

PART III
SECTOR PLAN



8. AGRICULTURE

8.1 Changing Role of Agriculture in National Economy

Thai agriculture is gradually changing (1) from a foreign exchange earner to the domestic food supplier, (2) from extensive to intensive agriculture, and (3) from the subsistence agriculture under labor surplus economy to the economically productive agriculture under less labor surplus or potentially labor scarce economy.

Agricultural sector was once a major foreign exchange earner, accounting for 62% of the export in 1970. This percentage, however, dropped to less than 30% by 1985, with fast increase in industrial export and the foreign exchange earnings through tourism. At the same time, the domestic consumption for food and industrial materials is an increasingly important market of agriculture.

In the meantime, agricultural import has been increasing with the diversifying and increasing domestic consumption of food and other agricultural products. Especially, import of the protein food such as fish, livestock and dairy products as well as wheat are rapidly increasing. There is a great potential for import substitution of their products. On the other hand, malnutrition still prevails in the country. 20% of the children under 5 years of ages is identified as below the FAO standard of nutritional requirements, and this ratio reaches almost 30% in the northeastern region. Solution of the malnutrition is another important role of agriculture especially in terms of low cost production, preservation and distribution of food materials.

It is a well known fact that farmland expansion is coming to a saturation point in Thailand (See Fig. 8.1). More intensive and diversified use of existing farmland is now the only method to maintain agriculture.

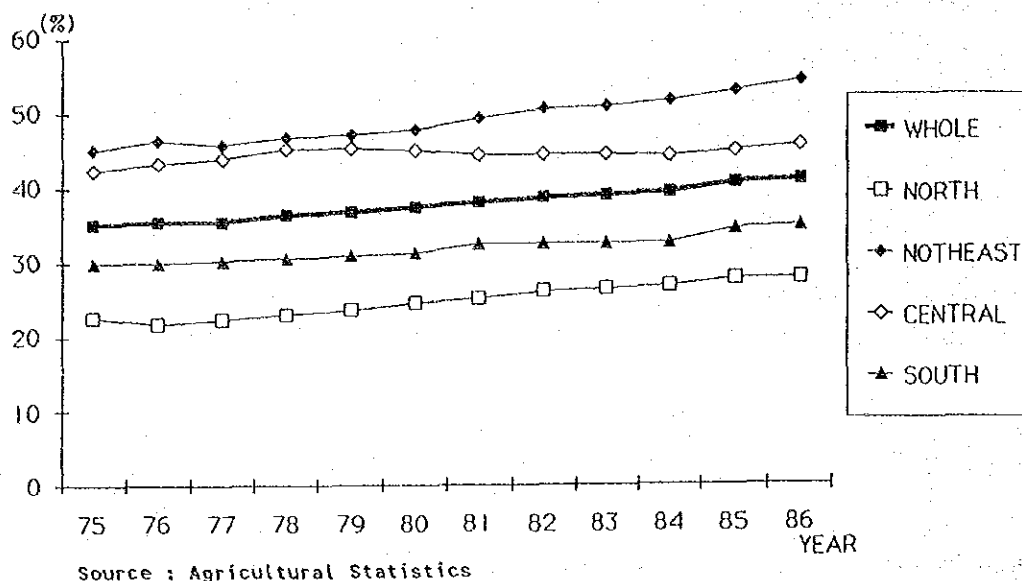


Fig. 8.1 Farm Land Expansion by Region, 1975-1986

Regarding the role of agriculture in labor absorption, a basic prospect is that the aggregate labor demand increase will inevitably follow an absolute decline of agricultural employment within 10 years at the latest if the national economy will continue to grow at a rate of 6% to 7%. The agriculture will inevitably be adjusted to reduce the seasonality through perennial irrigation and year around use of farmlands as well as to reduce labor dependence through mechanization. Agricultural production on the basis of subsistence farming will have to be replaced increasingly by economically productive agriculture in the areas suitable to it.

8.2 Comparative Advantage of Upper Central Region

Under the changing national agriculture, the UCR has a number of comparative advantages supported basically by three major factors: irrigation, good soil (see Table 4.1 Comparative Nature of Land Use of UCR), and the good access to huge and expanding consumption market of the BMR. Because of these factors, net income from crop per rai in the UCR is higher than the average of the whole Kingdom in spite of its lower expenditure for crop per rai than that of regional averages.

Firstly, definite advantage of the UCR lies in high yield rice production. It produces 10% of major rice and 21% of second rice of the country. The second rice is a major part of the rice to be exported. Yield of rice is higher than the national average by 1.5 times for major rice and 1.1 times by second rice, and the yields are still increasing. Major production area of rice is Chai Nat, Sing Buri, Ang Thong and Ayutthaya all being under the Chao Phraya Irrigation Project. In future, the relative importance of the UCR in rice production will be greater than other less productive regions, especially subsistence rice farming areas, as the rice market will demand larger competitiveness in both quantity and quality with the participation of surrounding countries in international rice market on one hand and with the declining propensity of the Thai people to eat rice on the other.

Secondly, good soil on the upland of Lop Buri and Sara Buri has high potential for diversified agriculture provided that water is made available. Present upland area is covered mainly by forage crops such as maize, sugarcane, soybean, cassava and sorghum. The UCR accounts for 15% of maize and 45% of sorghum produced in the country. Demand for forage crop will further expand as domestic livestock production will increase. Actually, soybean production is increasing rapidly in the UCR. Though vegetable production, which is concentrated in Lop Buri, is somewhat stagnant, fruits such as mango, sugar apple and tangerine, especially in Sara Buri and Lop Buri, are another potential crop showing a rapid production increase with expanding market of the BMR, though their relative share is still small in the country.

Thirdly, with a growing domestic demand for protein food, a good access to Bangkok and the rich forage production, the UCR, Sara Buri and Lop Buri in particular, has strong advantage in livestock production such as cattle and chicken. In fact, the national food consumption increased by 2.9% per annum compared to 2.1% population increase during the post 10 years. During the period 1982 to 1987, food import increased at a rate as high as 20% per annum whereas agricultural export increased by 7% per annum during the same period. Potential for domestic food market should still be large because more than 20% of children is still under malnutrition and, at the same time, food habit is rapidly changing in Bangkok. Growth of livestock in the UCR has been quite rapid. During the past few years, the UCR has contributed 30% of the national production increase in cattle and 10% of that in chicken.

Fourthly, the UCR, Ang Thong and Ayutthaya especially, is advantageous in another source of protein, namely, fish. While fresh fish production is rapidly expanding in the country, it is growing even faster in the UCR at a rate of more than 40% per annum to account for more than 7% of the national production value. This is because of, the availability of the area suitable for fishfarm pond, the market access and the advanced fish farming technologies supported by government effort. The area of fishfarm pond has increased by 5 times during the period 1983 to 1986, the increase being 20% of the national total increase in fishfarm pond. Also, fishfarm yield per rai of pond is 2 times higher than the national average.

Fifthly, agriculture of the central region, including the UCR, has already been quite intensive in farm inputs. The central region uses about 50% of fertilizer in the country, more than 50% of agricultural equipment and agricultural chemicals. While fertilizers consumption level of Thailand is still one-fourth of the average of developing countries and it has not increased much partly due to a high price of fertilizers, the use of agricultural equipment and chemicals is expanding rapidly in the country. Intensive use of these input is made possible in the UCR partly by irrigation and partly by a good access to the BMR, being distribution and maintenance center. Coming labor shortage economy will strengthen this advantage of the UCR.

8.3 Strategies and Targets

Agricultural production and income of the farmers who support it have to be more stable and higher in order for the UCR to maintain its strategic position in national food production and to make use of it as a basis for regional economic diversification.

To this end, the UCR needs to overcome its basic constraints (see Chapter 2.3 Constraints of this report), namely, water shortage in dry season and chronic floods in rainy season, little space remained for further expansion of farmlands, international market fluctuation, seasonal unemployment and high tenancy, by fully making use of the comparative advantage as mentioned earlier. The strategies consist of (1) agricultural intensification, (2) agricultural diversification and (3) conservation of agricultural environment.

1) Agricultural Intensification

Further intensification is necessary, because the UCR is endowed with fertile soil and enjoy high productivity of paddy, but there is no room for increasing production by expanding agricultural land. To achieve the agricultural intensification, the following actions should be accelerated:

- Increasing productivity with appropriate technology and land use,
- Expanding high productivity crops, and
- Using water resource effectively.

Improvement of post harvest facilities such as those for storing and packaging is necessary to control products quality, to cope with fluctuating market and thus enhance value added.

Expanding newly released high yielding varieties and cheaper fertilizer will successfully achieve the agricultural intensification.

Development and better management of water resource will accelerate agricultural activity during dry season and increase yields.

2) Agricultural Diversification

While the main crops will continue to play an important role in sustaining export and feed factories, agricultural diversification should be accelerated to create farm opportunities during the dry season and to stop the environmental deterioration caused partly by excessive cultivation of a limited number of export field crops.

Priority should be given to:

- Expanding livestock and fishery production, and
- Expanding fruits and vegetables production.

To achieve this diversification, development of unused water resources should be accelerated; and livestock and fishery production, and nitrogen-rich crop and forage production should be expanded. The

nitrogen rich resources will make existing hydrocarbon resources production of the UCR more effective.

These diversification, especially increasing dairy products, will contribute to foreign exchange savings as well.

3) Conservation of Agricultural Environment

Environmental conservation is essential because inappropriate farming system has induced land deterioration such as soil erosion and deterioration of soil fertility, while forest area is very small in the UCR. The environmental conservation will contribute to not only the alleviation of land deterioration but the agricultural diversification and intensification. Fertile soil is the most important natural resource to sustain future agricultural development in the UCR. In this regard, agroforestry and raised-bed cultivation should be expanded.

In accordance with the macro economic targets, in which the agricultural GDP is expected to grow at an annual rate of 3% and the agricultural development strategies earlier mentioned, the production targets are set as shown in Table 8.1.

Table 8.1 Agricultural GRP Target for the UCR

	1987		2010		Rate GRP	Annual Growth Rate			
	GRP in Million Baht	Percent Composition	GRP in Million Baht	Percent Composition		World Market Price	Value Added Per Rai	Yield Per Rai	Per Cultivated Area
Paddy	5,433.3	53.6	5,649.7	28.3	0.17	-0.28	-0.28	1.44	-0.99
Field Crops	1,943.1	19.2	3,972.2	19.9	3.16	1.8	0.88	0.42	1.86
Vegetables	49.6	0.5	602.0	3.0	11.46		0.3	0.8	10.37
Fruits	584.8	5.8	2,117.8	10.6	5.75		0.4	0.95	4.41
Agro-Forestry	13.5	0.1	207.2	1.0	12.6				
Others	606.5	6.0	1,559.1	7.8	4.19				
Livestock	1,293.2	12.8	4,877.4	24.4	5.94				
Fisheries	200.3	2.0	1,007.7	5.0	7.28				
Total	10,124.3	100.0	19,993.1	100.0	3				
Employment in 1000 persons	718.0		564.0		-1.04				
Productivity	14,100.2		35,448.8		3.99				

Major considerations taken into account in this target is as follows :

- 1) Paddy production will be intensified through an increase of yield from 423 kg per rai at present to 592 kg per rai in the year 2010 despite a substantial conversion of paddy field into other uses, including field crops cultivation.
- 2) Field crop production will largely increase by substantial water resource development in the upland area, the conversion of paddy into field crop areas, and the recovery in yield increase with introduction of the integrated farming system in the upland.
- 3) Production area of fruits and vegetables will increase at rates of 4.4% and 10% per annum, respectively through crop diversification both in lowland and upland, with a possible result of substantial contribution to agricultural GDP because of their high value per rai.
- 4) Based on the feed crop production increase and great domestic market needs, livestock and fisheries production will increase at a rate of 6% and 7% per annum so that production of protein materials and supporting feed materials will be a main base of agriculture and agro-processing industries in the UCR.

8.4 Development Potentials and Strategies by Zone (See Fig. 4.4)

Agricultural development strategies need to be applied in a area-specific manner in the UCR and elsewhere, particularly when environmental consideration becomes an integral component of the strategies. Proposed strategies of intensification, diversification and environmental conservation have respectively different degree of importance and different interrelationships among others depending on areas with particular potentials and constraints.

In the Chap Phraya Delta area, rice intensification is the most important and diversification should also be promoted in the context of utilizing land and manpower during the dry season. In the upland area, stress should be placed on the intensification with water resource development and the diversification to stabilize the economic and environmental base for the

diversification at the farm level. In the soil eroded area, the environmental conservation should be stressed, not for its sake but to enable agricultural diversification.

In accordance with a proposed land use framework presented in the Chapter 4, we recommend the following zone-specific strategies in correspondence to zone-specific potentials :

Zone 1 : Intensive Rice Cultivation

This zone should continuously grow paddy because of its soil best suited to paddy and irrigation facilities. Paddy yield in this zone is one of the highest in the country. Possibility of increasing in productivity and production is high with expanding newly released high yield variety : Suphan Buri 60, of which potential yield is 40% higher than existing varieties and effective equally in rainy and dry seasons, and improving irrigation system and water management. Soils are suitable for upland crops, too. Effective use of residual water after paddy harvesting is important for agricultural diversification and increasing productivity in the idle land representing 75% of the cultivation area during the dry season. Introducing of short cropping period variety such as vegetable, soybean, mungbean and leguminous forage in the area will contribute to expanding livestock and fresh water fish production and productivity. Diversification should be accelerated in the better drained soils area with effective use of abundant ground water during dry season. Mixed crop of fruits and vegetables, being high value added crops, should be expanded. Furthermore, with recent changes in RID's policy of water allocation in favor of crop diversification, soybean can and should be promoted to grow in this zone with only supplemental irrigation.

Along the Chao Phraya River, conversion of some paddy land into upland crop land is possible. In view of the need to drain water during the dry season, raised-bed cultivation should be promoted in this zone as well. Promising crops are tree crops such as pomelo, banana and mango together with vegetables, medical crops and pasture under these crops.

Freshwater fish production should be accelerated in this zone with the effective use of ponds between ridge in the raised bed cultivation as well as on-farm ponds to be developed by future land consolidation. Fish fry

production will soon be doubled with the opening of fishery stations in Ang Thong and Sing Buri in 1990 on top of the existing one in Chai Nat.

Another potential of this zone is a large volume of unused farm by-products such as straw and rice bran. These should effectively be used as feed materials and possibly fuel energy sources.

Zone 2 : Floating Rice Cultivation

This zone should primarily continue to play a role of flood retention being critical to Bangkok. Floating rice should be the main crop in this zone. Productivity of rice will increase with expanding high yield variety such as Hantra 60, of which potential yield is 25% higher than existing ones. Effective use of residual water after harvesting paddy and is important for the diversification in better drained area similarly to Zone 1. This zone is advantageous for large-scale production of high value freshwater fish because of vast flat land covered with the acid sulfate soil which is not suitable for crop production and the abundant availability of groundwater.

