  $RCA_i = (X_{i, \text{South Sulawesi}} / \sum X_{\text{South Sulawesi}}) / (X_{i, \text{Indonesia}} / \sum X_{\text{Indonesia}})$   
 where  $RCA_i$  is the revealed comparative advantage of commodity  $i$ ,  
 $X_{i, \text{South Sulawesi}}$  is export value of commodity  $i$  from South Sulawesi,  
 $\sum X_{\text{South Sulawesi}}$  is total export value from South Sulawesi,  
 $X_{i, \text{Indonesia}}$  is export value of commodity  $i$  from South Sulawesi, and  
 $\sum X_{\text{Indonesia}}$  is total export value from Indonesia.

Source: BPS (2004) *Statistik Perdagangan Luar Negeri Indonesia Expor 2003*

Figure 1- 7 Export Competitiveness of South Sulawesi (2003)

### 1.3 Major Sub-Sectors

#### 1) Food Products

Since agro and marine products are the major resources available in South Sulawesi, the food/beverage sector receives the highest policy priority. Followings are the current status of the major agro and marine products that are processed in Mamminasata.

##### Cacao

Cacao beans and cacao products are the second largest exporting goods from South Sulawesi next to nickels. Indonesia is the third largest cacao producer after Cote d'Ivoire and Ghana, while 70% of exported cacaos from Indonesia are produced in South Sulawesi. However, qualities of Indonesia cacaos are considered different between from African beans. Indonesian Cacaos are low in flavors, while African cacaos are high in flavors with high scent. Cacaos from South Sulawesi are currently characterized as small beans, low butter fat content, and high level of waste content. Such a reputation has made the price of fermented cacao beans inelastic to quality

although the fermented beans have much better scent than the unfermented beans<sup>2</sup>. This has discouraged farmers to conduct fermenting; thereby dominant markets for cacao beans from South Sulawesi remain to be unfermented cacaos.

The largest market for Indonesian cacaos is USA where beans are mixed with higher quality cacao to improve flavor. Accordingly, the largest cacao processing company in Mamminasata, PT Effem Indonesia, originates in USA. Yet, only 10% of cacaos are processed in South Sulawesi while others are exported in beans.

Major threat to the industry is a production rate of cacao. Prevailing problems are CPB (cacao pod borer), moths that lay eggs in cacao pods. CPB has affected production of cacao beans more than 50%. Another problem is aging of cacao trees. Yields of cacao beans reach the peak in around 8 - 10 years while many cacao trees in South Sulawesi are over 20 years old.

Both farmers and industry can be benefited if proper plantation techniques are adopted to increase productivity. There are several ongoing projects to disseminate proper plantation techniques. The most notable initiatives are cocoa village models by ASKINDO (Indonesia Cacao Association), which sets up 3 model farms in 12 regencies, and Prima project by PT Effem, which provides advices on plantation techniques for 1,000 farmers in Luwu.

### Sugar

The public sugar factory in Takalar, PTP Nusantara XIV, absorbs the largest number of labor force in the manufacturing sector, employing about 1,500 people; however productivity of sugar is low due to shortage in sugarcane supply and use of obsolete machinery in the factory.



**Public Sugar Factory  
Takalar**

Problems associated with the sugar industry are not restricted to local factors. Production of sugar has fallen short of the national demand since 1967. About half of the national consumption relies on imports. The government has been trying to increase production of sugarcane by protecting interest of sugarcane farmers. This has been done by controlling price through BULOG (Badan Urusan Logistik: National Logistics Agency) and by imposing trade barriers to the sugar imports. However, the tendency of farmers' disincentives to sugarcane plantation has not been rectified. Sugarcane field in Mamminasata has also

---

<sup>2</sup> The cacao price from South Sulawesi was Rp. 10,300 for unfermented beans, Rp. 10,800 for semi-fermented beans, and 11,300 for fermented beans per kilogram on 10 November. Prices are based on transactions in the New York Market.

been shifting to plantations of other crops such as maize.

The low sugarcane productivity (averaged of 35 tons/ha) is attributable to the shortage in irrigation water and inadequate variety for irrigated cultivation, as well as improper application & inputs.

In order to rectify the situation, it is necessary to make sugar industry competitive by inviting private investors. As a matter of fact, the government has liberalized production of sugar and is promoting public investment. Yet, it is easier to call in private investment where a large-scale open field is available, such as in Lampung.

Another way to increase dynamism of the sugar industry is to pursue commercial activities through byproducts of sugarcane such as molasses and ethanol. While sugar does not satisfy the local demand and are imported from neighboring countries; namely, Taiwan, Malaysia, and Hong Kong; molasses are exported to South Korea and Taiwan. Such value added products can pursue further market opportunities if supported by steady supply of sugarcane and sound manufacturing practices. Moreover, ethanol can be produced from biomass, leftover after extracting sugar juice. With the modern technology, biomass can gain both commercial and ecological values.

#### Frozen Shrimp

Frozen shrimp is one of the popular export products from Mamminasata while Japan is the top destination for black tiger shrimps. Black tiger shrimps from South Sulawesi nowadays face direct competition with those cultured in Kalimantan. Shrimps in Kalimantan are cultivated naturally in a pond as large as 10 ha. On the other hand, shrimps in South Sulawesi are cultivated in a small pond of about 1 ha. The difference in cultivation methods affects quality of shrimps, which are fragile to changes in salt concentration in a small pond.



**Japanese affiliated company producing frozen shrimps**

There are ways to increase values of frozen shrimps such as producing ready to deep-fry shrimps coated with flour. Yet, Mamminasata falls behind Vietnam and China for such value added production.

#### Seaweed

Indonesia is the fourth largest producer of red seaweed. Particularly, the coastal area in Takalar is a major production area of the specie called cottonii, which potentially have wide range of use for gelling and viscosity agents. Currently, approximately 1% of the total production volume is processed into chips and powder in South Sulawesi while majority of others are exported in dried forms. The chips and powder are

processed up to semi-refined carrageenan, which are further processed abroad for non-diet products such as cosmetics.

Similar to the case of cacao, procurement of seaweeds involve multiple levels of middlemen and traders; thus it becomes difficult to maintain proper quality control of raw material. There are two main problems in the quality of raw material. Firstly, the seaweeds are harvested before maturity. Those which are harvested before 45 days contain less gelatin, but traders do not check the maturity level and purchase by quantity. Secondly, the seaweeds are often dried directly on sand and get contaminated. While the demand for seaweeds is growing from 5 to 10% per annum, it is necessary to adopt measures for quality control so that the sector would maximize opportunities in the growing market.



**cottonii**

## 2) Wooden Products and Furniture

Forestry is an important resource in South Sulawesi, producing teak, ebony, and nyatoh. Wooden and furniture sector earns the highest value added per employee in the manufacturing sector Mamminasata. Most enterprises are producing either wooden furniture for local markets or wooden material for construction. Mamminasata has an advantage not only in resource availability but also in its labor intensive nature and long lifetime. These factors counteract remoteness from markets and enable targeting at markets not only domestic but also abroad. Moreover, construction demands in Mamminasata area provide positive impacts. However, in terms of supply condition, availability of woods is getting scarce due to forestry protection. There is also a concern over illegal logging, which jeopardize fair trade in the market.



### Plywood

Plywood from Mamminasata is widely exported to Japan. A plywood manufacturer, formerly with Japanese ownership, absorbs second largest labor force in Mamminasata, employing approximately 1,500 people.



**Former Japanese affiliated company producing plywood**



## Furniture

Majority of furniture are produced for domestic markets while there is one Japanese enterprise producing specialized furniture utilizing artistic curving imported from Bali and Jepara.



**Furniture produced by local small and medium enterprises**



**Company producing specialized furniture for the Japanese markets**

### 3) Cement and Mineral

The cement and mineral sub-sector is another important industry in Mamminasata. The Bosowa group has two big mineral companies in Maros for cement and marble products<sup>3</sup> while there are many companies producing cement-related products such as tiles and poles for power distribution. PT Semen Bosowa, initiated in 1999, produces 1.8 million tons per year. There is also a larger cement factory in Pagkep, PT Semen Tonasa, with production capacity of 3.5 million tons per year.



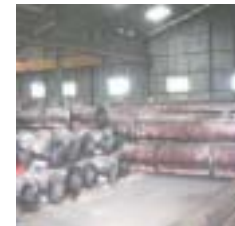
**Cemen Bosowa Maros (cement)**



**Bosowa Mining (marble tile)**



**Other cement products 1 (pavement)**



**Other cement products 2 (poles)**

Mineral sector is a good source of income not only for large and medium enterprises but also for small and micro enterprises. There is a big ceramic "*sentra*"<sup>4</sup> in Takalar and Gowa. Both JICA and CIDA (Canadian International Development Agency) have assisted in increasing product value and markets for the ceramic producers. In addition, there is a brick *sentra* where 1,072 units are operating in Gowa.

<sup>3</sup> Production capacities are 1.5 million/ton for cement and 0.1 million/ton for marble in Maros. It is estimated to exist 2.6 billion capacity of marble reserve in Maros (Direktori Sulawesi Selatan 2004 pp.90-91).

<sup>4</sup> "*Sentra*" means geographical concentration of enterprises operating for production and sales of similar goods. "*Sentra*" usually consist of many micro-scale enterprises.