Zone 3 : Upland Crop Cultivation

Agricultural potential is high for both upland crops and paddy because of good soil conditions in this zone. However, agricultural production has been unstable due to the dependence on fluctuating rainfall and yield of upland crops has been declining due to decreasing soil fertility.

Generally, the ecosystem of upland crop area is very sensitive in tropics. Especially, soil conditions are easy to deteriorate. This zone is a typical case. Therefore, an environmentally sound integrated farming system (IFS) should be introduced coupled with water resource development.

IFS aims at efficient use of limited water resource, improvement of agricultural environment and reduction of seasonal unemployment crop diversification at the farm level. In an IFS, the area of cultivation comprises house lot, raised-bed cultivation and major crop area. An emphasis is placed on the plantation of trees and tree crops to cover soil surface, to increase water holding capacity of soil and to plant diversified crops under the tree shade (see Fig. 8.2).

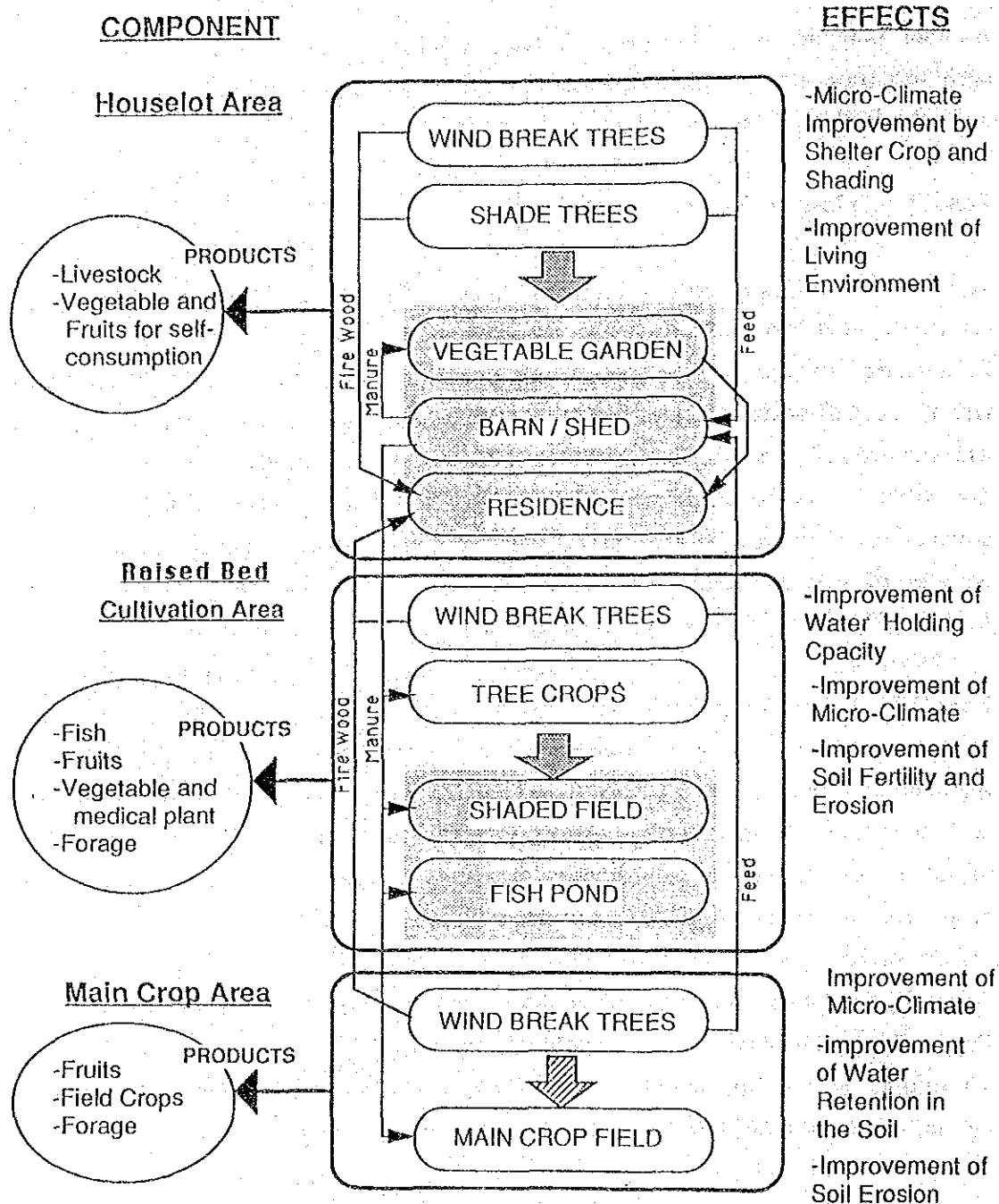


Fig. 8.2 Components of Integrated Farming System

Maize will continue to be the main crop for sustaining both feed industry and export in this zone. However, composition of field crops should be diversified. Sugarcane and soybean are promising for diversification, because sugarcane factory is under construction in Lop Buri and soybean gains increasing importance in agro-processing and import substitution.

Mixed cropping system such as the cassava with beans and the maize with beans should also be accelerated to increase land use intensify and to prevent soil deterioration.

Unused water resource is available in this zone from Pasak River and its tributaries. However, the amount of water is not enough to irrigate main crop field. Therefore, introduction of raised-bed cultivation should be promoted. Fruits should be cultivated in the IFS as a main and a shadow crop. Vegetables and leguminous forage can be cultivated under the fruits trees.

Livestock and fishery production further be increased should by using forage and waste of vegetables.

Zone 4 : Soil Conservation

The area in this zone has been severely affected by erosion because of its soil and topographic conditions. Idle land and low productivity field is the predominant.

This zone should be covered with vegetations throughout the year to prevent erosion hazard. However, reforestation is unfeasible for existing farm land. Agroforestry should be applied. In conserving soil, there are three types of trees to be planted. First type is the fruit tree crops such as tamarind and cashew nut. These trees will contribute to reducing seasonal unemployment because they are harvested during the dry season. Second type is forage trees such as leucaena. The nitrogen rich feed from this tree will contribute to increasing livestock productivity. The third type is mulberry for sericulture. According to Sericulture Research Center, mulberry is possible to grow in the eroded area. Sericulture is a promising agro-processing industry in Thailand.

8.5 Proposed Programs and Projects

Three types of programs and projects are important to support the agricultural development strategies: water resource development and management, land consolidation and agroforestry, dairy promotion.

As for the programs and projects of water resource development and management, descriptions are given in the Chapter 12 WATER RESOURCES of this report.

1) Upland Land Consolidation Program

In the UCR, land consolidation has long been practiced but only in the lowland. This method could effectively be applied to the upland as well with well coordinated water resource development.

One of the most important factors to improve the agricultural environment in the field crop area is introduction of tree crops. Construction of wind breaker and shade trees in conjunction with small- and medium-scale water resources development or pond construction are most useful. In order facilitate the land consolidation projects for the upland areas, involvement of the Royal Forestry Department (RFD) is indispensable.

Required wind breakers area is estimated at 300 thousand rai in the UCR which corresponds to 10% of field crop cultivation area. It is estimated that more than 10 million pieces of tree seedlings per annum for 20 years are necessary. Cooperation of RFD in tree crop seedling supply is important and it can effectively be done by modifying the existing procedures of the Central Office for Land Consolidation Project so that RFD is incorporated in the scheme.

2) Agroforestry Program

Agroforestry program is proposed in the soil conservation area and the forest area to be preserved but already encroached. There are 370,000 rai of the field crop areas subject to soil erosion and 240,000 rai of the reserved forest areas which have already been encroached. The

agroforestry program should be carried out by Central Office of Land Consolidation in the field crop areas and by RFD, for close coordination with reforestation program, in the reserved forest area.

3) Dairy Farming Promotion

Under the growing trend in livestock in terms of both production and domestic market, production has least caught up with market demand increase in the dairy products, with a result of a rapidly increasing import of them. In view of a plenty of feed materials available and potentiality of downstream processing industries in the UCR, distribution of dairy cows should be urged. Proposed location of the center is Phra Phutthabat which is the central city to provide various urban services for the upland crop cultivation area.

In parallel with the increase in dairy cows and dairy products, a system should be organized to collect milk efficiently. Milk storage facilities should be distributed at the village level so that either agricultural cooperatives or milk processing industries can quickly collect milk.

9. INDUSTRY

9.1 Issues of National Industrialization

Industrialization has been rapid in Thailand. Relative magnitude of the manufacturing sector increased from 16% to 22% of GDP and from 10% to 63% of exports during the period 1971 to 1987. With a sharp increase in export-oriented direct foreign investments during the period 1987 to 1988 (See Table 9.1), fast growth of manufacturing production and export will continue as far as Thai industrial products are competitive in the world market.

However, the country will not be able to maintain the present low-wage-based competitiveness unless its industries will become more technology intensive.

Table 9.1 Direct Foreign Investment Under the Scheme of Board of Investments

	1985	1986	1987	1988*
Number of Projects:				
Approved	182	191	377	523
Started	78	145	172	124
Amount of Registered Capital of Projects: (million baht)				
Approved	4,482	3,989	12,587	15,921
Started	2,275	3,392	4,966	3,632

Source : Board of Investments

Note : Jan. - Aug.

Typical growing export manufacturing industries are footwear and clothing. Footwear export showed the highest growth among manufactured exports at an annual rate of 73% during the period 1977 to 1987. Clothing export showed the largest contribution of 18% to the expansion of manufacture export during the same period. An international comparison suggests that Thailand is very competitive in these industries but other Asian countries have also been gaining their competitiveness following after Thailand as typically observed

in the case of Indonesia (See Fig. 9.1 which shows the changing competitiveness in terms of net export ratio defined as the net surplus export over a total of export and import for certain commodity). An obvious issue is to strengthen competitiveness of Thai industries by accumulating industrial skill and technologies in long term.

Second key issue is the need to diversify industrial structure with particular emphasis on basic and supporting industries. Without strong basic and supporting industrial base, recent rapid industrialization has entailed the increased dependency of producers durables on import, which is defined as the ratio of the import amount of producers durables to the gross domestic fixed capital formation (only the machineries and apparatus excluding transport equipment), as shown in Fig. 9.2

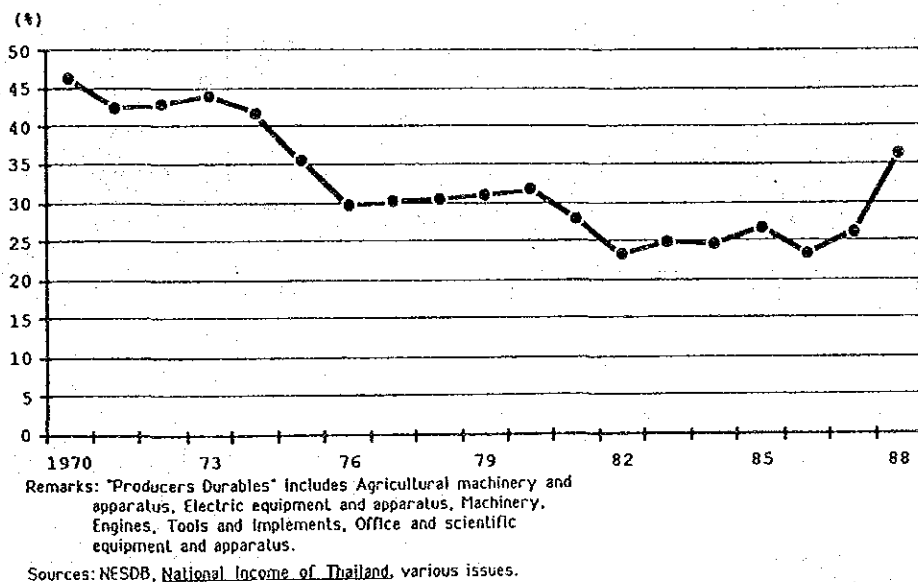
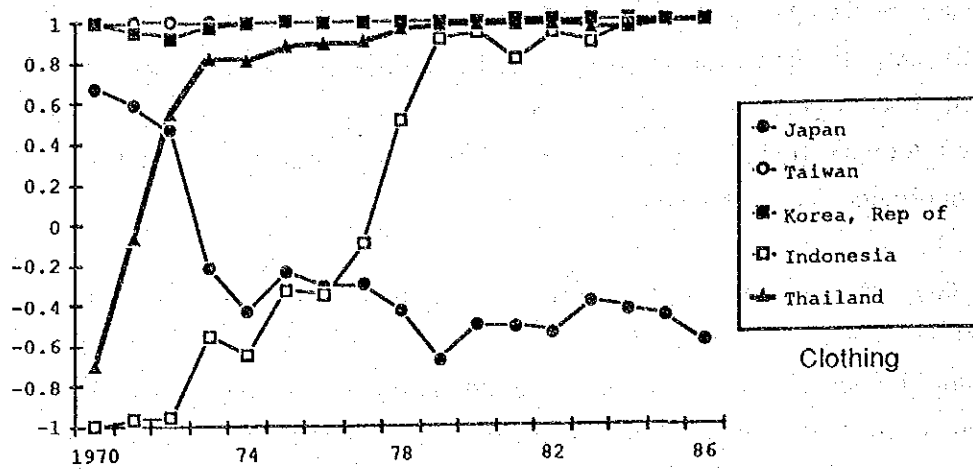
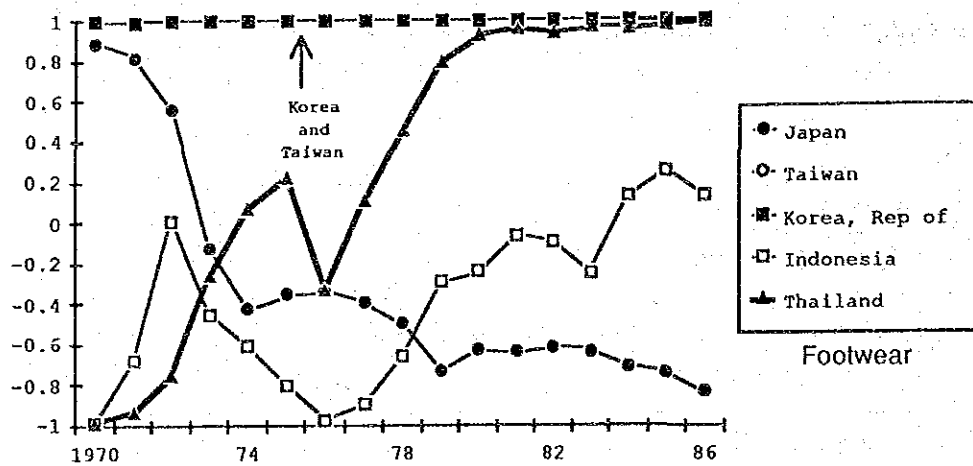


Fig. 9.2 Import Dependency of Producers Durables

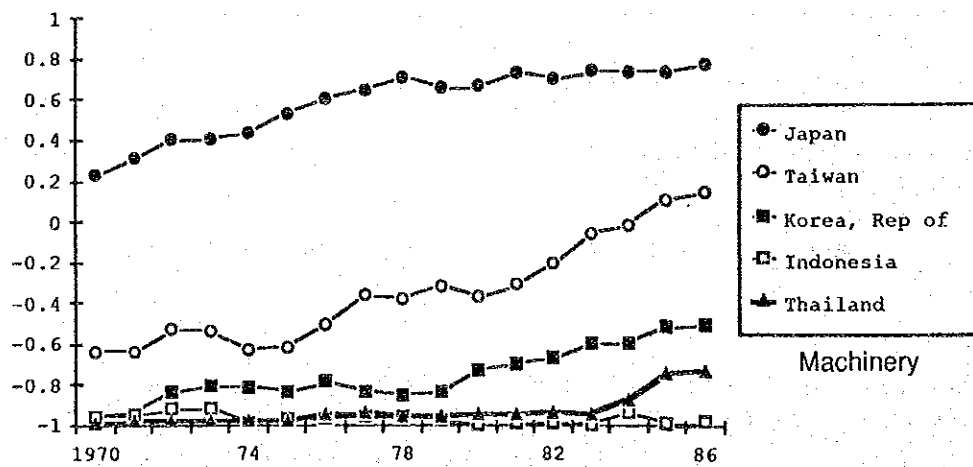
This problem is associated with export orientation of industrialization, too. Our sample interview survey on foreign investors suggests that the more recent the investments are, the more they are export oriented and, at the same time, the more they are dependent on imported materials and equipment (See Table 9.2). The investors, too, are faced with the difficulty in increasing local procurement ratio because of inadequate supporting industries.