**traditional  
ceramic  
products**



**small ceramic products  
assisted by CIDA**



**decorated ceramic  
products assisted by  
JICA**



**traditional clay bricks in  
Gowa**

#### 4) Recycling Sector

For the environmental protection, functions of the recycling sub-sector are getting more and more important. Recycling business exists for plastics, paper, metal, and bottles; but manufacturers, which deal with recycling, are yet a few in Mamminasata. Most recyclable waste are collected and sent to Surabaya. Although contribution to GRDP from the recycling manufacturers is only 0.1% of the manufacturing sector, recycling sub sector has been growing by 10% in Indonesia and 7% in South Sulawesi for the last 5 years.

There are only three manufacturers that reproduce recyclable waste; the first one for plastic company producing pails, hangers, pots, the second for aluminum producing household tools, and the third for metal. There are a few more enterprises, which use recyclable bottles for soy sauce and ketchup.



**Waste metal are  
recycled in a small-scale  
factory for production.**

**Table 1- 1 List of Recyclable Waste in Mamminasata**

Plastics	Basket, Plastic Block, Plastic Bottle, Damar, Plastic Bag
Metal	Thin Iron, Thick Iron, Thick Aluminum, Bronze Wire
Paper	Cartoon, Color Paper, News Paper, HVS
Bottle	Soda Bottle, Soy Bottle, Marquisa Bottle, Fanta Bottle, ABC Bottle

### 1.4 Supporting Institutions

#### 1) Department of Industry and Trade.

There are 6 supporting institutions under Disperindag (Dinas Perindustrian dan Perdagangan: Department of Industry and Trade).

#### BPTTL

BPTTL (Balai Perembangan Teknologi Tekstil & Logam: Institute of Textile and Metal Technology Development) is formed under Disperindag South Sulawesi.

BPTTL has six UPT (Unit Pelayanan Teknis: technical service unit): three for textile (Soppeng, Wajo, Enrekang) and the other three for metalwork (Makassar, Parepare, Sidrap). UPTs provide SMEs (small and medium enterprises) with trainings and advisory services. SMEs can also come in to UPT to use the machinery.

UPTs in Indonesia have poor reputation for inadequate maintenance of machinery and for having only basic equipment, that is only serviceable for start up micro enterprises. The case of metalwork in Makassar is not an exception. The machinery of metalwork UPT in Makassar is poorly maintained, and the waste material is spread on the floor.



**Facility is utilized by SMEs.**



**UPT Makassar does not show any practice of "5S".**

### RETPC

Regional Export Trade Promotion Center in Makassar was established in 2004 under JICA cooperation. It aims at developing value-added products for export promotion. Its staff works closely with Disperindag South Sulawesi. Activities include provision of trainings, market information and technical advices, and participating in exhibitions.

There are two major events, which may affect performance of RETPC. Firstly, RETPC in Makassar is likely to be affiliated to Dinas Trade after an expected split of Dinas Industry and Dinas Trade. A concerned is that the split may cause RETPC to lessen emphasis on development of value-added products and concentrate on trading. Secondly, three staff sent from NAFED (National Agency for Export Development) are scheduled to return to Jakarta this year, and the management will be left in the hands of Dinas Trade. Whether local officials are ready to control such ambitious tasks or not is uncertain.

### BDI

BDI (Balai Diklat Industri: Institution for Industrial Training and Education) is an organization under PUSDIKLAT-INDAK (Pusat Pendidikan dan Pelatihan- Industri Kecil dan Dagang Kecil: Center for Education and Training of Industry and Trade). BDI conducts trainings for the officers of Disperindag. It has completed construction of hostel that accommodates 72 persons. Trainings are currently not open to non-officials. Receiving recommendation from a JICA advice on human resource development, BDI will start trainings on "shindan-shi", or official consultants for SMEs.

### LPT-Indak

LPT-Indak (Lembaga Pembinaan Terpadu Industri Kecil dan Dageng Kecil) provides loans to small and medium enterprises in an amount of Rp. 5 to 25 million per enterprise. Duration of lending is two years for the manufacturing sector and 1 year for the trading sector. From 10 to 15 enterprises receive loans per year, depending on availability of fund. Currently, majority of loans go to traders. Performance of repayment is not as expected because some SMEs are unlikely to feel obligated to make repayment.

### BPSMB

BPSMB (Balai Pengujian & Sertifikasi Mutu Barang: Institute for Testing and Certifying Product Quality) undertakes testing of voluntary and mandatory items to issue a certificate for Standard National Indonesia (SNI). Voluntary items include cacao, coffee, nutmeg, and mace. Mandatory items include cashew nut, cashew kernel, black tea, conventional rubber, pepper, clove, vanilla, rice, fertilizer, salt, and mineral water. BPSMB carries out limited testing, which do not satisfy all the testing items of ISO. There are two private companies in Mamminasata, which carry out testing for ISO.

### Balai Metrologi

Institute for Measurement provides certificates to the measurement tools. In regulations, measurement tools such as scales in the markets have to be certified every year in order to protect the interests of consumers who purchase based on the scales.

## 2) Department of Labors and Transmigration

The Department of Labors and Transmigration has BLKI (Balai Latihan Kerja Industri: Vocational Training Center for Industry and Service). Trainings are designed for the young people for employment, as well as for enterprise laborers. The courses include automotive, machinery, welding, electricity, construction, services, sewing, and beauty. About 370 young people receive training every year.

BLKI has received technical cooperation from JICA. The effect of cooperation is observed by the level of practices in 5S<sup>5</sup>. Equipment and machinery are well maintained. 5S is actually well practiced.



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<sup>5</sup> 5S is basic principle for creating productive work environment, standing for Japanese terms of Sort (*seiri*), Set in Order (*Seiton*), Shine (*seiso*), Standardize (*Seiketsu*), and Sustain (*Shitsuke*)

## 1.5 Cluster Activities

The Ministry of Industry and Trade promotes a cluster approach for industrial development. The cluster approach strengthens linkages among the stakeholders while improving capacity of individual enterprise.

One effort by the government is observed in a program called Gerbang Emas (Gerakan Pembangunan Ekonomi Masyarakat: People Economic Development Movement). Eleven products, mainly agro- and marine products, have been identified for promotion. The goal of Gerbang Emas is to increase productivity and quality of the selected products through empowering the local people and strengthening linkages among the local institutions. In Gerbang Emas, the government works as a facilitator while banks are expected to work as financier.

**Table 1-2 11 Selected Products in Gerbang Emas**

Products	Production Areas	Main Activities
coconut	Pinrang	<ul style="list-style-type: none"> <li>• Trainings in post harvest</li> <li>• marketing</li> </ul>
silk	Wajo, Enrekang, Soppeng	<ul style="list-style-type: none"> <li>• breeding silkworm</li> <li>• yarn twisting</li> </ul>
seaweed	Takalar, Maros	<ul style="list-style-type: none"> <li>• production</li> <li>• procurement</li> </ul>
salt	Jeneponto	<ul style="list-style-type: none"> <li>• production</li> </ul>
honey	Maros, Makassar	<ul style="list-style-type: none"> <li>• breeding</li> <li>• training of honey production</li> </ul>
corn	Bantaeng, Makassar	<ul style="list-style-type: none"> <li>• cultivation</li> <li>• procurement</li> <li>• processing</li> </ul>
rice	Pinrang, Pare-pare	<ul style="list-style-type: none"> <li>• cultivation</li> <li>• procurement</li> </ul>
milk	Sinjai, Gowa	<ul style="list-style-type: none"> <li>• breeding</li> <li>• processing</li> </ul>
handicraft (souvenir)	Gowa, Makassar	<ul style="list-style-type: none"> <li>• processing</li> </ul>
coffee	Toraja, Enrekang	<ul style="list-style-type: none"> <li>• cultivation</li> <li>• procurement</li> </ul>
cacao	Luwu	<ul style="list-style-type: none"> <li>• cacao cultivation</li> <li>• trading</li> <li>• processing</li> </ul>





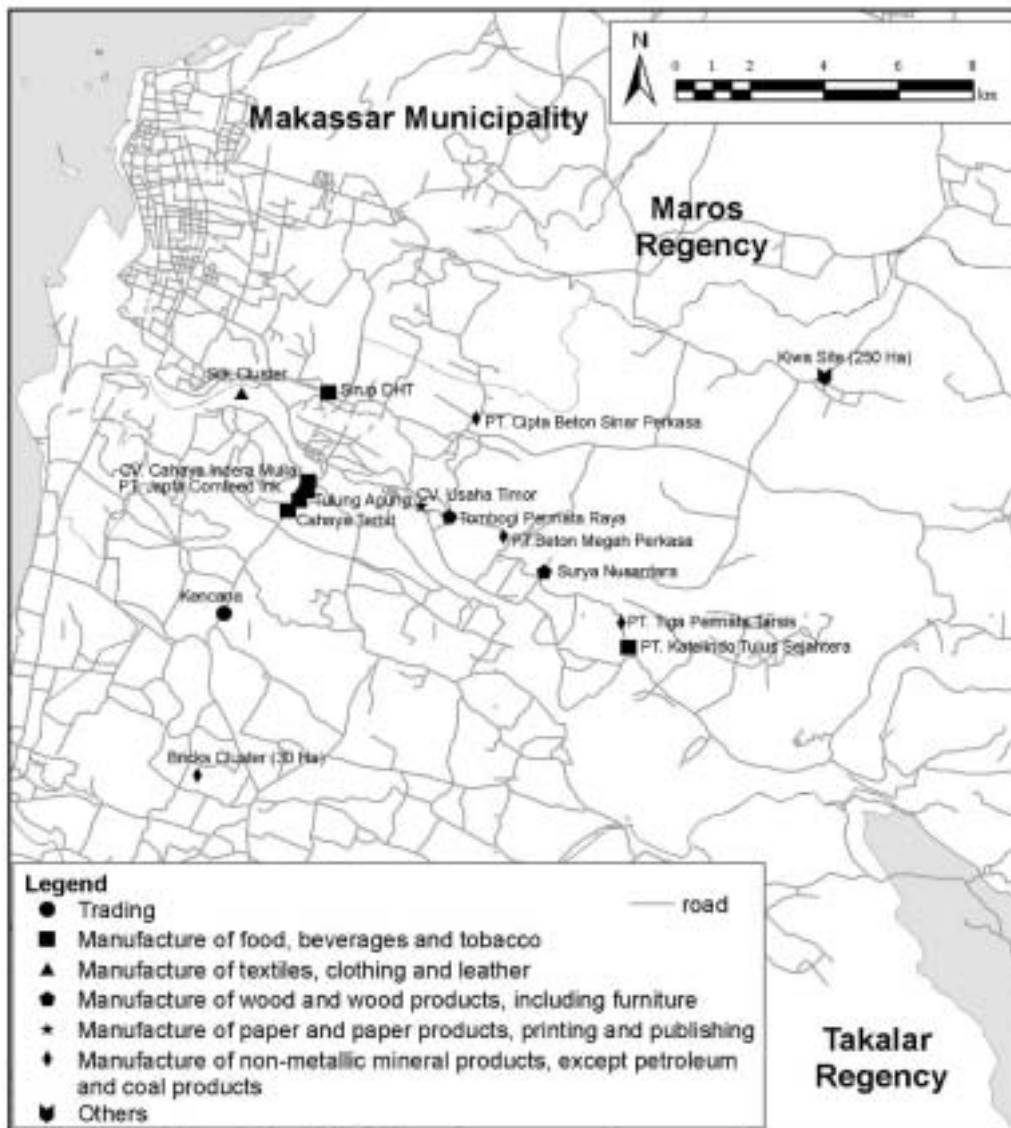


Figure 1-9 Gowa Industrial Mapping

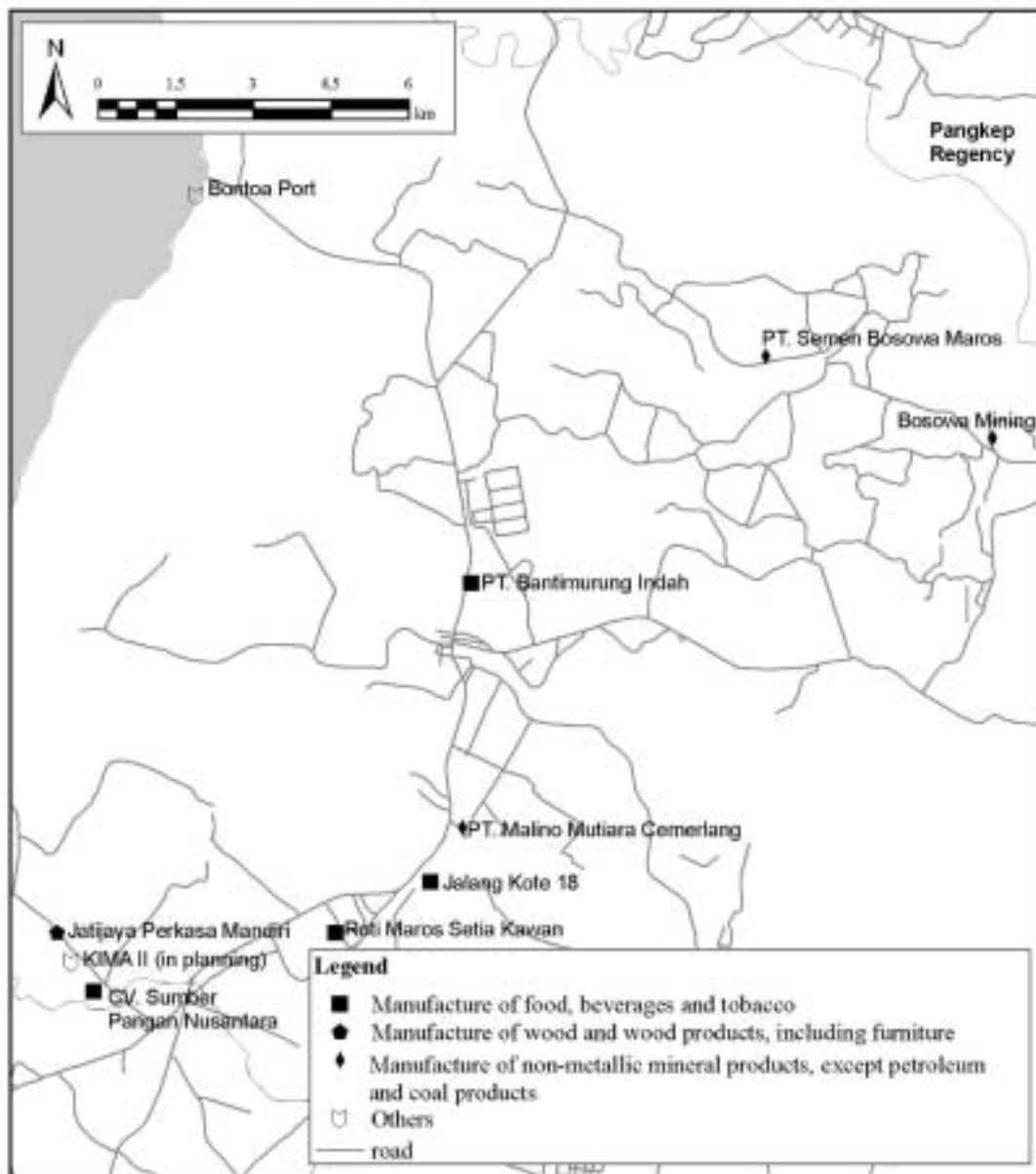


Figure 1-10 Maros Industrial Mapping



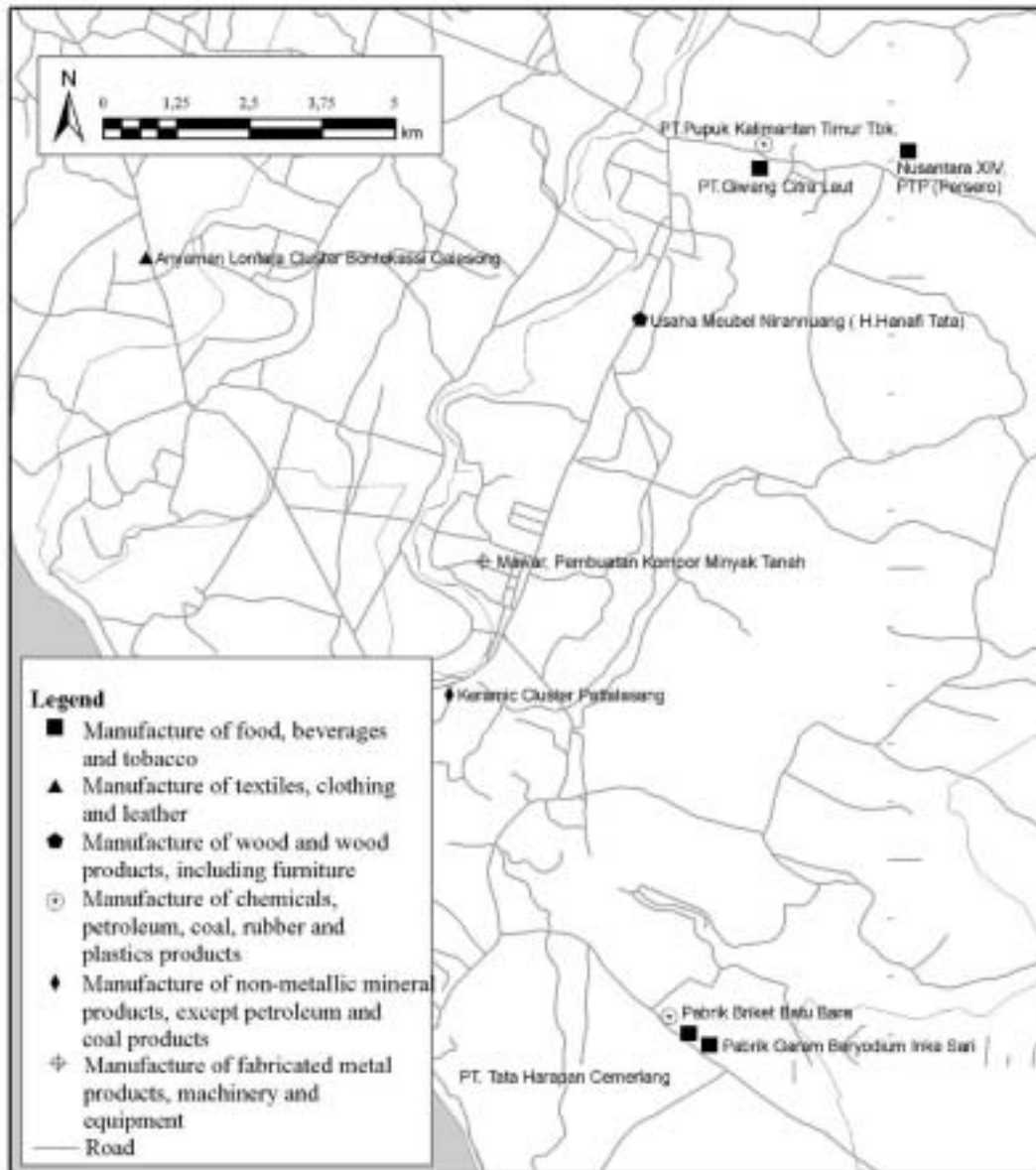


Figure 1-11 Takalar Industrial Mapping

## 2. ISSUES TO BE ADDRESSED

### 2.1 Analytical Approach

Issues to be addressed the manufacturing sector in Mamminasata are analyzed based on the four determinants in Michael Porter's Diamond Model<sup>6</sup>; namely, i) demand conditions, ii) related and supporting industries, iii) factor conditions, and iv) firm strategy, structure, and rivalry. The issues on trade and investment have close relation to the manufacturing sector development.