Clothing



Footwear



Machinery

Source : U.N. International Trade Statistics

Fig. 9.1 Net Export Ratio of Selected Manufactured Products:
A comparison of Asian Countries

It is, therefore, important to accelerate import substitution of capital goods and enhance local procurement ratio both at micro and aggregate levels.

Third key issue is domestic resource utilization. According to the TDRI's report on Thailand in the International Economic Community (1989), the agro-processing industries are the most competitive among other industrial groups together with the light processing and miscellaneous product industries.

Table 9.2 Export-Orientations and Local Procurement Ratio of Sample Foreign Investors by Period of Establishments

Sample Number	Period of Establishment	Ratio of Products Exported	Local Procurement Ratio	Industrial Type	Employment Size (persons)
1	1960s	0%	50-60%	Vehicles	Morethan 1000
2	1960s	5%	70%	Rubber products (materials)	Morethan 1000
3	1960s	7%	30%	Textile	100-1000
4	1960s	20-30%	90%	Electric products	100-1000
5	1970s	100%	50%	Food processing	100-1000
6	1970s	Nil	30%	Vehicles parts	100-1000
7	1970s	35%	Nil	Vehicles parts	less than 100
8	1970s	10%	95%	Electric parts	100-1000
9	1980s	100%	Nil	Steel products	less than 100
10	1980s	100%	0%	Precision machines	100-1000
11	1980s	90%	0%	Chemical products	less than 100
12	1980s	100%	0%	Precision machines	100-1000

Source : The Study Team Survey

Besides, the export performance of the Thai agro-processing industries is 86% attributable to world income (average figure for all Thai industries is 57%). This means that the agro-processing industries have bright prospect as world income rises. In the domestic market, too, the agro-processing industries as well as other industries which process domestic resources such as construction materials have high potential because of diversifying and modernizing life style of people in accordance with fast urbanization.

The fourth issue is market opportunity. Major destinations of export commodities from Thailand are the USA, Japan, Singapore, Netherlands, Germany, Malaysia, Hong Kong, the UK, China and Korea. However, thanks to favorable changes in international environment in neighboring countries such as those in Indochina and Burma, and the rapid economic expansion in the East Asia, the export market diversification will possibly proceed. This will

create the new market place, which will bring more comparative advantage to the Thai industries because of its proximity to these Asian countries.

9.2 Comparative Advantages and Disadvantages of the UCR

Under this prospects and issues of national industrialization, it is the ESB that primarily lead industrial development. It is from now on that the ESB is going to bear the fruits of huge public investments so far made.

However, the UCR can also contribute to the national industrialization by making use of its resource endowments, strategic location and plenty of manpower.

Availability of raw materials in the region is the most powerful seeds to develop industries. The UCR is the production center of rice and the distribution center of maize and cassava which are transported from the northeastern region. Considering the potential of agricultural diversification, including livestock and inland fisheries, the UCR has great comparative advantage in agro-processing industries.

The another resource potential in the UCR, in particular, Sara Buri, is its abundant mineral deposit such as materials of cement, ceramics, and marble (See Table 9.3).

From the viewpoint of industry, the UCR has potential of the surface water from Chao Phraya River and Pasak River with the proposed Pasak dam. In addition, the areas along Chao Phraya River, and the areas between Muang Lop Buri and Amphoe Kaeng Khoi have extensive and productive underground water. According to our survey to companies in the UCR, quality of these underground water is also excellent in term of soft water and low conductivity water, while the southern part of the BMR and the ESB are suffering from low water quality.

Table 9.3 Mineral Production In the UCR

Minerals	Annual Average Production, 1984-88	% in the Whole Kingdom	Major Production Area
Limestone	8,855,131	78.8	Sara Buri
Marble	149,463	28.9	Sara Buri, Lop Buri and Chai Nat
Iron	36,100	46.5	Lop Buri
Shale	1,277,755	82.2	Sara Buri
Marl	86,323	100.0	Sara Buri
Phyrophyllite	34,420	95.6	Sara Buri
Calcite	121	12.9	Chai Nat

Source : Department of Mineral Resources, Mineral Statistics of Thailand, 1984-1988

Strategic location at the gateway of the BMR provides the UCR with good market access not only to the BMR and overseas but potentially to the northeast region and beyond (neighboring Indochina countries). Direct link between the UCR and ESB would engage opportunities for the UCR to diversify inter-regional industrial linkages. On top of highways, the region can utilize railways and inland waterways for transporting specific products such as cement and tapioca products. Good access to Don Muang airport is another locational advantage enabling the UCR to attract light and the high value-added industries to make products such as electronics parts and watches.

In this connection, inland location is an added locational advantage of the UCR since some industries, such as precision machinery and electronics, require precise machining and, therefore, should be located inland in order to avoid staining by sea wind.

In terms of energy supply, too, the UCR takes advantage of its strategic location. As for the electricity, the UCR is a power supply gateway to the BMR as having ultra high voltage transmission lines from primary power resources in the northern and the northeastern regions. The UCR is also a strategic point of the national natural gas pipelines system, where the on-shore and the off-shore gas line will be met. The off-shore gas line has already reached to Sara Buri from the ESB and is used for cement and ceramic industries. Taking into account, a proposed distribution center of petroleum products in the UCR, to which the pipeline comes from ESB refineries to distribute the petroleum products to the northern and the northeastern

regions and the upper part of BMR, the UCR can meet the increasing industrial energy demand with electricity, natural gas and petroleum products.

Table 9.4 clearly shows these comparative advantages of the UCR as reflected in the industrial-mix of BOI approved projects. While the industrial-mix is diversified in the BMR and the eastern region, it is considerably specialized in a limited types of industries in the UCR: agro-processing, mining and ceramics and medicine/electrics of labor intensive types.

As for disadvantages, the UCR suffers from two major points: the lack of urban agglomeration and a growing environmental problem.

**Table 9.4 BOI Approved Projects to Start Operation during 1984 to 1989
Regional Distribution by Industrial Groups**

		NUMBER OF PROJECTS												
		1	2	3	4	5	6	7	8	9	10	11	12	
		MINING			WOOD SANDRIES			PRECISION			MECHINE			
		AGRO	CERAMIC	CHEMICAL	PLASTIC	APPRELE	TEXTILE	FURNIT.	ZAKKA	MACHINING	ELECTRY	OTHERS	SERVICES	TOTAL
BKK	1 BANGKOK	14	3	3	12	23	4	3	30	4	28	27	25	174
BMR	2 SAMUT PRAKAN	22	14	19	6	5	3	0	17	1	30	18	7	152
	3 SAMUT SAKHON	18	1	2	3	5	3	0	5	2	1	2	1	43
	4 NAKHON PATHON	3	1	2	2	0	0	0	4	0	0	1	0	13
	5 NONTHABURI	0	2	0	0	1	0	0	1	2	0	0	1	7
	6 PATHAN THANI	9	6	4	3	4	4	1	18	10	21	8	2	90
	Sub-total	52	24	27	14	15	10	1	55	15	52	29	11	305
UCR	7 AYUTTHAYA	1	1	0	0	0	0	0	0	0	11	1	7	21
	8 SARA BURI	1	9	1	0	0	0	0	0	0	1	0	1	13
	9 LOP BURI	4	1	0	0	0	0	0	0	0	0	0	0	6
	10 ANG THONG	0	0	1	0	0	1	0	0	0	0	0	0	2
	11 SINGBURI	0	0	0	0	0	0	0	0	0	0	0	0	0
	12 CHAI NAT	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sub-total	6	11	2	0	0	1	0	0	0	12	2	9	42
E		19	0	3	1	3	0	6	4	0	3	5	3	47
W		10	4	3	0	0	0	0	0	0	4	1	5	27
S		40	7	1	0	0	0	2	2	0	0	2	27	81
N		7	10	1	0	0	0	0	1	0	0	0	14	33
NE		12	1	0	0	0	0	1	0	0	3	0	11	28
	TOTAL	160	60	40	27	41	15	13	92	19	100	65	105	737

Existence of the urban agglomeration together with local authority's initiative in development promotion is a most basic factor to regional industrialization. Aside from the local initiative which is a national policy matter, the UCR has not been able to develop industries sufficiently except for large and medium scale enclave-type foreign investments, because of the lack of cities which can provide a variety of local markets, transport, distribution, repair and other business services as well as urban amenities. Existing cities are too close to Bangkok for them to maintain these urban functions and too far from Bangkok for industries to enjoy the various business services and contracts in Bangkok. This is why some foreign investors jump into regional cities such as

Chiang Mai with a certain degree of agglomeration of urban services, amenity and human capital together with air transport access rather than spreading beyond the area within a certain distance from Bangkok. If there would be a city area which is comparatively near Bangkok and large enough to provide not only infrastructure but a variety of business services for industry, then, the industries which are discouraged from locating in the BMR for high land price and growing congestion programs would be much more attracted to such cities than to remote regional cities.

As for the environmental aspect, the main problem is a growing conflict between the unguided dispersal of industrial plants and estates along major highways especially in Changwat Ayutthaya and the need of environmental protection particularly in this Changwat Ayutthaya. Environmental factor in this Changwat is critical for the people in Bangkok to be ensured with safe drinking water and flood control, because this Changwat is situated along the Chao Phraya River and it is at its most immediate upstream of the BMR. Despite this, industries are rapidly spreading over this Changwat to potentially cause industrial pollution of Chao Phraya River and the deterioration of flood water retarding function. This trend takes place simply because of land price spiral, limited availability of lands within the BMR due to insufficient access road network and the lack of effective land use control especially outside the municipal boundaries.

With strengthened environmental control in the Changwat Pathum Thani, a danger of pollution sources would simply be spread over to the Changwat Ayutthaya, without effective government intervention in industrial location in favour of other areas such as Sara Buri, which is more suitable from both environmental and industrial viewpoints.

9.3 Objectives and Targets

In view of the comparative advantages and disadvantages of the UCR the following objectives are set for its industrialization.

1) Deepening and Widening of Regional Economy

In order to deepen and widen the regional economy in the UCR, industrialization should be directed toward the following:

- Promotion of agricultural and non-metallic mineral resource base industries for increasing value added within the UCR by processing of regionally available raw materials and fully utilizing its geographical position to be at the gateway to the BMR.
- Promotion of linkage type industries, by properly accommodating the industrial spill-over from the BMR and by attracting investors on the basis of its regional potential in labor, land, infrastructure and location.
- Promotion of the small and cottage industries by local investors in order to diversify regional industrial and employment structure.
- Promotion of urban support industries to support local economic activities, including agriculture, construction works and transport.

2) Strengthening Linkage and Minimizing Conflict between Agricultural and Industrial Activities

Coexistence of agriculture and industry is a pre-condition to maintain agriculture, which will continue to be the essential economic base of the UCR as the national center of the supply of domestic and export food products. From the view point of national industrialization, possibly the main potential of the UCR is in the processing of agricultural and other raw materials either produced in or shipped to the region.

Linkages need to be strengthened between agriculture and industry of the UCR to achieve the following:

- To increase the value added to regionally produced or domestically imported agricultural products through improved post-harvesting, agro-processing and distribution processing such as packaging.
- To provide year round jobs for seasonal migratory workers through the promotion of cottage industries and the attraction of labor intensive industries such as light processing industries.
- To diversify manufacturing, repairing, processing, and distribution industries to provide the agriculture with low cost

farm input such as farm tools, machines, insecticides, and fertilizers.

Emerging conflicts between agricultural and industries of the UCR need to be minimized particularly in the following four points.

- To monitor and control industrial water pollution.
- To strengthen land use control so industries will not scatter over agricultural lands causing land speculation which can undermine the willingness of farmers to maintain agriculture.
- To avoid an excessive concentration of labor intensive industries, large scale ones especially, in order to minimize the agricultural labor shortage, which could eventually cause the shortage of viable farmers.
- To discourage bulk water consuming industries from locating in the region to the extent necessary to ensure sufficient water for agriculture in the dry season.