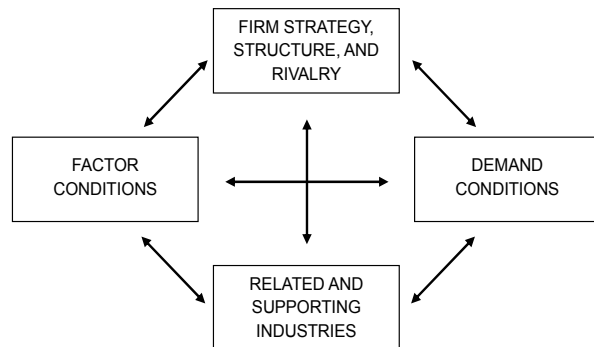


Figure 2-1 Porter's Diamond Model

### 2.2 Demand Conditions

There are two types of choices in general for industrial locations; resource-based and consumer-based. Enterprises operating close to consumers are easy to learn about the context of demands. If a local market demands for higher quality products, it gives incentives to the enterprise in developing competitive consumer-based industry. However, the markets in South Sulawesi generally value the products not in quality but in price. This is a weak condition for the enterprises to target at production of higher values unless the enterprise belongs to the resource-based industry, targeting at markets outside.

### 2.3 Factor Conditions

Factor conditions include availability of material and human resource and readiness of infrastructure. While Mamminasata has advantages in availability of material as explained in the previous section, there are many issues to be addressed in human resource development and infrastructure.

<sup>6</sup> Michael Porter's cluster theory originates in his book "*The Competitive Advantage of Nations*" in 1990. He argues that successful clusters are those in which the four determinants are most dynamically correlated as illustrated in Figure 1.8.

## 1) Human Resource Development

Mamminasata has many institutions for higher education, but their contributions to the manufacturing sector have not been significant. Since job opportunities in the manufacturing sector are limited, graduates from universities are not well absorbed in the manufacturing sector. For example, out of 700 graduates from the faculty of technology at Hasanuddin University (UNHAS) every year, only 30% go into the manufacturing sector.

Moreover, education at universities fail to provide practical knowledge necessary for manufacturing, particularly about production and quality controls. The Faculty of Technology at UNHAS has a compulsory program on internship, in which students work in manufacturers from 2 to 6 months. There are limited chances available for students who stay in Makassar to get experience at manufacturers which demonstrate the best practice in production and quality control.

The laboratories at the Faculty of Technology at UNHAS possess only basic equipment and machinery. Moreover, they do not practice 5S unlike BLKI.



**Laboratories of the Faculty of Techniques at UNHAS**

## 2) Infrastructure

Infrastructural development is prerequisite to attract investors in Mamminasata. Yet, the level of infrastructure still remains low.

### Road

Makassar is a strategic location for shipping various products from South Sulawesi. Therefore, the road conditions are vital for linking the production area and Makassar. Especially, locations of fresh agro- and marine- products to be integrated into Mamminasata economy are bounded by transportation time. Also, any new industrial area to be planned in Mamminasata has to be secured with good access road to the port and airport.

### Electricity

Mamminasata often has electric failure. While controlling electricity consumption is vital for the environment preservation, long and/or sudden cut off of electricity is definitely not a good sign for industrial development. At a minimum requirement,

sudden cut off has to be prevented as in damages processing and obstructs companies from planned production.

### Water

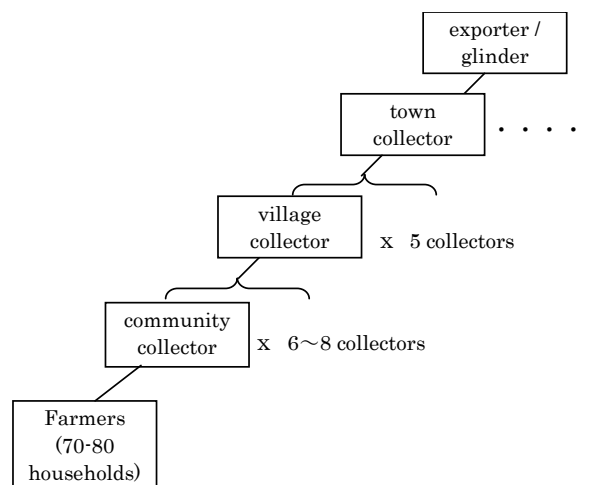
Many locations in Mamminasata also lack enough water supplies. Many companies are dealing the problem by using the well water.

## 2.4 Related and Supporting Industries

Another limitation of the industry in Mamminasata is weakness in related and supporting industries. Although food and beverage sector is a focused sector for promotion, weakness in related and supporting industries is a hindrance to the growth.

### 1) Suppliers

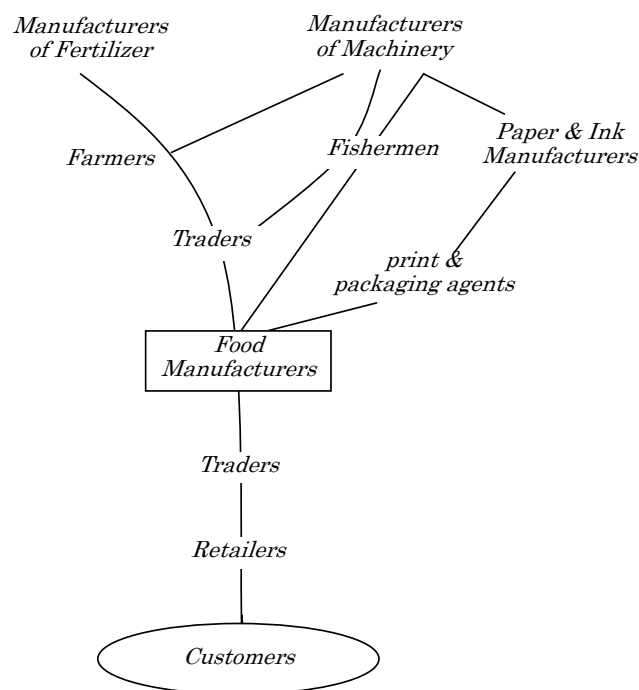
While Mamminasata is targeting at promotion of resource-based industries, it is important to strengthen the vertical linkages among the suppliers of the raw material, manufacturers, and traders. However, communications along those vertical stakeholders are notably weak in Mamminasata. Because producers operate in a small-scale, three to four levels of middlemen and traders exist between the producers and manufacturers (See Figure 1-9). This complex vertical tree makes it hard for manufacturers to convey their requests for improving quality of raw material to producers. Consequently, commodities are transacted based on quantity along the chain. Moreover, manufacturers hardly differentiate price by quality and conduct inspection after purchasing.



Source: PENSA(2003) Agribusiness Linkages Program: Cocoa Program Report, IFC  
**Figure 2-2 Trading Chain (Case Study on Cocoa)**

2) Related Industries

Moreover, the food and beverage sub-sector does not have competitive related industries. Figure 1-10 illustrates a food cluster. Only few enterprises work in the machinery as well as printing and packaging sector. In late 1990's, GTZ has assisted in training on manufacturing of prototype agricultural machinery at UPT. The training course was designed to develop supporting industry for the agricultural sector. UPT still continues to provide similar training courses three times a year. Similar training may be required for printing and packaging sector.



Source: JICA Study Team

**Figure 2-3 Industrial Linkages of the Food Cluster**

3) BDS Providers

One symptom that shows low industrial development is a lack of active BDS (business development service) providers who serve business development on a commercial basis; including consultancy and training services. Based on the recommendations from the Committee of Donor Agencies, the central government is trying to promote markets for the BDS providers. Yet, this policy direction is not much practiced in Mamminasata, and the local government still considers that the public officials are the main actors to provide BDS for SMEs. East Java On the other hand, Disperindak holds a list of BDS providers including the workers in large enterprises, and send appropriate BDS providers for consultancy and training services to SMEs.

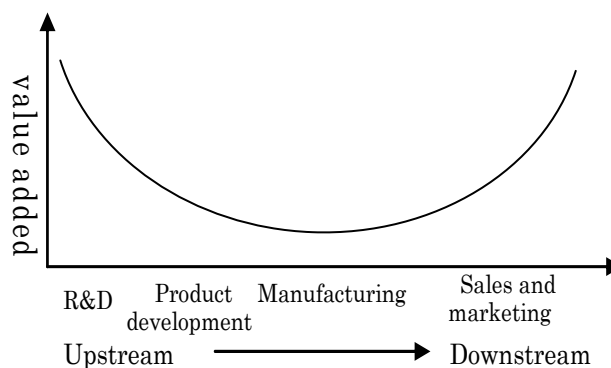
Dinkop (Department of Cooperative and Small Medium Enterprises) used to carry

out MAP (modal awal dan padan; partial initial investment) project from 2001 to 2003. Under this, one BDS provider was attached to assist one cooperative for three years. Each BDS provider received up to Rp. 50 millions for three year operation. Although about 50 BDS providers were appointed in the program, their performance was generally considered unsatisfactory. Two problems have been pointed out; firstly, most BDS providers did not keep incentives for three years because payment was made at the beginning of the operation. Secondly, this project was initiated before BDS providers gained their capacity, and they were immature as private consultants. Based on this result, the policy was changed and Dinkop ceased to support BDS providers for cooperative development.

There are currently limited market opportunities for BDS providers. One is the financial training course provided by the Bank Indonesia, which aims at fostering BDS providers as financial intermediaries. The duration of one course is from three to four days. Due to the shortness of the course, only basic knowledge is gained through the training courses. Another market opportunity is financial support from the state-owned enterprises, which are regulated to spend 5% of their profit for SME development.

## 2.5 Firm Strategy, Structure, and Rivalry

Value chain shows a line of activities for manufacturing, starting from upstream (R&D and product development), manufacturing, and to downstream (sales and marketing). "Smile curve"<sup>7</sup> shows that along the line of production process, the mid-stream point creates the lower added-value in comparison to upstream and downstream.



**Figure 2-4 Smile Curve**

The industry in Mamminasata mainly focuses on inbound logistics and operation activities. Majority of enterprises do not deal with outbound logistics, market/sales,

<sup>7</sup> The idea of "smile curve" was proposed by Chairman of Acer Co. Ltd in Taiwan.

and service activities to reach the final markets. They process half-processed products and remain as suppliers to manufacturers in the final markets. It is a challenge for the industry in Mamminasata to move into both upstream and downstream directions.

Table 2-1 shows a SWOT (strength, weakness, opportunity, and threats) analysis for the food industry in Mamminasata<sup>8</sup>.

**Table 2-1 SWOT Analysis on Food Industry in Mamminasta (tentative)**

	Factor conditions	Home demand conditions	Related and supporting industries	Firm strategy, structure, and rivalry
Strength	Abundant raw material		Supporting activities by Gerbang Emas, RTEPC, etc.	
Weakness	<ul style="list-style-type: none"> <li>• Insufficient infrastructure</li> <li>• Only limited plain fields is available for new investors</li> </ul>	The best quality is only for export use.	Lack of supporting industries	Not going into higher value added products
Opportunity	Mamminasata Development Plan	Upgrade of living standards		
Threat				Market competition by imported goods

Source: JICA Study Team

<sup>8</sup> This exercise is best to be undertaken in a workshop by the leading members of the industry.

### **3. DEVELOPMENT POLICY AND STRATEGY**

#### **3.1. Development Strategy**

##### **1) Players**

There are only 180 medium and large enterprises, yielding Rp 2.5 billion added values in Mamminasata. As pointed out previously, not only the absolute number of enterprises but also variation in the sectors is limited. Assisting the existing enterprises alone would not be enough for industrial development in Mamminasata. In addition to assist in the existing enterprises, two directions should be simultaneously sought in order to increase the number of players in the manufacturing sector; i.e., (i) inviting new investors from outside Sulawesi, and (ii) fostering the new entrepreneurs from the local human resource. Until investment conditions improve, it is more realistic to target at investors who are operating in Indonesia and willing to expand their activities in Mamminasata. New investors will be gradually invited along with the improvements in investment conditions.

##### **2) Target Market**

While the local demand does not seek high quality products, it is more plausible strategy for the industry to target at markets outside Mamminasata, utilizing the resource available in East Indonesia. However, remote location increases transportation cost and requires longer transportation duration. Following three conditions should be met in order to counteract these disadvantageous factors.

- a) Labor intensive production
- b) Stability in quality against time and temperature
- c) Added value exceeding investment and operation cost

Referring to the above conditions, it is understandable that the woods industry such as plywood used to be the popular sector for investment. On the other hand, some food products do not satisfy above conditions. For example, ice cream, which requires severe temperature control, is not suitable for targeting the markets outside while infrastructure has not fully developed. Frozen shrimps, which used to be popular exporting goods for the Japanese manufacturers, are now losing competitive edge because the sector cannot absorb increased cost in labor, electricity, and taxes while the added value remains low. Contrary, canned or retort food satisfy the condition on stability in quality against time and temperature.



Food industry also requires higher investment cost to satisfy sanitary conditions if targeted at the international markets. The same ingredients such as coconut oil and seaweed powder can be used for both food and cosmetics. From the view point of the investment and operation cost, targeting at cosmetics industry requires less cost and potentially higher added value if the company has sound technology, packaging design, and marketing strategy.

As for the local enterprises without enough technological capabilities, the initial target market should be local. After accumulating enough capital, knowledge in markets and technology, then they should gradually step up to national and to international markets.

### 3) Emphasis on Human Resource Development

In order to upgrade existing enterprises and nurturing new entrepreneurs, capacity of institutions dedicated to human resource development should be strengthened; namely, universities, UPT, and BDI.

#### Technical Universities

Technical universities have two mandates for human resource development: to develop human resource capable of undertaking R&D activities and to develop practitioners who effectively work or assist in industries. Currently, technical universities in Mamminasata have not fully satisfied either target. In terms of the immediate needs of the industry in Mamminasata, more practitioners are necessary to be developed through the university education by paying more attention to education in entrepreneurship and in practical knowledge of manufacturing.

#### UPT

At some stages of industrial development, private capacity may surpass what the public sector offers. It may be true that the function of UPT has become less effective because the private sector has gained more competence than what the public sector offers in more developed area in Indonesia. However, function of UPT is still vital in Mamminasata where the industrial players are quite limited. Capacity of UPT should be upgraded and give knowledge to SMEs not only in production of prototype products but also on production and quality control. UPT itself should demonstrate the best practice in 5S and production process (though with limitations of not carrying out mass production). Moreover, UPT should collaborate with the universities in order to bring in newly graduates to utilize the facility for incubating new business. To do this, UPT should become an attractive place for newly graduates in terms of cleanness, discipline, and the lquality of advisory services.

## BDI

Currently, BDI in Mamminasata is only utilized for Disperindag personnel. As some BDI is already trying out, the training opportunities at BDI should also be extended to SMEs and BDS providers.

### 4) Public-Private Partnership

In order to bring in industrial dynamism, the private sector should be the center players for industrial development while the public sector works as a facilitator or a supporter of the activities. Based on this policy, two principles should be followed.

Firstly, the government should enhance the capacity of BDS providers and provide opportunities for them to develop the markets. Especially, the personnel who work in the private sector should be invited to join the BDS markets. For the extension services, the network of BDS providers will be more effectively utilized to reach out SMEs which spread in wide area. Instead of trying to reach out SMEs directly, the public institutions like RETPC should collaborate with BDS providers.

Secondly, the government should minimize interference in markets. The public enterprise should be directed to give rooms to the private sector to join the markets. Mamminasata has a bad experience in failure of a public paper company in Gowa. The same mistake should not be repeated by the public sugar company in Takalar. Before the industry completely loses competitive edge and the farmers cease producing sugarcanes, the private investment should be sought in the sugar industry.

### 5) Promotion of Supporting and Related Industries

The industry and the market heavily rely on East Java because Mamminasata offers limited production variations. In designing industrial development, the target beneficiaries should always incorporate supporting and related industries. Countries like Malaysia provide a preferential tax treatment for a new investor who brings in "pioneer" status. This type of tax treatment should be studied well. At the same time, new training programs should be planned for capacity building of the existing enterprises and new entrepreneurs.

### 6) Cluster Promotion

Cluster promotion strengthens linkages among stakeholders. It is an effective approach to create competitiveness in industry. Gerbang Emas is on-going initiative in this direction. For successful activities in the cluster promotion, five lessons from JICA Study for Straightening Capacity of SMEs in Indonesia (2001-2004) should be reminded.

### Short-term and Long-term Goals

The cluster promotion activities should set both short-term and long-term goals that bring in benefits to the participants. Short-term goal should be attainable within a seizable period since the participants' interests inevitably fade away if they do not acquire benefits within a pre-agreed period.

### Cluster Facilitator

A cluster facilitator plays a vital role in determining the success of cluster promotion. While majority of participants tend to be passive at the initial stage of cluster development, a cluster facilitator is someone motivated and dedicated person who considers the benefit of all participants in the activity. He can be from the public sector, one of the member enterprises, or a BDS provider. The most important task of the facilitator is to bring in stakeholders in the activities and assist in creating linkages among the participants.

JICA Study for Strengthening Capacity of SME Clusters proposed to utilize of the function of LPM (Lembaga Pengabdian Kepada Masyarakat: Institute for Community Service) at the universities because the ideal function of the cluster facilitator requires a notion for contribution to the society. The activities as the cluster facilitator also provide the students with good educational opportunities. UNHAS (Hasanuddin University) in Mamminasata is expected to play a more active role in SMEs through strengthening its LPM.