3) Target Industrial Types

(1) Resource-based Industries

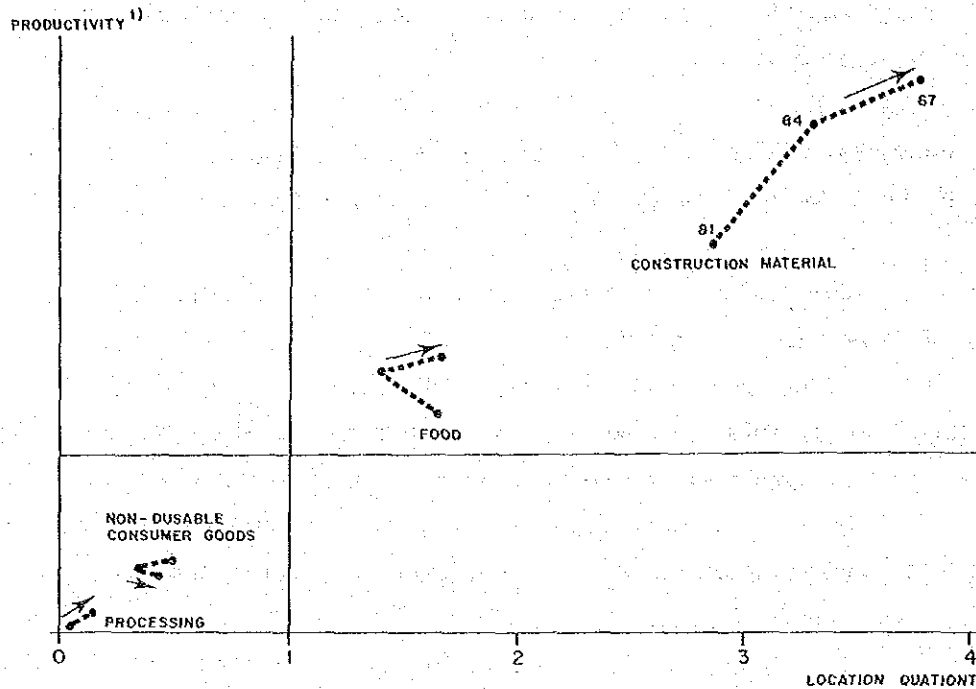
The UCR is endowed with two distinct resources to develop industries:

- Agricultural and livestock/fishery products for agro-processing industries, and
- Non-metallic mineral products for the construction materials industries.

As shown in Fig. 9.3, the UCR is increasingly specialized in these industries, compared with other regions, with their productivity being higher and increasing faster than the national average.

Agro-processing Industries

In addition to the locally available materials for the industry, the transit location of the UCR from the Northeast as well as the



Source : Industrial Census, MOI Data
 1) Productivity = $\frac{\text{UCR Productivity of Industry } i}{\text{Total Average Productivity of Industry } i}$
 2) Location Quotient = $\frac{\text{UCR Manufacturing } i\text{'s Share Over UCR}}{\text{Total MFG Production/National Aggregate Share of } i \text{ MFG to the Total Production}}$

Fig. 9.3 Comparative Advantage of UCR Manufacturing

North to the BMR enables it to collect land process agricultural materials, especially major crops such as rice, maize, cassava, sugarcane and soybean from these regions to be stored in the UCR. Accumulation of physical distribution activities on this basis is also a potential factor to further diversify resource-based industries (of the national storage capacity of maize and cassava, the UCR represents 43% and 35% respectively). The development of the agro-processing industries is important to strengthen the agricultural sector which is and will be the backbone of the UCR economies and societies, as well as the industrial sector.

To strengthen the existing agro-processing industries for which materials are produced in the UCR, meaning that the UCR agriculture is also strengthened (e.g., rice and chicken).

However, it is not correct to simply preassume that agro-processing is suitable for rural area. Table 9.5 shows the agro-processing industries are concentrated and diversified in the BMR. Downstream industries need to enjoy scale of agglomeration in terms of market and industrial linkages even in the field of agro-processing. It is in this context that we stress the comparative advantage of the UCR as the gateway in a certain part of processing, namely, processing and recyclic use of byproducts of major bulky agricultural raw materials.

To strengthen the existing agro-processing industries for which materials come from outside the UCR, meaning that the industry is developed by its strategic location to collect materials and the well-prepared transportation facilities, while the local agricultural sector has no direct benefit (e.g., cassava and maize)

Table 9.5 List of Changwat with More Than 10 Factories Registered to MOI by Each Food Processing Industrial Type (Number after Changwat Indicates the Number of Factories Registered to MOI)

CODE	Industry	BMR	UCR	Neighboring changwats
31139	Other canning and Preserving of fruit and vegetat	Bangkok	39	Phetchaburi 18
				Ratchaburi 15
31142	Manufacture of fish sauce	Samut Prakan 15		Rayong 19
		Samut Sakhon 14		Samut Songkhron 15
31149	Other canning, preserving and processing of fish, shellfish and other sea foods	Samut Sakhon 106		Samut Songkhron 21
		Bangkok 47		Rayong 16
		Samut Prakan 14		Phetchaburi 14
31161	Rice mills	Bangkok 48	Ayutthaya 39	Phetchaburi 101
		Nakhon Pathon 30	Sara Buri 35	Ratchaburi 38
		Pathum Thani 19	Sing Buri 22	Suphan Buri 36
			Ang Thong 20	Chon Buri 35
			Lop Buri 19	Prachin Buri 32
				Chachoengsao 30
				Kanchanaburi 17
				Rayong 10
31163	Grain flour mills	Bangkok 12		Chon Buri 31
31164	Tapioca mills			Prachin Buri 22
				Rayong 11
31171	Bakeries	Bangkok 222		
		Samut Prakan 10		
		Nakhon Pathon 10		
31173	Manufacture of moodies and similar products	Bangkok 74	Sara Buri 16	Ratchaburi 22
		Nakhon Pathon 14	Sing Buri 10	Chachoengsao 19
		Samut Sakhon 10		Phetchaburi 13
31190	Manufacture cocoa, chocolate and sugar confection	Samut Sakhon 466	Lop Buri 18	Phetchaburi 122
		Bangkok 99	Sing Buri 15	Ratchaburi 14
				Suphan Buri 11
31212	Manufacture of ice	Bangkok 63		Suphan Buri 11
		Samut Prakan 10		
31220	Manufacture of prepared animal feeds	Bangkok 31		
		Samut Prakan 12		
31340	Soft drinks and carbonated waters industries	Bangkok 35		Phetchaburi 10
35120	Fertilizers and pesticides	Bangkok 11		
		Nakhon Pathon 4		
		Pathum Thani 2		
38220	Agriculture machinery	Bangkok 67	Lop Buri 23	Suphan Buri 20
			Sara Buri 19	Ratchaburi 12
				Kanchanaburi 11
				Prachinburi 10
				Phetchaburi 10

Source : "Summary Statistics of the 1984 Industrial Establishments" by National Statistical Office

- To discover and develop the agro-processing commodities for which materials are available in UCR, but are not used for processed food (e.g., rice bran, rice husk, egg and beef)
- To introduce the new agricultural commodities which are technologically and economically viable to produce in the UCR and have the potential in the market place as processed food (e.g., fish, milk, baby corn and bamboo shoot)

Construction Materials

Endowed with abundant limestone in the UCR, supporting raw materials such as gypsum in Phichit and Nakhon Sawan and availability of various energy source, i.e., (1) natural gas pipeline from the ESB at present and the Northeast in the future, (2) electricity and (3) lignite from the North, the construction materials industries have been an essential industry in the UCR. Expecting the continued construction boom in the BMR and the construction works to expand in the rural areas, including the Northeast, as well as those in the neighboring indochina countries, these industries and their related industries such as mining, steel bar and wires as construction materials, and packaging will be an engine of the UCR industrialization. This region will be a national construction materials supply center.

(2) Linkage Type Industries

The UCR is faced with industrialization pressure due to the BMR economic expansion. Although this momentum could be either absorbed largely within the BMR or directed to the ESB, the UCR can also needs to prepare for accommodating the increasing pressure of industrial deconcentration.

Light Processing Industries

Light processing industries are concentrated in the BMR at present because they are labor intensive and market oriented. However, due to the increasing cost of labor and land possibility for these industries to relocate from the BMR is increasing.

According to our industrial survey, 17 industrial establishments out of 80 samples (21%) existing in the BMR prefer outside the BMR for new investments. Since the ESB will be industrialized mainly by heavy and chemical industries and linkage type industries, which earn higher value added than light processing industries, light processing industries can not compete with these industries in capturing labor and land. Therefore, the UCR is the most suitable candidate to absorb the light processing industries with potential for relocation because of proximity to the BMR, lower land price than the areas between the BMR and ESB and the ESB itself and availability of labor force. The possible light processing industries are apparel, accessories, sundries, house wares, sports goods and artificial flowers.

Precision Machining and Electronics Industries

The UCR, Changwat Ayutthaya in particular has been faced with an influx of these industries, especially those by direct foreign investments. The crucial factors to these industries are (1) quality and quantity of either surface or groundwater, (2) stable supply of electricity, (3) proximity to airport and (4) labor force. The UCR has comparative advantages in all these four factors over the BMR and the ESB. The possible products under this category are watch/clock, optical instrument, measuring instrument, medical equipment, and various kinds of electronics. Since these industries are inevitably attracted to this region, government strategies for these industries should be laid down from the viewpoint of regional development management rather industrial promotion. Of particular importance are:

- establishment of industrial hazardous waste treatment center for various wastes from these industries, such as electroplating waste liquid, organic solvent, waste oil and solid waste; and
- development of local components manufacturers or supporting industries through technology transfer from DFI.

(3) Agriculture Input Industries

Since the UCR is an agricultural production center, agriculture input industries, such as fertilizer, pesticides and agriculture machinery, have some opportunity to be developed in the UCR in order to increase its agricultural productivity.

Like in the case of agro-processing industries, considerable proportion of the agriculture input industries have been concentrating on the BMR due to its access to regional market on all directions. However, agriculture requires local-specific inputs such as mixing of fertilizers and feeds appropriate to different crops. As a major agricultural region, the UCR should encourage the growth of some concentrations of agricultural input industries in Lop Buri and Sara Buri.

(4) Energy Consuming Industries

The UCR is endowed with a variety of existing and potential energy sources. In order to screen out the appropriate industries from this view point, the energy consuming industrial types are listed up in Table 9.6.

Jointly considering other potentials and constraint of the UCR, only food processing and construction materials industries have comparative advantages to be developed in the UCR.

(5) Cottage Industries

Beside the above modern industries, the cottage industries play an important role in regional economies by absorbing the seasonal labor force in agricultural sector, resulting increase of non-farm income of farmers. The comparative advantage to promote cottage industries in the UCR is: (1) agglomeration of existing cottage industries with sufficient technique, (2)

Table 9.6 Energy Consuming Industrial Types

Industrial Type	Energy Consuming Product or Process	Possibility in the UCR	Bottleneck
Food processing	chemical seasoning	large	
	noodle	large	
	sugar	large	
	starch	large	
Textile	dyeing	small	pollution
Wood	particle	small	no materials
Pulp/paper	pulp	small	pollution
	paper	small	pollution
Chemical	all	small	limited linkage and pollution
Plastic/rubber	all	small	limited linkage
Cement/ceramic/ glass	cement/ceramic	large	
	glass	small	materials produced in the Southern region
Metal	all	small	limited linkage

availability of seasonal workers from the agricultural sector, (3) existence of tourism spots in the region such as Ayutthaya, Lop Buri, and Phra Phutthabat, which can be their market place, (4) proximity to Bangkok and, in turn, overseas to catch market information and taste, and (5) the Royal Project of Folk Arts and Crafts for Farmers in Bang Sai, Ayutthaya, which offers the training opportunities in the basic handicraft skills.

Above-mentioned industrial types are justifiable in the light of present comparative advantages of the UCR. Looking at the future beyond the year 2000, more diversified industries are possible to grow on the basis of these target industries. Of important factors to be considered in long-term, are, first, the industrial linkage with the ESB under a possible expansion of the BMR toward east such as Chachoengsao which will be stimulated by the proposed UCR-ESB link, and the increasing needs to redevelop the space used by industrial and distribution processing facilities for business, commercial and residential use by encouraging the relocation of major space consuming facilities.

We do not specify the types of such industries to emerge in long-term. A likely picture, however, is as follows:

- Some key assembly industries will be set up at the east of the BMR and between the UCR and the ESB upon completion of the Bangkok outer ring road and further, the proposed UCR-ESB link.
- Such key industries will be dependent on the ESB in procurement of basic industrial materials and product export, on the BMR in business transactions information, financing, and on the UCR, northeastern region and northern region in labor supply.
- With these key industries, the UCR, the GSIC in particular could become a major center to supply various parts and components on the basis of industrial and business activities as well as infrastructures and urban services accumulated by then through the growth of above-mentioned target industries.

4) Target Industrial Location

The following classification of industrial location is appropriate to describe industrialization pattern: (see Fig.9.4)

- Area A : Southern part of Changwat Ayutthaya
- Area B : Sara Buri - Ban Moh - Tha Rua - Nong Khac - Kaeng Khoi
(the Greater Sara Buri Industrial Core)
- Area C : Major cities and their vicinity along the inter-regional highway on both North-South and East-West directions
- Area D : Rural area

Area A is located at about 75 kms away from Bangkok and can be considered as a part of the BMR. As mentioned earlier, an environmental factor is important in this area in consideration of negative impact of industrial development here over the drinking water and flood in the BMR as well as over the tourism and cultural asset in the area. Despite this, seven industrial estates are under construction or planned to be in operation by 1992 with a total area of as much as 9,125 rai. It is unavoidable that land price increase and limited industrial access within the BMR will make this area a major center of such labor intensive assembly export industries that can afford to purchase substantial areas in the industrial estates. They are mainly