### Open Participation

Membership in the cluster promotion activities should be left open because stakeholders change in accordance with the topic. If the membership becomes closed, the members turn to pursue their own interest and may create conflicting interest with non-members. Participants should join in the activities on voluntary basis. It is better to have an active small group than a passive large group.

### Learning from Buyers

One of the most effective activities in the cluster promotion is for the participants to learn the requirement directly from buyers. DINAS should assist in making meeting arrangements with buyers. In some successful cluster promotion activities experienced in the world, the buyers are actively involved as they provide technological advice and trainings.

### Learning from a Good Practice

Another effective activity is to learn from a good practice. One way to do this is to arrange a study tour to a model case which demonstrates higher performance at a seizable level. Cooperation from DINAS is desirable to make appointments in the

study tour.

7) Stable Supply with Quality Improvement

Producers are likely to respond to the quality improvement if their effort is compensated by economic interest. Accordingly, incentives should be created by receiving higher payment for better products. Price of some products like cocoa is driven by the international market price, in which small system change in South Sulawesi does not affect price. One possible way to make a change is to bring in buyers in the markets which utilize a product in various ways. An illustrative example can be considered in case of sugar. The policy is directed to keep the sugar price low for the benefit of people, but the low price of sugarcane has made farmers lose interest in sugarcane cultivation. If sugarcane is used not only for sugar but also for byproducts such as molasses and ethanol, price of sugarcane may increase without effects on sugar price.

Makassar City is opening a trading center in KIMA (Kawasan Industri Makassar; Makassar Industrial Estate). The trading center may provide the producers with opportunities for transactions with various buyers who utilize the product for different purposes and with different intentions. The center may also strengthen communications between producers/ traders and buyers to pursue common interest in quality development.

8) Designing Industrial Area

Industries should better be directed to industrial area, which provides comparative advantages in security, sufficient infrastructure, turn-key service for various administrative procedures, and stronger linkages with various industrial sectors. Concentration of industries is also ideal for managing industrial waste. In choosing a location, investors also take importance on housing conditions and availability of entertainment (sports field). Forming a strategic marketing team is another important agenda in designing the industrial area. It is necessary either sublets or makes joint sales to an experienced agent or employs experienced personnel.

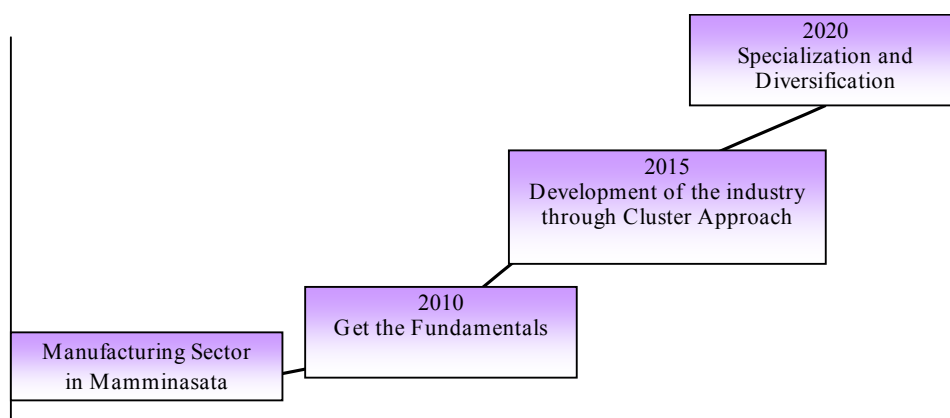
9) Budgetary Control

The nature of the industrial needs usually changes as the industry develops. The context of the public institutions should be changed accordingly. However, it is better to utilize existing institutions than creating new ones, because it will increase public expenditure. It is also important to scarp or modify certain activities/institutions if their missions become no longer required by the industry. For example, it has nowadays become common understanding that the government should not directly finance to SMEs. While scarping unnecessary activities, such budget should be shifted to restructuring more important assistance such as rehabilitation of UPT.

### 3.2 Development Scenario

#### 1) Steps for Industrial Development

At present, the manufactures in Mamminasata produce mainly half finished or low-value added products. They are highly concentrated in food/beverages and wooden work sectors, and the supporting industry has weak foundation. In order to upgrade the industry towards the year 2020, a mid-term goal should be set every five year.



Source: JICA Study Team

**Figure 3-1 Industrial Development Scenario (Image)**

**Table 3-1 Industrial Development Scenario (Agenda)**

	Term Agenda	Actions	Goal
2005-2010	Get the Fundamentals	<ul style="list-style-type: none"> <li>infrastructural development</li> <li>enforcing market friendly policies</li> <li>development of human resource</li> </ul>	<ul style="list-style-type: none"> <li>To create business environment to call in more investment</li> <li>To create human resource that show good practices in manufacturing</li> </ul>
2011-2015	Development of Industry through Cluster Approach	While targeting at agro-and marine- related manufacturers, cluster approach is taken.	To strengthen linkages among the different sector of industries
2016-2020	Specialization and Diversification	To guide each enterprise to focus on technological development, in which it has core competence.	To create industry, which manufacture high quality value added products

Source: JICA Study Team

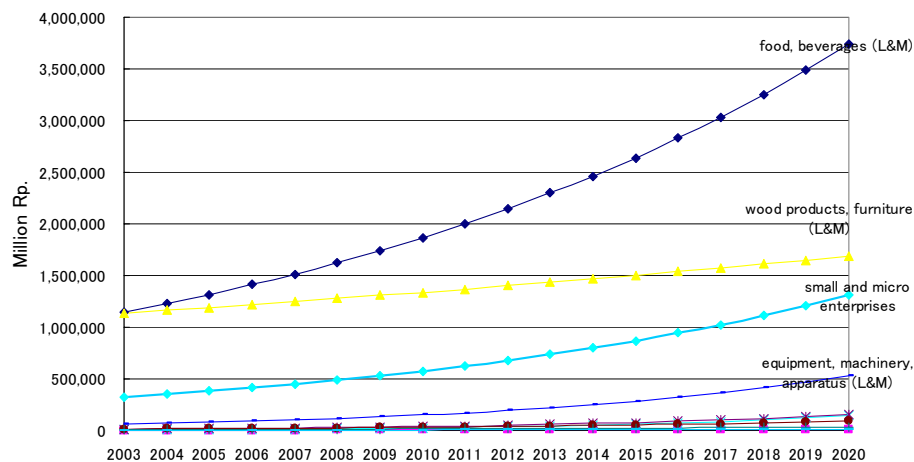
Up to the year 2010, the government has to make an effort to get the fundamentals by developing infrastructure, market friendly policies, and human resource. Then from year 2011 to 2015, investment is aimed to be accelerated. While targeting at agro- and marine- related manufacturers, cluster approach should be taken so that the

supporting industries grow at the same time. It is assumed that by the year 2015, Mamminasata gets enough enterprises that are ready to leap for high quality and value added products. Then from year 2016 to 2020, stress is on technological development. Each company is guided to focus on technological development, in which it has core competence, then as a whole, technological diversification is observed within Mamminasata.

## 2) Targeted Growth

The Ministry of Industry is preparing a mid-term national development plan, in which 8.6% annual growth is targeted for the non-petroleum manufacturing sector from 2004 to 2009. Then it aims at attaining at an annual 10% growth from 2010 to 2025. Similarly, BAPPEDA South Sulawesi forecasts the annual growth rate in the manufacturing sector in South Sulawesi at 9.3% from 1994 to 2020.

However, the average growth rate in the manufacturing sector from 2000 to 2003 was 5.0% in Mamminasata, and it appears that the 9.3% annual growth is a little too ambitious especially because preconditions, infrastructural development and policy measures are not met at present. Over estimation has to be avoided in order to prevent excessive investment, which results in lower return. Therefore, JICA Study Team proposes the annual average rate of 6.3%, which is at arm's length if proper efforts are made to attain the goal (See Appendix for the methodology of calculation).



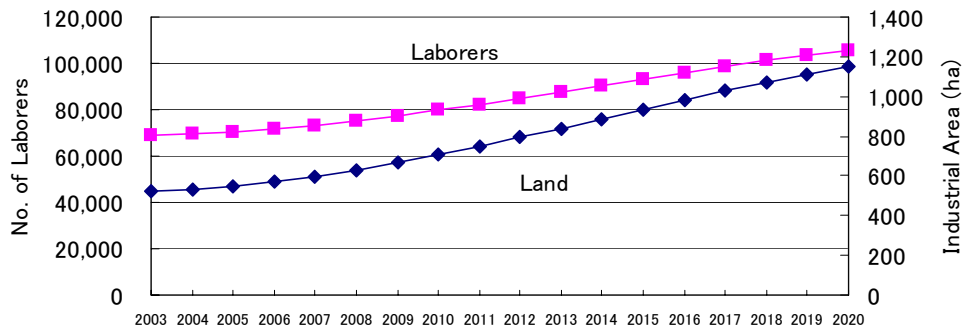
L&M: Large and medium enterprises  
Source: JICA Study Team

Figure 3-2 Projected Growth of Manufacturing GRDP Sector in Mamminasata

## 3) Land Use

Based on the GRDP projection model above, the size of industrial area is projected. It is estimated that additional net area of 700 ha would be required to support the growth of the industrial sector including the land for warehouses and expansion of existing enterprises towards year 2020. It is noted that the designation of land use for