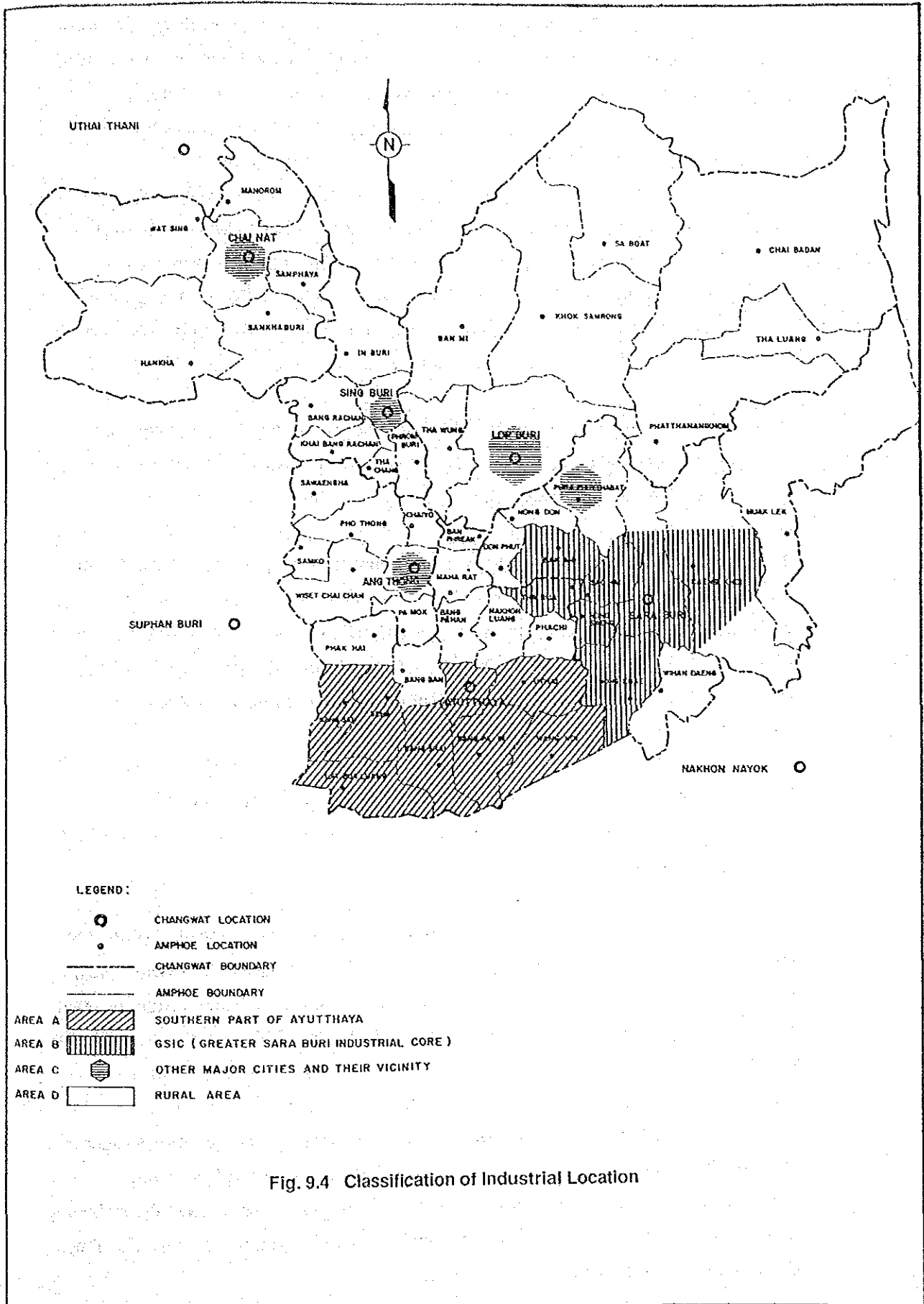


Fig. 9.4 Classification of Industrial Location

foreign investors. But sooner or later, such industries are likely to lose labor cost competitiveness against the industrial development of similar pattern in the lower wage countries near Thailand.

In short-term, the followings are important in this area.

- (1) environmental management through the control of industrial locations in such a way to make the fullest possible use of planned industrial estates; selection of less polluted industries; and provision of sufficient waste treatment system for common use in industrial estates.
- (2) planned expansion of urban areas with proper utilities in order to accommodate the workers and their families which are expected to increase rapidly.

In long-term, some of the presently competitive labor intensive export industries may become necessary to be replaced by other types of industries such as light processing industries which move out from Bangkok and various supporting industries to supply parts and components for major industries in the industrial estates as well as those in and around the BMR and the ESB.

This area will also be a center of cottage industries based on the agglomeration of blacksmith works and government cottage industrial training institute.

Area B has the highest potential for industrial development within the UCR with its existing cement, ceramic, and metal-based industries near Sara Buri and its existing storage facilities for agriculture products near Tha Rua with inland water access to the BMR, the ESB and the average market.

It has also access to various directions, including potential direct access to the ESB by not only planned railway but our proposed highway. Compared to the Area A, the Area B is free from environmental problem. Three industrial estates are under construction in order to capture these development potentials.

With the sufficient industrial integration Area B could possibly be the core of industrial development in the UCR in long-term while Area A should be regarded primarily as a space to properly accommodate short and medium-term investments of labor intensive type.

The Area B has a potential importance in the context of developing a greater BMR. This area could be a core to receive deconcentration of industries in the BMR without causing inefficient infrastructure and utility network and environmental problems, if its central city being Sara Buri can be developed as a center to provide various business services and supporting industries.

Area C can be a moderate industrial core by developing labour intensive industries, raw material based industries and cottage industries, contributing the growth of city functions. Of particular importance in these areas is the primary and distribution processing of agricultural products brought from their hinterlands.

Area D can develop scattered cottage industries which can absorb the seasonal unemployment of the agriculture sector and create additional income for farmers.

9.4 Strategies

1) Industrial Area Management

Industrial area management is essential in the UCR in view of environmental sensitivity and efficient land use in the region.

First, industrial estate should properly be developed and managed in order to avoid intensive pressure on environmental capacity, urban and utility services, and local labor market. Compared to the industrial area requirement estimated at 20,000 to 30,000 rai in the year 2010, a total area of 13,900 rai will soon be provided by ongoing/planned industrial estates in Ayutthaya and Sara Buri. Average size of the industrial estates are 2,000 rai, which is large enough to be more than 50% of Lat Krabang Industrial Estate. Moreover these industrial estates are

concentrated in southern part of Ayutthaya and the area around Sara Buri.

In Ayutthaya, which has 9,200 rai of ongoing/planned industrial estates already, further industrial estate development should be discouraged particularly, from the environmental viewpoint. Further estates should be developed in the GSIC and the area around major cities, including Changwat capitals, at a smaller individual scale and in a decentralized pattern. Since ongoing/planned industrial estates are large enough, they should contain sufficient space for waste treatment, flood retarding pond and other facilities for the common use of industries.

Second, industrial zoning should be set forth within the framework of overall regional land use for the purpose of the efficiency in provision of urban and utility services and environmental management. While industrial zones should be delineated through consultation among concerned agencies, including local authorities, Ministry of Industry, Ministry of Interior, Board of Investments and Office of National Environmental Board, we recommend that the GSIC be designated as the industrial zone for the UCR.

Third, all the industries should be equipped with waste treatment system on either individual or collective basis. Our industrial survey revealed that 70% of sample industries in the UCR has no waste treatment system compared to 45% in the BMR, by the reason that no regulation imposes such a system.

While industrial pollution should be regulated under an overall environmental management strategy as discussed in the Chapter 7.2 Land and Environmental Management, we recommend the following measures to be taken with special reference to waste treatment for the target industries.

(1) Operation of agro-processing industries is generally small/medium scale and seasonal. Their wastes are almost no harmful but great in volume and perishable due to heavy contents of organic residual materials. Thus, cooperation among industries should be promoted for the natural treatment in the

buffer space, semi-closed recyclic use of industrial water and utilization of excess sludge as feed and manure.

- (2) Regarding cement and ceramic industries, the air pollution from cement industries has already been serious enough in Sara Buri. A past study has revealed that the air pollution can virtually be solved by installation of powerful dust collectors in the factories. The matter is not technical but simply strong enforcement. Ceramic industries cause water pollution, which, however, can easily be treated by collective effort of ceramic industries to develop waste water stabilization ponds.
- (3) Light processing industries do not cause any serious industrial waste
- (4) Precision machinery/electronics are not a clean industry. They discharge not only waste water and solid waste but also dangerous substance such as waste oil, organic solvent and heavy metal. In view of the definite need to avoid severe pollution of surface and ground water, both of which have very much to do with people's living in the BMR, by leakage of dangerous wastes, it is strongly recommended to set up appropriate areas to discharge the solid waste with concrete sealing and to establish an industrial hazardous waste treatment center in the GSIC before waste volume will exceed the capacity of the treatment center being planned at Rangsit.

2) Promotion of Agro-processing Industries

Despite that the UCR is the distribution center of major agricultural commodities, only very basic processing is done in the UCR and are shipped to the BMR and oversea. In view of a vast variety of downstream industries after the basic processing (see Fig. 9.5), the UCR are losing huge amount of value added.

Crop	Basic Process in UCR	Good Processed in UCR	Goods Not Processed in UCR	Examples of Possible Application
Rice	Milled rice	Vermicelli Starch	Rice snack	
			Alcohol	Whiskey
	Rice bran	Oil	Soap Deoiled cake Wax	Animal feed
	Husk	Brick Fuel Activated Charcoal		
Straw	Animal feed Handicraft	Mushroom Culture Straw board Straw paper Straw bags		
Cassava	Tapioka flour	Pellet for animal feed	Single cell protein	Animal feed
			Alcohol	Fuel
			Modified starch	Food material Industrial use Medical use Monosodium glutamate Animal feed
Sugarcane	Raw sugar Molasses	Refined sugar Animal feed	Glucose	
			Lysine	
	Bagaase	Animal feed	Alcohol	Drugs Rum
			Acids Chemicals	
Maize	Stalk/leaves Grain	Fodder Animal feed	Paper board Fuel Activated Carbon	
			Starch	Industrial use Food material Medical use Cosmetic use Dextrins Syrum (residual) Corn oil food use drug use industrial use
	Cob		Activated charcoal refined carbon	dry battery cells
Soybean	Soy milk	(residue)	animal feed	
	Bean curd	(residue)	animal feed	
		Fermented sause Fermented food Confessionary Baby food Oil extraction	(residue)	Soy bean oil
			Defatted soy bean	Glycerin/lubricate oil/paint/soap Margarine/confessionary

Fig. 9.5 Downstream Industries of Major Crop

Especially there is a great opportunity for the UCR to make use and blend major crops and the wastes from their basic processing for the production of the animal feed, which would very much contribute to further strengthen the livestock industries of the UCR.

Although the technologies to develop the agro-processed products for direct use by consumers have highly been developed and widely use in many industrialized countries, the agro-processing technologies for the process between basic processing stage and downstream manufacturing stage have rarely been developed in Thailand because most of agro-processing industries are: (1) small and medium scale without adequate ability to introduce new technologies and (2) merchandise origins which are more interested the profit from market fluctuation than from produce in technology.

This situation implies necessities of government actions to promote medium stream industries of major crops by introducing and diffusing the processing technologies.

Besides technological assistance, in order to maximize integration effect among various downstream commodities, industrial estate specialized in agro-processing industries should be established. Recommended location is Tha Rua, where a variety of major crops concentrate for shipping by inland waterway.

3) Promotion of Small and Medium Scale Industries

In the UCR, small and medium scale industries have been contributing to the development of local economy in terms of labor absorption, resource utilization and meeting local needs.

However, those enterprises are, at present, facing with a difficult situation due to the competition with the mass-produced goods produced and distributed by large scale enterprises. Under such circumstances, small and medium scale industries have to respond to the situation by developing new product, diversifying and sophisticating their products.

Though large scale enterprises can adapt themselves smoothly to the ever changing internal and external economic environment, this is not the case with the medium and small scale industries. Consequently, promotional measures should be taken by the government to overcome present situation and to strengthen the linkage between the local small and medium scale enterprises and the large scale ones.

Particularly, improvements should be made in the following points at the national level:

- (1) In order to make full use of the recent reduction of minimum investment amount required for application to Board of Investment (BOI), BOI should offer special services with simpler criteria and procedure in favor of such small and medium scale industries that plan to hold transactions with those already approved by BOI.
- (2) Implementation of value added tax in place of the business tax which has been a serious bottleneck to promote transactions among domestic manufacturers.
- (3) Development of business incubator as a comprehensive services of the regional level to strengthen management, rather than technical capability of local entrepreneurs.
- (4) Organizing of small and medium scale industries with common interests such as waste treatment, joint material purchase, joint storage and information exchange.

9.5 Projects

1) Agro-Tech Center

In order to encourage the intermediate processing of five major crops concentrated on the UCR (rice, maize, cassava, sugarcane and potentially soybean), the agro-tech center is proposed to be set up in Sara Buri City being the urban service center of the GSIC.

Agro-Tech Center provides total technological consulting services mainly for small-medium scale industries and is specialized in applied agro-processing technologies for the major five crops. While Food Industrial Department of TISTR offers similar services, local resource specific institute is necessary to promote local based industries. Agro-Tech Center could be a branch laboratory of TISTR.

The total technological consulting services offered by the Center are:

- development of applied technology requested by private sector with cooperation of central institutions, universities, and foreign public and private institutions.
- trial production to identify and solve technological problems.
- quality inspection to meet with domestic and foreign standard.
- technological services by offering seminars, training courses, and reference books and reports such as international standard.

The initial cost should be provided by the central government. The operation cost, however, should mainly be met by the Center itself by means of member fee, research and other service fee.

2) Integrated Agro-Industrial Park

Although huge amount of agricultural products, such as rice, cassava, maize, sugarcane, and soybean, are transported into the UCR for basic process, there is no linkage effect in the UCR, resulting in a limited value added generated.

Taking these integrated and linkage effects of agro-processing industries into account, it is recommended to establish the Integrated Agro-Industrial Park with the following objectives:

- to develop downstream industries of the five major crops,
- to strengthen linkage among these products,
- to encourage agricultural diversification by offering industrial market, and
- to encourage livestock production by reducing animal feed cost through efficient use of residuals from agro-processing.

Industrial Estate Authority of Thailand (IEAT) should play a primary role to manage the Park. The following management guidelines should be adopted in order to maximize linkage effect:

- to allow participation only to agro-processing industries,
- to arrange mutually related industrial facilities,
- to set up water recycling system with treatment plant, and
- to encourage activities of participants cooperatives

The project site should be at Tha Rua along Pasak River in consideration of:

- existing distribution facilities,
- inland water transportation,
- water availability of both surface and underground, and
- proposed East-West link highway.

3) Village Industry Promotion Centers

There are several kinds of village industries being produced in the UCR. Especially, blacksmith industries are concentrated in Aranjik Village, Nakhon Luang, Ayutthaya, where cutlery and agricultural tools are produced by 2,000 craftsmen.

Because of limited cooperation among craftsmen, however, no modern management nor advanced technology have been introduced, resulting (1) weak bargaining power to purchase materials and to sell products and (2) low quality and productivity, respectively. This makes village industries less attractive for young successors.

Although the Royal Project of Folk Arts and Crafts for Farmers in Ayutthaya offers basic handicraft skills training course, trainees can not apply these basic skills for high value added products. Ministries of Industry and Interior also offer opportunities for farmers to obtain basic skills but they lack business-oriented training.

Therefore, it is recommended to establish village industry promotion center with the following functions:

Technological Assistance

- to organize training courses/seminars to diffuse new production technology
- to provide advanced equipment for craftsmen to develop new products
- to conduct basic research for the use of new materials and equipment

Managerial Assistance

- to develop domestic and overseas market channel by various market promotion such as exhibitions, promotion missions, and events
- to train potential craftsmen as management leaders to organize craftsmen's cooperatives
- to function as a matchmaker between craftsmen and traders
- to follow up graduates from the Royal project by providing soft loans to start up business and introducing traders and market

The centers are recommended to be set up first in Ayutthaya where blacksmith production is a viable seed and, then, in Chai Nat, where agricultural and marketing cooperatives are active enough to generate management leaders.

4) Business Incubators

Traditionally the scope of business of small and medium scale industries is rather limited and their management resources are scarce.

Therefore, it is a prerequisite for small and medium scale industries to effectively utilize the available external management resources for new product and technology development.

At the same time, strengthening of the industrial management promotional function at the regional level is the missing link in achieving the government's basic policy to decentralize industries.

In view of these, business incubator is proposed to promote interactions between small and medium scale industries, and outside experts, large

scale industries, government agencies, research institutes and financial institutions, etc.

Generally, there are several important conditions to start up business and grow up as a successful entrepreneur. These conditions are:

- Encounter with excellent management advisor
- Utilization of external management resources
- Start up in growing business field, and
- Entrepreneurship

In order to meet these conditions, incubator service should be set up with the following principles:

- Providing flexible business space and utilities
- Management and technology consultancy
- Mutually stimulative atmosphere
- Short-term service, and
- Financial coordination

Incubator services include business supporting services, business office, facilities and management services.

Administration/steering committee of incubator should be set up based on public and private cooperation at the regional level. Provincial Chambers of Commerce should play a key role in this committee. In order to implement incubator services effectively supporting groups should be established, comprising expert group, industrialists group and local leaders group.

Potential beneficiaries of the business incubator services are successors of local business, spin out from large industries or universities and experienced skilled workers with entrepreneurship.

10. DISTRIBUTION AND MARKETING

10.1 National Issues of Distribution Sector

Distribution sector grew in Thailand with a main role of exporting agricultural products through systematic links between villages and international market. However, the rapid socio-economic development in recent years calls for changes in the distribution industry.

The volume of domestic goods movement has increased rapidly at a speed considerably faster than GDP (See Table 10.1).

Table 10.1 Increasing Volume of Goods Movement

	1983	1984	1985	1986	1987
Volume of Goods Movement	27,762	38,375	37,364	40,840	45,288
GDP	355,408	80,739	394,113	411,814	466,361

Unit : Goods movement volume in thousand ton and GDP in million baht

Source : Transport Statistics, 1989
Gross Regional and Provincial Products, 1989

The increase in volume of goods movement has involved diversification of goods and movement. Major factors to this include agricultural diversification, industrialization and changes in people's life style. Generally in Thailand, national agricultural diversification has been progressing through the regional specialization of the products for domestic market on one hand and the regional spread of the products for export market on the other hand. The central region has increasingly been specialized in some products such as rice, sorghum and dairy products while the maize production which was once concentrated in the central region has been spreading over other regions (See Table 10.2)

Table 10.2 Change In Location Quotient of Selected Agricultural Products In Central Region

	1981	1986
Paddy	1.61	1.93
Maize	3.58	2.89
Sorghum	5.28	6.78
Mungbean	1.58	1.35
Cotton	2.71	1.34
Cattle	0.94	1.18
Swine	1.02	1.25
Dairy Products	8.31	8.07
Fresh Water Fish	1.41	1.22

Source : MOAC

Location quotient = $\frac{\text{Percentage of certain commodity in total products in certain region}}{\text{Percentage of certain commodity in total products in the whole kingdom}}$

Coupled with the effect of urbanization, the agricultural diversification of this pattern has diversified and increased the volume of agricultural product movement.

Industries require a more multi-directional distribution network with the processing and storing activities involved at various stages. While industrialization has taken place mainly in the BMR, industries have also grown in regions. Industrial GDP has expanded by 1.7 times in the regions outside the BMR during the period 1975 to 1985 (See Table 10.3). There will be intensified movements of the semi-manufactured products, parts and finished goods between regions including the BMR and the ESB.

Table 10.3 Growth of Manufacturing

	Unit : Million Baht		
	1975	1980	1985
BMR	26,745.1	46,538.3	60,545.6
Central	1,149.1	1,900.2	2,307.5
Western	1,419.2	1,778.6	3,120.9
Eastern	2,710.0	3,678.7	4,923.5
Northern	1,443.1	2,001.6	2,450.3
Northeastern	2,494.6	3,229.8	4,069.3
Southern	870.6	1,512.0	1,510.2
Whole Kingdom	36,831.7	60,639.2	78,927.3

at constant 1972 prices

Source : Gross Regional and Provincial Products, 1985

Changes in life style have been taking place in both urban and rural areas. Changes in food habit is remarkable in that food varieties are increasing, with a consequence that distribution industries are increasingly required to be ready for delivering a variety of foods constantly. In urban area, there is keen competition between supermarkets, department stores and traditional markets. Newly opened supermarkets and department stores have been getting larger share in commerce based on the consumers requirement of variety of commodities and higher value added. On rural side, penetration of modern home equipment such as furniture and electric equipment are taking place, with a consequence that the urban-to-rural flow of goods is diversifying.

While these factors have been diversifying the movement of goods to be distributed, changes have also taken place in marketing channel in the distribution system. Of remarkable changes are increasing participation of agro-processing industries in the distribution and marketing of agricultural and agro-processed products. While this change will stimulate the diffusion of marketing and technology information in rural areas, it will also be necessary to improve distribution system in a way to ensure producers' income. There is a growing need of adjustment in marketing structure. As industrialization and urbanization will proceed, it will increasingly be important to sustain the agriculture, which is by its nature less productive and stable than non-agricultural sectors in the national economy.

While agricultural productivity improvement is one factor to sustain agriculture, another factor is to ensure reasonable and stable prices of products. In this context, distribution sector needs to play a more positive role in ensuring reasonable and stabilizing farmer's income or, more specifically, producers share. To this end, participation of farmers in the distribution and marketing activities will be called for.

Thus the important national issue of distribution sector is to establish an efficient distribution system in response to the changes in industrial, agricultural and living style changes and to the increasing needs of encouraging farmers to continue agriculture.

These national issues of the distribution sector are significant to the development of the UCR in that it is the gateway to the BMR and that maintaining its agriculture has not only regional but national importance.

10.2 Characteristics of Distribution Channel of Agricultural Products

10.2.1 Farmers Marketing Conditions

Agricultural marketing is of buyer's market type in the UCR as well. Farmers have practically no bargaining power for their products (See Table 10.4). Approximately 60% of the farmers sell the products in their farm, particularly, 82% of rice are sold in the farm. On the other hand, there are more cases selling at local markets and Amphoe markets regarding vegetables and fruits as shown in Table 10.5. It seems that traditional major crops such as rice and maize tend to be sold at the farm because traditionally organized distribution channels exist. The main reason for selling at the farm is to save transport cost and the reason for selling at the local markets and Amphoe markets is to save transport cost and to get services provided there. On the other hand, miller and processor are preferred because of the availability of contractual prices, those set under contract farming in particular.

Commodity price, which is based practically on export price or price of market in Bangkok, has always fluctuated. The international prices of agricultural products move depending on various external elements. Therefore, there has hardly been successful effort to stabilize the international prices of the agricultural products (See Fig.10.1). The price fluctuation of agricultural products causes marketing risk on the part of distributors. The distributors traditionally take huge profits from trading to manage the marketing risk on one hand, while the farmers can not make production plan without sure prospect of their income under this condition.

Contract farming which has spreaded over the nation as well as the UCR is a new attempt of agro-firms to minimize the marketing risk caused by price fluctuation and to keep quality of materials. Along with modernization of society and economy, the agro-firms need to realize scheduled supply and standardized quality of products, which are requirement from markets. The contract farming is realizing it through direct connections between market needs and production.

Table 10.4 Price Determinants of Agricultural Products

	Seller	Buyer	Contract	Both S & B	Total
Rice	60	6	2	4	72
Maize		19	1		20
Soybean,Mungbean		12			12
Cotton		4			4
Sugarcane			24		24
Sorghum		14	1		15
Vegetable		8			8
Fruits	9	13			22
Milk		19			19
Cattle	5	4			9
Hog	8	2	6	2	18
Others	4	1	2	1	8
Total	69	76	28	4	177

Source: Study Team Survey

Table 10.5 Place of Product Sold

	Farm	(%)	Local Market	(%)	Amphoe Market	(%)	iller,Process	(%)	Others	(%)	Total
Rice	50	0.82			1	0.02	10	0.16			61
Maize	12	0.80			2	0.13			1	0.07	15
Cotton	3	0.75			1	0.25					4
Vegetable	8	0.42			11	0.58					19
Fruits	2	0.22	6	0.67	1	0.11					9
Sorghum	11	0.85	2	0.15							13
Cattle	4	0.80							1	0.20	5
Hog	11	0.92			1	0.08					12
Others	20	0.87			3	0.13					23
Sugarcane							23	1.00			23
Milk									19	1.00	19
Total	121	0.60	8	0.04	20	0.10	33	0.16	21	0.10	203

Source: Study Team Survey

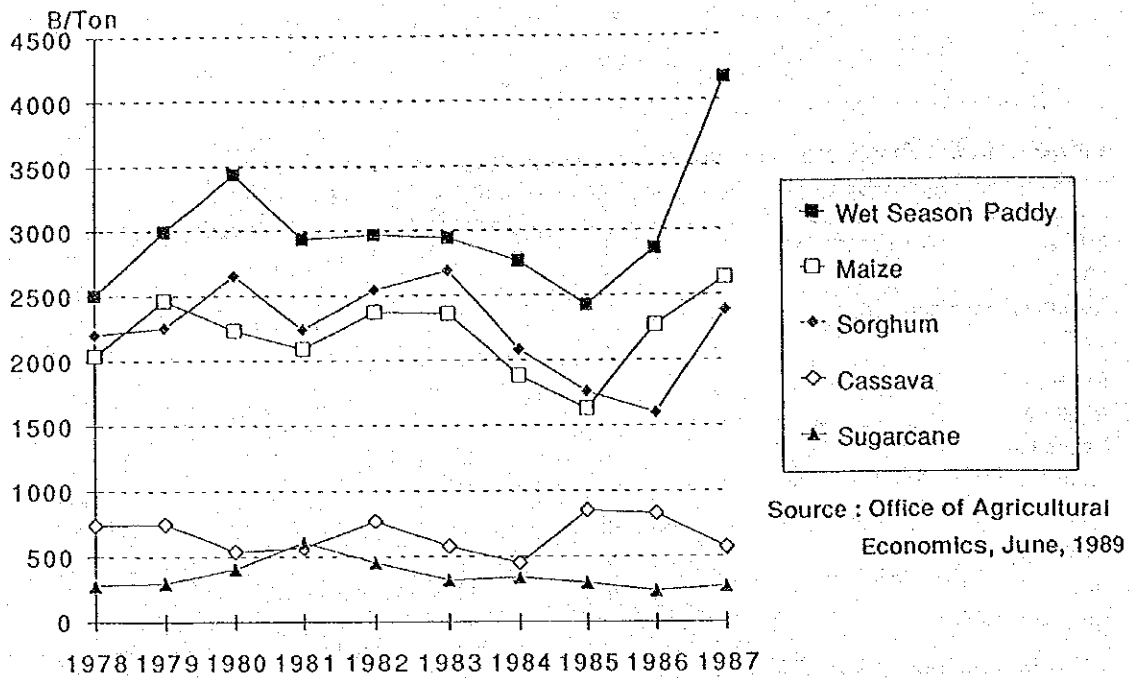


Fig. 10.1 Annual Price Fluctuation of Selected Crops

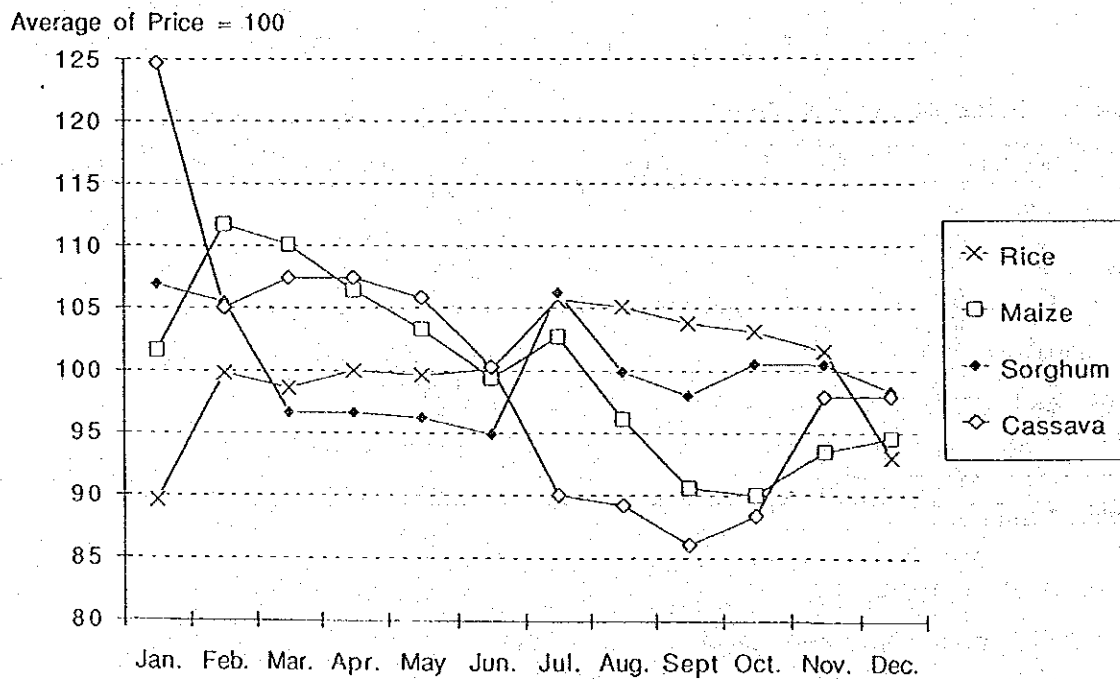


Fig. 10.2 Seasonal Price Fluctuation of Selected Crops

Thus, the farmers are organized by money lending institutes such as Bank for Agriculture and Agricultural Cooperatives (BAAC), commercial banks and agro-firms. On the other hand, traditional farmers' organizations such as agricultural cooperative, and registered farmers group have also tried to develop their capability particular in the provision of loans. Some of outstanding farmers organizations deversify their works to marketing activities.

10.2.2 Local Market Situation

1) Origin of Commodity

Agricultural products such as vegetable, fruit and fish are distributed from other regions to supplement the local supply. Table 10.6 shows the level of self sufficiency by commodity. Vegetables, fruits and fish are only 50% self sufficient. Commodities brought from other regions are distributed in the local market, both wholesale and retail. Sara Buri, Ang Thong and Sing Buri have core markets which serve as wholesale market. Commodities are distributed from these core markets to the local retail markets (See Fig. 10.3).