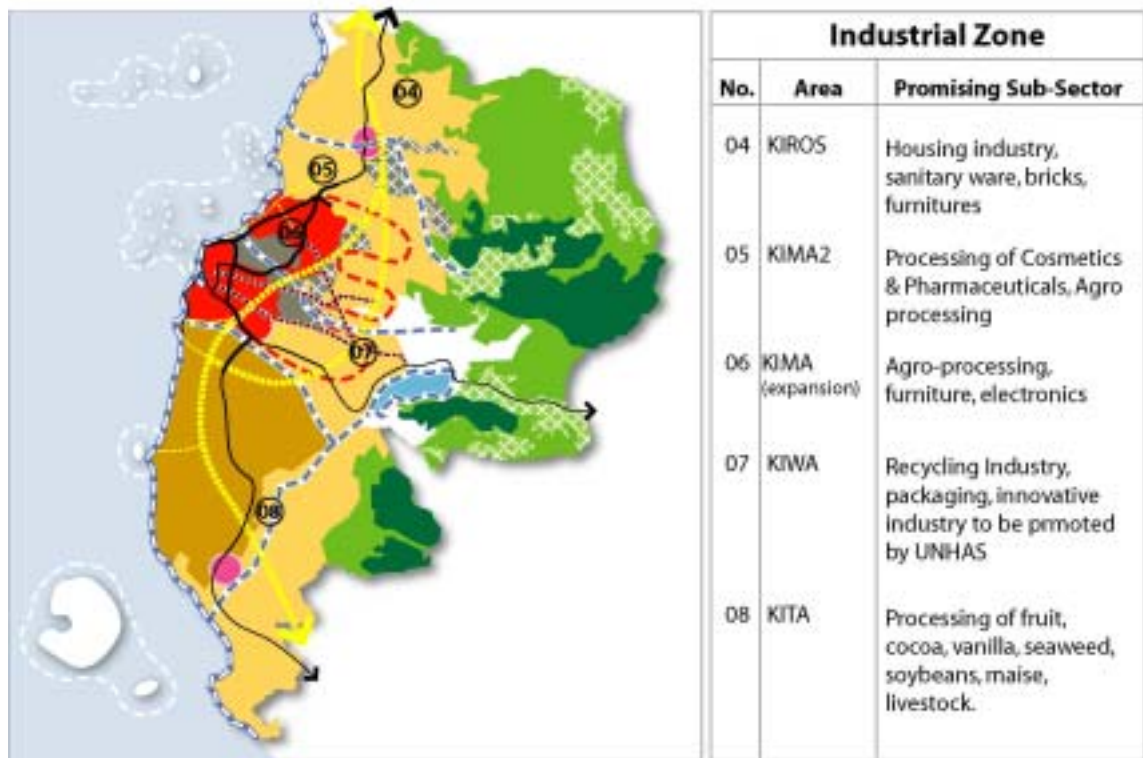
industries may be longer than the estimated net requirement of land for industrial development.



Source: JICA Study Team

**Figure 3-3 Projected Growth of Laborers and the Industrial Area in Mamminasata**

Currently, KIMA management team is investigating some candidates for the new industrial areas. KIMA plans to expand 200 ha around the existing locations while it also looks for additional area. Government of Maros, Gowa, and Takalar respectively proposing possible location in each regency. Figure 3-4 and Table 3-2 summarizes characteristics and possible functions at each location.



**Figure 3-4 Industrial Zoning in Mamminasata**

**Table 3-2 Proposed Industrial Location**

Name	Location	Function	Road	Access to Facility	Land Availability	Land Conditions
KIMA	Makassar	Mixture of various industries	○	Near seaport and airport	○ 200Ha + unsold 30ha	Industrial Area
KIMA2	Kec. Marusu, Maros	Agro & marine, cement, marble, woods	1km from Jl. Pattaingalloang	Near seaport and airport	△ 200ha	Villages
KIWA	Pattalasang, Gowa	Agro, link with Hasanuddin Institute of Technology	Outer outer ring road & extension of Jl. sulatan Alauddin		○ 255ha	Unused field for sugar cane
KITA	Galesong Utara, Takalar	Agro & marine, woods	Coastal road	Near local seaport	△ 200ha	Villages

Source: JICA Study Team

Among KIMA2 (Kawasan Industri Makassar 2), KIWA (Kawasan Industri Gowa), and KITA (Kawasan Industri Takalar), KIWA is the only location that the area is already owned by the government since the land had been used for sugarcane cultivation for the sugar factory in Takalar. The location for KIWA is close to Suguminasata, where a concentration of small and medium enterprises is observed. The exact locations for KIMA2 and KITA are undecided, but Maros government is considering of selecting location close to Makassar border.

### Criteria

In selecting the locations, there are two important criteria. Firstly, industrial sites should be considered in respect to attractiveness to the investors who put an importance on infrastructural conditions. Good access to airport and seaport are the prerequisites not only for export but also for import. More over sufficient electricity and water have to be secured. A black out of electricity cannot be accepted. Secondly, investment cost should be considered in conjunction to construction of road, electricity, water, and telecommunication network. The scale merit is required if developing an industrial area in a remote area.



### Functions

Being close to seaport and airport, KIMA serves for enterprises engaging in various activities. If KIMA2 is established, it can have a similar function. KIMA2 is closer to cement and marble factories, and it has potential of developing construction and housing related manufacturing utilizing the mineral products.

On the other hand, KIWA locates inland unlike other candidates. It is, therefore, less likely to have a larger volume of inputs and output in processing. However, uniqueness of KIWA is its closeness to the Faculty of Technology at UNHAS, a planned new campus in Gowa. The Ministry of National Education is planning to initiate a new project called "Hi-Link", in which R&D activities at the universities are designed to have direct contribution to the local industry. KIWA may be a good location for enterprises to receive benefits of the "Hi-link" project. If the project is successful, it may call in enterprises willing to carry out software and R&D activities.

As for KITA, an industrial location has to be planned in conjunction with the agricultural field. Takalar is a vital location for rice, sugar, and maize production. Takalar may better call in investors utilizing agro and marine products for higher value added products such as cosmetics and nutritious foods rather than establishing a large industrial estate. An idea is to set up an industrial park near at the Takalar Sugar Factory, if it can be revived with the private initiative, strategically locating such industries as processing of mango and other fruit juice, soy bean milk, seaweed processing for cosmetics and nutritious fruits, woog box fabrication and supporting industries, as well as processing of by-products from the sugar mill.

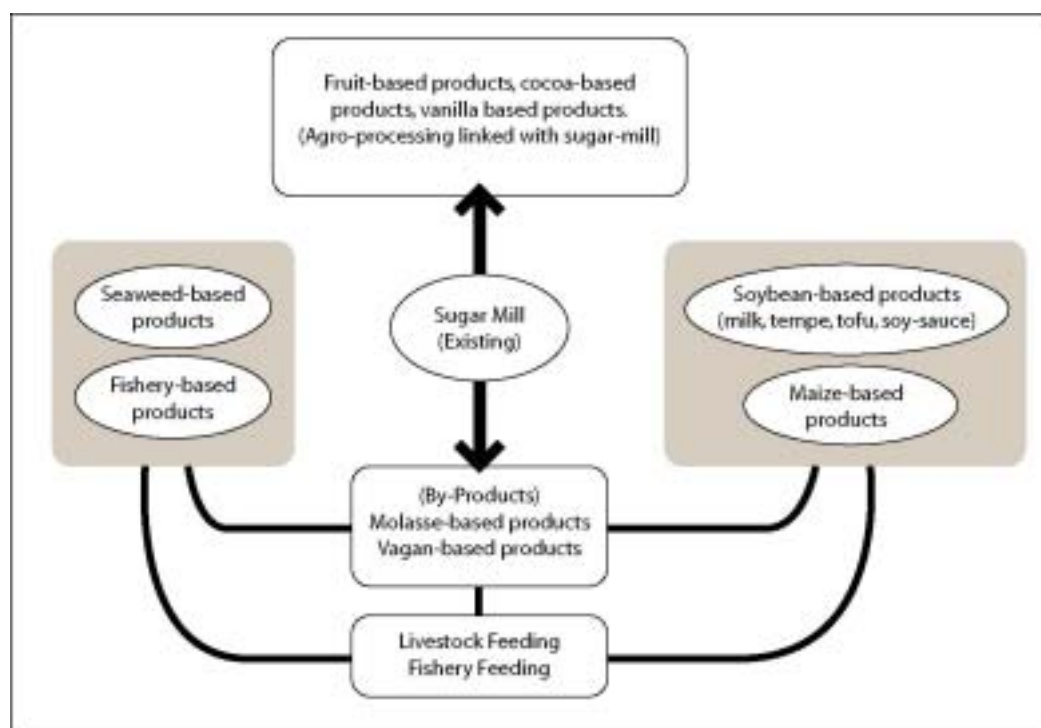


Figure 3-5 An Image of Takalar Agro-based Cluster

#### 4. ACTION PLANS

In order to promote industrial development, 10 actions are proposed for immediate implementation. Table 1-5 presents the list of action plans. Although the detail plans are not listed for the items on development of fundamentals, they are prerequisite for industrial development.