Table 10.6 Self-sufficiency of the UCR In Agriculatural Commodities

Commodities	Self-sufficiency
Vegetables	51.5%
Fruits	49.1%
Meat	95.3%
Chicken	88.9%
Egg	76.5%
Fish	47.3%
Processed Food	75.7%
Clothes	0.0%
Total	53.6%

Source : Study Team Survey

2) Collection and Delivery

Collection and delivery are the most primitive functions of wholesale market. In the wholesale markets in the UCR, vegetables and fruits are

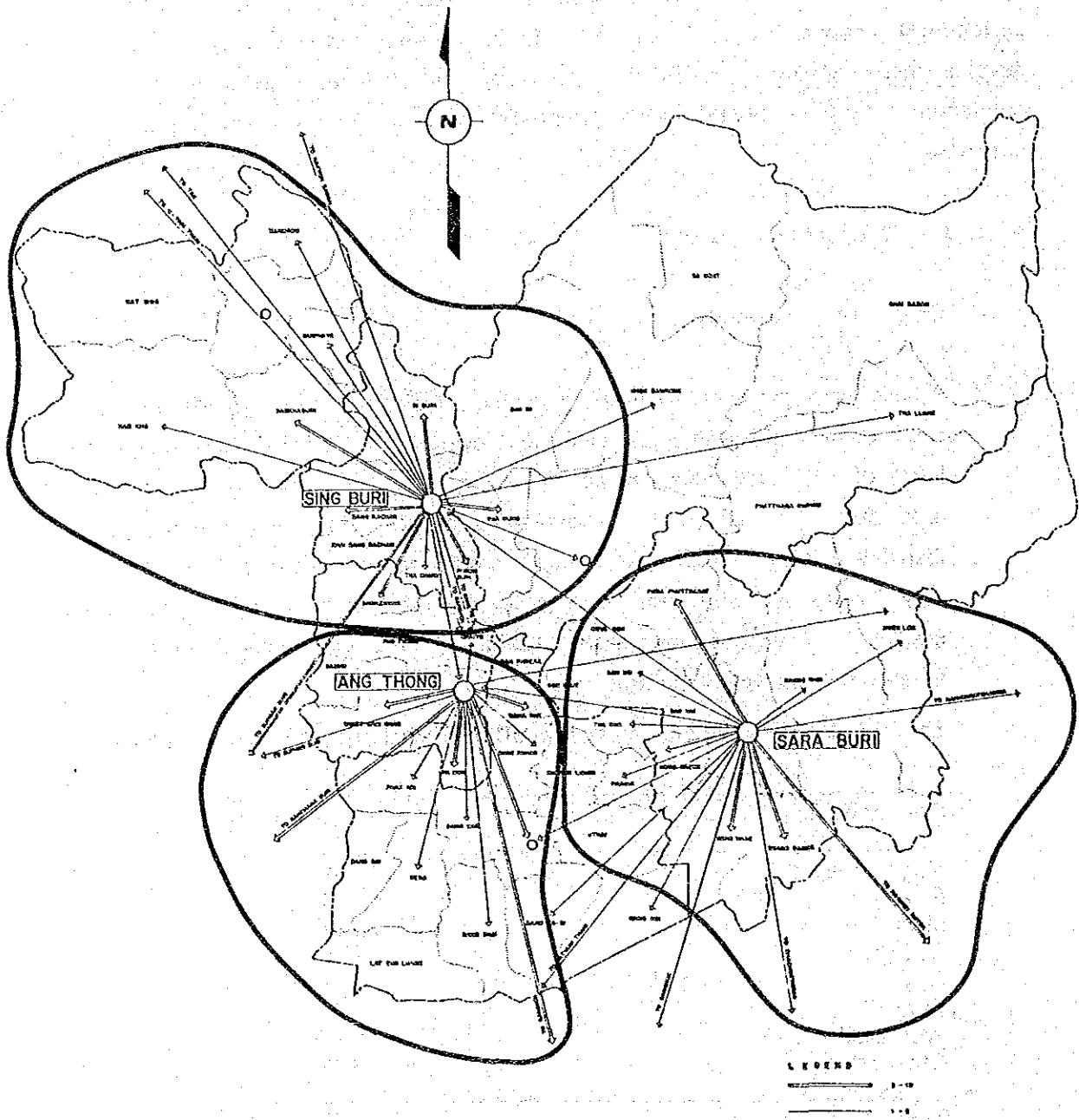


Fig. 10.3 Trading Areas of Three Major Centers

the main commodities accounting for 42.1% and 40.1% respectively of total commodities collected and delivered.

Customers comprises consumers being 53%, retailers being 36% and wholesalers being 9%. Most of wholesalers are from within Amphoe where market exists. 69% of the customers come from the Amphoe where market exists and 17% of them are from other Amphoe but within the same Changwat. Markets in the UCR serve mainly for local consumption. However, particularly, Sara Buri, Ang Thong and Sing Buri have relatively large wholesale markets which serve not only for their respective Changwat, but also for other Changwats both within and outside the UCR.

3) Pricing

Cross trading is basically applied to transaction. In this, several stages of transaction exist between farm-gate to retail market. Under this system, pricing power of wholesale market is not strong because merchants in several stages of transaction take risk of buying the commodities. This is one reason why Thai agricultural products have competitive price in the world market.

Merchants are supposed to set their prices depending on the prevailing market price information as well as on the original purchase prices plus some margin. But in the existing wholesale markets such as those in Sara Buri, Ang Thong and Sing Buri, merchants can set prices by themselves. This means that wholesale market itself has a pricing power rather than other traders, even it is not enough strong as in the case with consignment sale system of wholesale market.

4) Working Hours

Although wholesaling and retailing functions are mixed in the UCR markets, these functions are divided in terms of operation hours. While Sara Buri wholesale market is operated almost 24 hours. The commodities traded in wholesale market at midnight are transferred to retail market to be sold from early morning (See Fig.10.4).

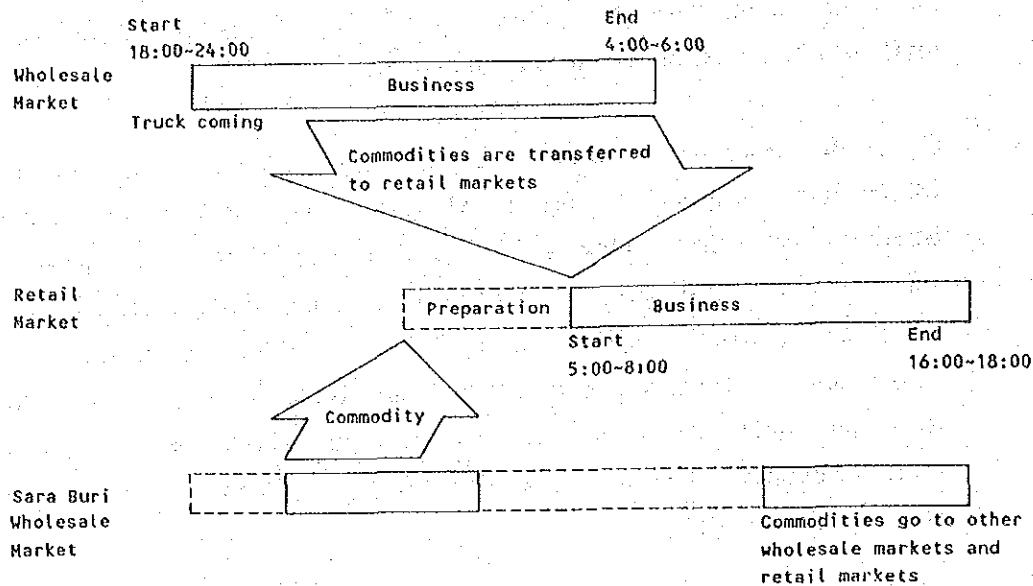


Fig. 10.4. Operation Hours of Wholesale Market

5) Management

Local markets are managed by the public and the private. Management collects rent fee for land and provides same services such as water supply, electricity and cleaning for the market areas. Drainage and parking area are not available in most of markets. There are no markets which have commodity group-specific layout.

10.3 Characteristics of Goods Distribution

10.3.1 Relationship with Bangkok Metropolitan Region

The BMR is a center of commodity flows. Most of agricultural products and mineral resources concentrate on the BMR, while industrial products and consumer goods are distributed from the BMR. The UCR is also closely connected with Bangkok.

A total volume of approximately 6.5 million tons a year goes from the UCR to Bangkok, which is 18.6% of the total amount of goods going to Bangkok from the rest of the country. Earth, sand and gravel constitute a largest portion of the goods going to Bangkok, accounting for 50.9%, followed by rice and cement. Cement from the UCR to Bangkok accounts for 87.9% of cement going to Bangkok and the rice from the UCR to Bangkok accounts for 32.4% of rice going to Bangkok (See Table 10.7).

Goods of 1.2 million tons a year come from Bangkok to the UCR, accounting for 11.7% of the total volume of goods from Bangkok to the rest of the country. Petroleum products have the highest portion of the goods from Bangkok to the UCR, amounting to 351 thousand tons a year or 30% of the total volume of goods from Bangkok to the UCR.

Other manufacturing products and other construction materials are following with the amount of 305 thousand tons and 50 thousand tons, respectively (See Table 10.8).

Table 10.7 Movement of Goods from Bangkok to the UCR

Goods	(Thousand tons)		
	Share in total movement		Composition of goods
	Volume from Bangkok to the	rest of the country	from Bangkok to UCR (%)
Rice	8.6	5.8	0.7
Maize	0.3	4.5	0.0
Topioca	0.5	5.0	0.0
Sugar	0.5	4.0	0.0
Other Agri.	22.2	14.1	1.9
Rubber	0.0	0.0	0.0
Farm Prod.	12.5	15.3	1.1
Forest Prod.	38.0	18.0	3.2
Petroleum Prod.	351.3	16.6	29.6
Earth, Sand and Gravel	6.2	28.0	0.5
Mineral Prod.	6.8	46.3	0.6
Cement	1.6	1.7	0.1
Other Construction	50.1	19.0	4.2
Fertilizer	95.4	8.5	8.0
Other Manufactures	305.6	12.5	25.7
All Others	223.1	7.6	18.8
Unknow	65.6	12.8	5.5
Total	1,188.3	11.7	100.0

Source : Transport Statistics, 1988

Table 10.8 Movements of Goods from the UCR to Bangkok

Goods	(Thousand tons)		
	Volume	Share in total movement to Bangkok from the rest of the country	Composition of goods to Bangkok from UCR (%)
Rice	1017.7	32.4	15.6
Maize	146.6	15.9	2.3
Tapioca	47.7	6.9	0.7
Sugar	16.4	1.5	0.3
Other Agri.	61.6	8.3	0.9
Rubber	0.2	0.1	0.0
Farm Prod.	25.8	3.3	0.4
Forest Prod.	49.7	3.2	0.8
Petroleum Prod.	2.4	16.6	29.6
Earth, Sand and Gravel	3315.3	16.3	50.9
Mineral Prod.	5.2	1.3	0.1
Cement	1217.9	87.9	18.7
Other Construction	251.9	53.9	3.9
Fertilizer	8.1	16.0	0.1
Other Manufactures	205.2	10.3	3.2
All Others	62.2	16.2	1.0
Unknow	75.3	10.4	1.2
Total	6,509.2	18.6	100.0

Source : Transport Statistics, 1988

10.3.2 Distribution Network of Export-Oriented Agricultural Products

The UCR is a center of export-oriented agricultural products such as maize, tapioca and rice. These products are mainly produced in the northern and northeastern regions and once stored in or passing through the UCR. According to the Table 10.9, 93% of rice, 90% of maize and 80% of tapioca are passing through the UCR to go to the BMR.

Table 10.9 Concentration of Export-Oriented Agricultural Products in UCR

Products	(Thousand tons)			
	UCR (%) (A)	Origin of Agricultural North/Northeast(%) (B)	Products (A+B)	Total Volume to Bangkok
Rice	1,017.7(32.4)	1,901.2(60.5)	(92.9)	3,142.7(100.0)
Maize	146.6(15.9)	677.7(73.7)	(89.6)	919.7(100.0)
Tapioca	47.7(6.9)	544.6(80.1)	(87.0)	692.4(100.0)

Source : Transport Statistics, 1988

10.3.3 Transportation

1) Locational Advantage

The UCR has a locational advantage to minimize the cost of transportation in consideration of the efficient combination of land, inland waterway, and sea transport as well as cheap land available for space consuming storage.

Because export-oriented agricultural products are heavy and low value added per unit, production and distribution costs should be minimized to keep their international competitiveness. In this regard, the inland waterway from the UCR directly to Ko Si Chang is a best way to minimize transport cost. The inland waterway carries 16.3% of the goods from the UCR to Bangkok (See Table 10.10). This percentage is much higher than the relative magnitude of the inland waterway in the cargo movement in the whole country, being only 0.3%.

Table 10.10 Transport Flows of the UCR, 1986

(Ton)

	From UCR to Bangkok	(%)	From Bangkok to UCR	(%)
Road	5,539,803	(74.7)	1,235,825	(95.2)
Rail	668,978	(9.0)	62,048	(4.8)
Waterway	1,207,668	(16.3)	695	(-)
Total	7,416,449	(100.0)	1,298,568	(100.0)

Source : Transport Statistics, MOCT, 1988

Note : The above table includes goods related to Pathum Thani Province

2) Characteristics of Transport Network

At present, collection, and delivery of cargo, and line-haul are undertaken by same company. It means that one trucking company works as both an area trucking company and a line-haul trucking company.

Each trucking company in Bangkok covers particular region with some special business connection, while trucking company in the rural area is connected with Bangkok. Cargo of trucking companies in Bangkok is mainly industrial and consumer products, while local trucking companies take care mainly agricultural products. Therefore, their transportation sometimes fails to be single loading.

10.4 Strategies for the UCR

In view of the national issues of the distribution sector and the present performance of distribution activities in the UCR, development issues for the UCR can be identified as follows.

10.4.1 Linking Agricultural and Urban Sectors in the UCR

Improvement of distribution system is essential in increasing and stabilizing agricultural income in the UCR. This involves the strengthening of marketing capabilities on the part of the farmers as sender of agricultural goods and the improvement of local and wholesale markets on the part of the urban consumers as receiver of agricultural goods.

10.4.2 Linking Agriculture with International Market

Concentration of export crops such as rice, maize and tapioca has enabled the UCR to be equipped with a system of collecting and dispatching these goods for export at a low cost. Agricultural diversification, including more production of vegetables and fruits, will provide added opportunities for the UCR to make use of the present agglomeration of distribution activities. For these opportunities to be realized, the issue is to strengthen distribution processing activities to enhance value added of products in the UCR.

10.4.3 Making Use of Locational Advantage

Being at the gateway of the BMR to the northern and northeastern regions through the national highways 1, 2 and 32, the UCR is at a good geographical position to play a function of distributing the industrial and consumer goods produced in the BMR to the regions at various directions.