**Table 4-1 Action Plans for Industrial Development**

	Government	Private Sector
Supporting Activities	Cluster Promotion Activities	
	1) Cacao industry 2) Sugar Industry	
	3) Strengthening Capacity of BDS providers 4) Strengthening Capacity of UPT 5) Strengthening Capacity of BDI 6) Strengthening Capacity of RETPC 7) Strengthening Capacity of BLKI	
Industrial Basics	8) Compiling industrial statistics 9) Development of industrial area 10) Strengthening capacity of technical universities (see actions on tax treatment in Chapter 2.5)	
Fundamental	Infrastructural development Macroeconomic stability Eliminating corruption Eliminating illegal products from the markets Improvement in basic education	

Source: JICA Study Team

1) Cluster Promotion for Cacao Industry

Background	Indonesia is the third largest cacao producer while 70% of exported cacao beans are from South Sulawesi. However, the cacao industry has many issues. Firstly, quality of cacao beans from South Sulawesi is rated low-level. Accordingly, international market price remains low whether fermented or unfermented. Price inelasticity has discouraged farmers to improve quality of cacao beans. Secondly, the industry is threatened by lowering productivity because of aging of cacao trees and pervasion of CPB. Thirdly, only 10% of the cacaos are processed in South Sulawesi while others are exported in beans.			
Implementation Organization	a) Private sector (farmers, traders, cacao processors) b) ASKINDO c) BDS Providers d) DINAS (Agriculture, Industry and Trade, BPPMD) e) KIMA f) microfinance institutions			
Purpose	a) to increase productivity of cacao b) to improve quality of cacao c) to increase cacao processing			
Activities	a) trainings on plantation techniques b) trainings on post harvest techniques c) purchasing cacao trees with microfinance loans d) communication improvement between processors and the farmers e) inviting new investors in cacao processing			
Implementation Schedule	Activities	2006-2010	2011-2015	2016-2020
	a) trainings on plantation techniques	→		
	b) trainings on post harvest techniques	→		
	c) purchasing cacao trees	→		
	d) communication improvement between processors and the farmers	→		
e) inviting new investors in cacao processing	→			
Expected Outcome	a) Increased production in cacaos b) Quality improvement of cacao beans c) Market price based on quality of cacao beans d) Increased production in processed cacaos			

## 2) Cluster Promotion for Sugar Industry

Background	Although Indonesia once used to be one of the most strong production centers of sugar, she has decreased production level and can no longer satisfy the national demand. Mamminasata as one of the strategic location for sugar production needs to strengthen industrial competitiveness.			
Implementation Organization	a) Private sector (farmers, traders, sugar factories, and byproduct factories) b) DINAS (Agriculture, Industry and Trade, BPPMD) c) P3GI (Pusat Penelitian Perkebunan Gula Indonesia; Indonesian Sugar Research Institute)			
Purpose	a) to increase production of sugar b) to maximize use of sugarcane			
Activities	a) construction of irrigation on the sugarcane field - Allocate additional irrigation water of the Bili Bili system - Study on alternative irrigation methods which require less water consumption (e.g., sprinkler irrigation and drip irrigation on undulated lands) b) Improvement in plantation techniques - Introduction of new varieties appropriate for irrigated cultivation - Appropriate application of fertilizer and other inputs c) inviting investors in sugar processing d) restructuring and renovation of public sugar factory e) inviting investors in production of molasses f) study on ethanol production and implementation			
Implementation Schedule	Activities	2006-2010	2011-2015	2016-2020
	a) Construction of irrigation	■■■■→		
	b) Improvement in plantation technique	■■■■→		
	c) inviting investors in sugar processing	■■■■→		
	d) restructuring and renovation of public sugar factory	■■■■→		
	e) inviting investor in production of molasses	■■■■→		
	f) study on ethanol production and implementation	■■■■→	■■■■→	
Expected Outcome	a) Increased production in sugar b) Increased production in molasses c) Increased income for the sugarcane farmers d) Promotion of alternative energy source			

### 3) Strengthening Capacity of BDS Providers

Background	The level of development of BDS providers indicates the maturity of industrial development. In Indonesia, the policy has been directed to develop private BDS providers. Yet, BDS providers have not developed their market while the government officials provide direct extension services in Mamminasata. This situation not only creates distortion in the BDS markets but also limits outreach to SMEs.			
Implementation Organization	a) BDS providers b) Supporting Institutions (BDI, RETPC) c) DINAS (Trade and Industry)			
Purpose	a) to expand outreach to SMEs b) to provide practical and customized services to SMEs			
Activities	a) Creating list of BDS providers including the employees in the manufacturing sector b) Trainings of BDS providers at BDI and RETPC c) Making linkages between BDS providers and BDI/RETPC for extension services			
Implementation Schedule	Activities	2006-2010	2011-2015	2016-2020
	a) creating list of BDS providers	→		
	b) trainings of BDS providers	→		
	c) linkages between BDS providers and BDI/RETPC	→		
Expected Outcome	a) Increased market for BDS providers b) Improved services by BDS providers c) Expansion of outreach to SMEs			



5) Strengthening Capacity of BDI

Background	BDI is one of the few institutions that provide industrial trainings in Mamminasata, but the training courses are offered only to the personnel of Disperindag. Moreover, BDI does not have training courses on production and quality controls.			
Implementation Organization	a) PUSDIKLAT-INDAK / BDI b) DINAS (Industry and Trade)			
Purpose	to increase contribution to the manufacturing sector			
Activities	a) opening training courses on 5S and production and quality controls (already in plan) b) opening training courses for the SMEs and BDS providers c) opening follow-up trainings (in class trainings→on-site practice→follow-up)			
Implementation Schedule	Activities	2006-2010	2011-2015	2016-2020
	a) training courses on 5S and production and quality controls	→		
	b) training courses for SMEs and BDS providers	→		
	c) follow-up trainings	→		
Expected Outcome	a) Improvement in 5S and production and quality controls among SMEs b) Improvement in knowledge on 5S and production and quality controls among the BDS providers and Disperindag officials			






7) Strengthening Capacity of BLKI

Background	BLKI is a vocational training center under Department of Labor and Transmigration. Approximately 370 young people receive training every year. BLKI is providing practical trainings, which are contribute to development of the local industry. Although various courses are offered, there is no course on packaging.			
Implementation Organization	a) BLKI b) DINAS (Department of Labor and Transmigration)			
Purpose	a) to increase contribution to the manufacturing sector b) to develop capacity in packaging			
Activities	a) Strengthen training on 5S and production and quality controls b) Establishing a course on packaging and printing c) opening follow-up trainings (in class trainings→on-site practice→follow-up)			
Implementation Schedule	Activities	2006-2010	2011-2015	2016-2020
	a) Strengthen training on 5S and production and quality controls			
	b) training course on packaging and printing			
	c) Follow up training			
Expected Outcome	a) Improvement in 5S and production and quality control among SMEs b) Improvement in packaging and printing among SMEs			





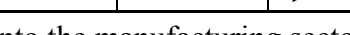
8) Compiling Industrial Statistics

Background	BPS-South Sulawesi does not publish industrial data broken down by the sector and city/regency. Investors require statistics data when determining the locations. It is important to have ready published data since investors would not spend much time for research and move away if the data is not available.			
Implementation Organization	a) BPS b) DINAS (Disperindag)			
Purpose	Enable industrial analysis more easily			
Activities	collect and publish industrial data broken down by sector and city/regency			
Implementation Schedule	Activities	2006-2010	2011-2015	2016-2020
	collection and publish of sartorial data			
Expected Outcome	Industrial statistics are well compiled.			

9) Development of Industrial Area

Background	In order to absorb projected industrial development, expansion of industrial area is necessary. Industrial area should be designed in a way to attract new investors. At the same time, concentration of industry is desirable in the view of environmental protection.			
Implementation Organization	a) KIMA b) BPPMD c) MMDCB (MAMMINASATA Metropolitan Area Development Cooperation Board)			
Purpose	a) to call in new investors b) to enable urban planning with sustainable development			
Activities	a) infrastructure development within and surrounding industrial area b) establishing comfortable residential and leisure (sports) areas c) setting up marketing formation d) setting up one-stop service formation			
Implementation Schedule	Activities	2006-2010	2011-2015	2016-2020
	a) infrastructural development			
	b) establishing residential and leisure areas			
	c) marketing formation			
	d) one-stop service formation			
Expected Outcome	a) Increased number of investors in the manufacturing sector in Mamminasta b) Proper management of industrial wastes			

### 10) Strengthening Capacity of Technical Universities

Background	While the manufacturing cannot absorb majority of university graduates in Mamminasata, it is important that technical universities should emphasize more on trainings for incubation. At the same time, technical universities should provide more practical knowledge and exercises that fit to the needs of the manufacturing sector. Faculty of Techniques at UNHAS is moving to a new location in Gowa. New campus should be designed alongside the new curriculum design.			
Implementation Organization	a) Faculty of Techniques, UNHAS b) LPM, UNHAS c) LPT-metalwork, Makassar			
Purpose	to strengthen development of human resource which contributes to upgrading of the industry			
Activities	a) establishing a mandatory course on entrepreneurship (topics cover business plan and marketing methodology) b) strengthening teaching of production and quality controls c) strengthen teaching of technical drawing d) strengthening linkages with UPT-metalwork to promote incubation activities by the graduates e) promoting activities of LPM			
Implementation Schedule	Activities	2006-2010	2011-2015	2016-2020
	a) entrepreneurship training			
	b) teaching of production and quality controls			
	c) teaching of technical drawing			
	d) strength linkage with UPT			
	e) promoting LPM activities			
Expected Outcome	a) Increased number of graduates move into the manufacturing sector b) Increased number of graduates start business in manufacturing c) Graduates demonstrate good practice in manufacturing			