10.5 Proposed Projects and Programs

10.5.1 Agricultural Cooperative Development

Strengthening agricultural cooperative is most important. Activities of the agricultural cooperative can be divided into four :

1) Credit Provision

To facilitate more flexible and easy the credit provision, savings from cooperative member have to be increased. This could offer an advantageous loan with a consequence of higher motivation of farmers to participate the agricultural cooperative.

2) Procurement

Procurement activity is efficient to reduce farming and household expenditure through buying large amount of agricultural inputs and consumer goods and allocating them to cooperative members at a prices lower than the procurement on individual basis. It is, therefore, recommended that Changwat federations of cooperatives procure agricultural inputs and consumers' goods and distribute them to cooperative member through agricultural cooperatives.

3) Marketing

Strengthening marketing activities is a key element of developing the agricultural cooperative because secure market channel is a basic necessity for production. To this end, agricultural products distribution centers should be developed, consisting of storage, grading and packaging facilities. With a bulk of products, bargaining power can be created and keeping fair transaction is made possible. Through the agricultural products distribution center, products with higher value added are shipped to regional level, wholesale markets, agro businesses and even contract farming.

The agricultural products distribution center in each changwat on their marketing activities in accordance with the types of main products such as rice, maize, and diversified minor crops

4) Farm Guidance

For agricultural diversification and higher productivity, farm guidance is important. The agricultural cooperative should, therefore, provide farm guidance with supporting of extension office. To this end, a subgroup can be a basis of farm guidance because of common interests and situation under the subgroup.

Fig. 10.5 shows proposed activities of agricultural cooperatives and agricultural products distribution center.

5) Mobilization of Contract Farming

The government staff tried to facilitate marketing opportunities through the service of the agricultural cooperatives and/or the farmers' groups. But this was not successful because it did not solve the problems of poor quality products and insufficient agricultural inputs. To solve the product quality problem by investing more on high quality inputs and practicing better post-harvest technology, it needs incentives through higher price received. Likewise, group production planning by farmers may solve the supply fluctuation problem.

In the late 1970s, processors of poultry products, oil seed crops and vegetables in the central, northeastern and northern regions tried to overcome the above-mentioned problems of low quality product and fluctuating supplies by offering contracts to growers.

Contract farming is widely practiced and it was found that many farmers prefer to sell their produce to the contract market in order to assure reasonable prices. In general, farmers alone have no choice to select the kinds of crops to sell by contract; the processing plant has to offer an agreement to them.

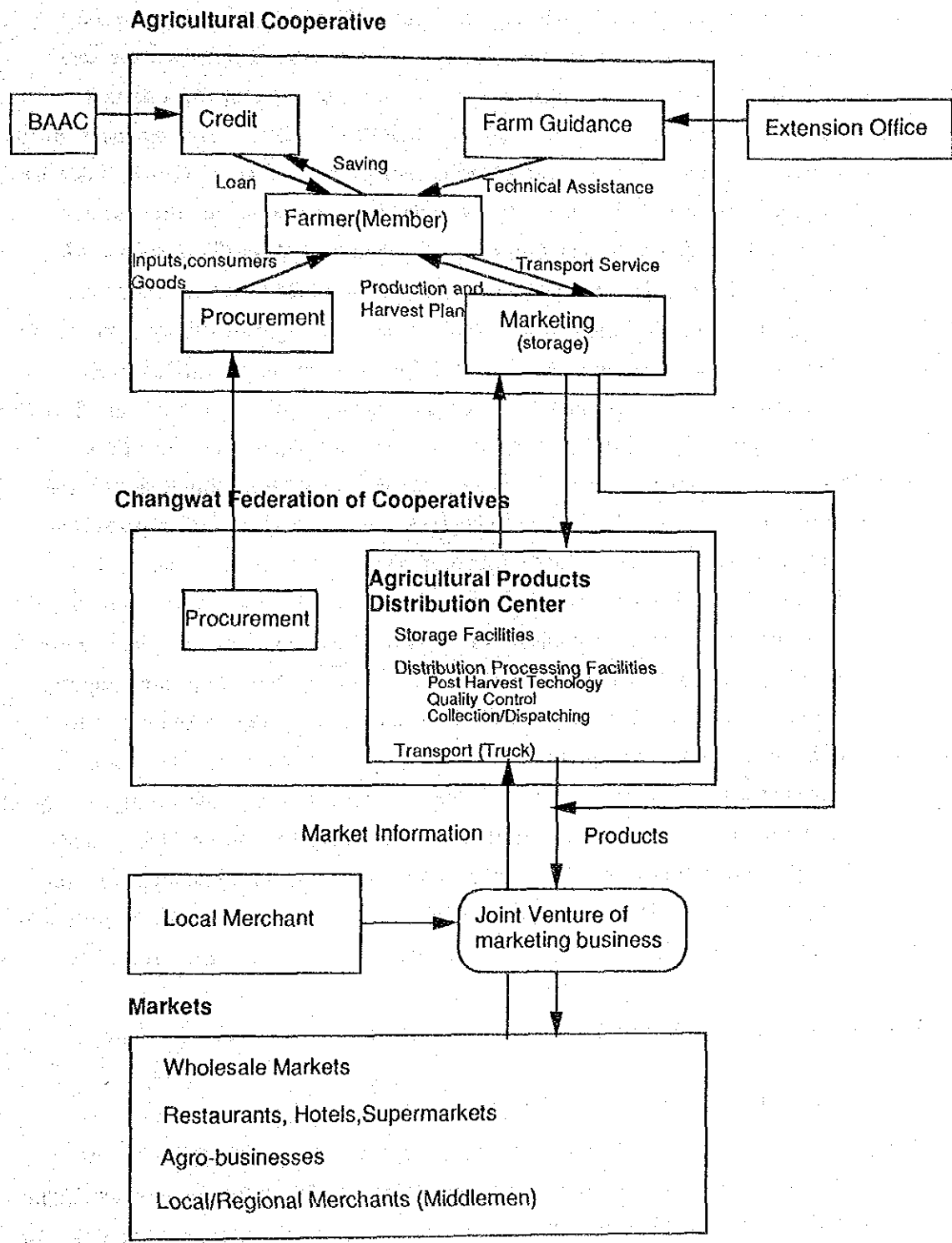


Fig. 10.5 The Concept of the Agricultural Products Distribution Center

At present the contract farming is widely used in the UCR for major crops such as maize, soybean, and rice. The said contract farming group consists of 5 to 20 farmers who normally are BAAC's customers and willing to form up as a special group for the purpose of contract farming activities jointly offered by BAAC and CPP. The business of the group may cover one or more crops at the same time. The full services of the contract farmers group include the provision to the farmer members of 4 items, namely (1) high quality seeds, (2) fertilizer, (3) pesticides, and (4) land preparation service. BAAC is involved in providing up to 30,000 baht group-guaranteed loan to the members for production purpose at 12.50% per annum interest. Agricultural business provides the above 4 services through the operation of BAAC with technical advice on crop production and agrees to buy the members' produce at the guaranteed prices. DOAE is involved in the coordination with Agricultural business and BAAC in the planning, implementing and evaluating processes.

Due to the current rigidity of agricultural cooperatives, the contract farming has not widely prevailed among them, but they are popular among voluntary farmers association. However, the scheme could effectively be combined with agricultural cooperative development because of the effectiveness of the contract farming especially in quick dissemination of the technologies in farming, post-harvesting and simple processing. For this end, however, it is recommended for the government to closely watch the fairness of contract to be maintained between farmers and agri-businesses.

10.5.2 Agricultural Products Distribution Center

1) Strengthening Wholesale Market

For the purpose of establishing the place of fair trade under adequate market information, and providing the stable marketing channels for anyone who brings commodities to wholesalers in markets, strengthening wholesaling market is necessary. Recommendations are the followings:

- Division of wholesale and retail functions,

- Adequate number of buyers and sellers,
- Market regulation on fair transaction,
- Adequate facilities and utilities, and
- Adequate information.

2) Marketing Information System Improvement

Information system consists of information collecting and dispatching systems. Both of them have to be developed simultaneously on the basis of central wholesale market, where marketing information are available and many commodities and people are concentrated.

For the information collection, specific regulations in the market places will be required. Supervisor of market gives registration or permission to the sellers and buyers. In exchange for this, supervisor obliges the sellers and buyers to submit the record of transaction everyday. This system contributes to improving transaction method by disclosing real prices.

For the information dispatch, both sending and receiving sides have to be upgraded. Specific channels of information dispatch are more important than through mass media. Wholesale market should be strengthened as a basis of dispatching information on price, volume and place of origin of products, while farmers groups and agricultural cooperatives have to be developed to be viable receivers of market information.

3) Location

As regional wholesale market, Sara Buri market, Sing Buri market and Ang Thong market should be developed. These markets take the highest place in the hierarchical structure of collecting and dispatching commodities to and from the UCR and some of vicinity areas.

10.5.3 Developing Distribution Center

1) Distribution Facilities Provision

An efficient goods distribution facilities will be required in accordance with the increase of volume of cargo. Systematic transportation consists of the delivery and collection to cover certain areas and the line-haul transportation among the certain areas. For this purpose, distribution center is recommended to cover sub-regional area.

Distribution center consists of storage, sub-regional truck terminal and relevant facilities. Storage aims at keeping industrial products and consumers products for stable supply to the UCR and vicinity areas such as a part of Suphan Buri and a part of Nakhon Nayok. Those commodities coming from the BMR are distributed from the storage under local wholesalers and agents. It is also a place to transfer the goods between truck and wholesale market, and between small and large trucks quickly without damage on commodities.

2) Location

Considering that the UCR is relatively a small area and near Nakhon Sawan and Nakhon Ratchasima which are proposed places of regional truck terminal, the truck terminal in the UCR should be planned with a size sufficient to cover the UCR. And, distribution center must take transportation advantage, so that location of distribution can be ensured with good access to road, railway, Route 1,2 and Asian Highway in particular. Another importance is to maintain existing trading areas. Relationship with other regions and network of cities are also important. From these view point, Ang Thong and Sara Buri are proposed. Ang Thong has close linkages with Suphan Buri at present and, in future, with Sara Buri through East-West Linkage. This linkage will encourage an agro-processing zone to be developed along side. Meanwhile, Asian Highway provides Ang Thong a close connection with the northern region. Ang Thong has a large potential to be a distribution center covering the East-West link and western part of the UCR.

Sara Buri is the core city of the proposed Greater Sara Buri Industrial Core (GSIC) and is a strategic location in view of the northeastern region. The distribution center in Sara Buri will cover the GSIC and the eastern part of the UCR.

10.5.4 Distribution Complex

1) Distribution Complex Development

For fostering distribution industries, two issues are important. One is encouraging the concentration of the agricultural products, and the other is fostering distribution processing industries. Both of them are complementary. Therefore, a distribution complex is recommended for the UCR by utilizing its locational advantages. The distribution complex consists of storage, grading and packaging facilities. Basic concept of the distribution complex is to attain more concentration of goods and create larger value-added.

(1) Grading, Selection and Making up of Agricultural Products

Selecting agricultural products in terms of size, taste and variety will be more demanded from consumers. Also, better appearance of commodity will be more important for marketing. Therefore, it is increasingly important to select, classify and package commodities in accordance with grade and standard.

(2) Packaging Industries Development

Packaging commodities aims at decreasing the damage on commodities, minimizing transport cost and keeping good appearance. Agricultural products coming to the UCR can be diverted to various requirements in terms of market destination, end-user and mode of transport. Regarding the market destination, the BMR and export are considered. Regarding the end-user, there are various kinds of users such as restaurant, hotels, supermarkets and usual market. Regarding the mode of transport, the UCR has options of road, inland waterway and air transport from Don Muang Airport depending on the transport

cost and nature of demand. Therefore, the agricultural products concentrated can be classified and packaged at a minimum cost.

(3) Storage Facilities Development

The vegetables and fruits which have higher value-added than rice, maize and tapioca pellet need good storage facilities for shipment. Cold storage in the UCR could attract various commodities under the situation in which no cold storage facility is available near Don Muang Airport. This function is supposed to be combined with other facilities and services to be made available here such as packaging, selection, grading and inspection.

2) Location

Tha Rua is the best location for developing the distribution complex, because the export-oriented agricultural products have traditionally been concentrated there on the basis of inland waterway transport. Tha Rua is also an important element of the GSIC and the East-West Link passes there to connect Tha Rua directly with Sara Buri as well as Ang Thong/Suphan Buri.

11. URBAN AND HUMAN SETTLEMENT DEVELOPMENT

11.1 Urbanization and Migration

Pattern of national urbanization which has long been predominated by urban primacy of Bangkok shows symptoms of new change. One is that the growth pole policy which has been stressed in the 5th National Five-Year Plan has started to bear its fruits. Population of regional urban growth centers is now growing at a rapid rate (see Table 1.2). The other is that population growth within Bangkok Metropolis is decelerating while the immediate surroundings of Bangkok Metropolis started to show a rapid population growth within the BMR. This trend is observed outside the BMR as well, though to a less extent (see Fig. 11.1).

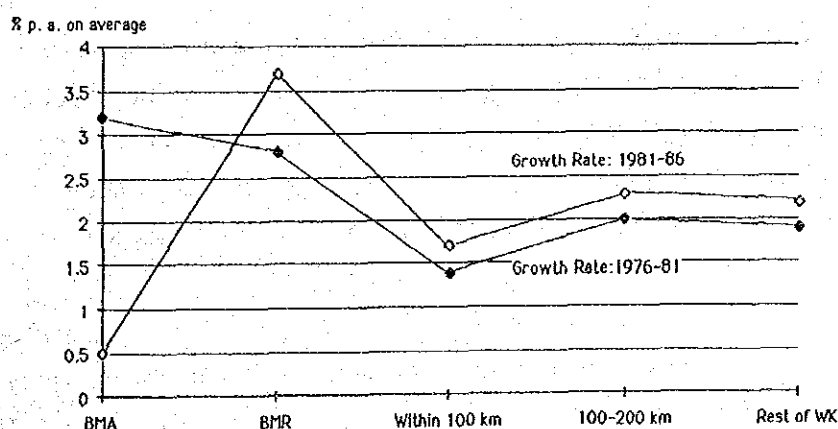


Fig. 11.1 Population Changes According to Distance from Bangkok

From the standpoint of the UCR, however, these new symptoms have not brought about significant changes in the region. Though the UCR is a region, it does not have a viable regional growth center. Secondly, the UCR economy has been less active than the eastern and western regions.

Urbanization in the UCR will thus have much to do with the national urban policies to encourage growth of a series of the cities at the levels lower than those which growth pole policy has aim at. At the same time, the urbanization in the UCR will be subject to the future pattern of urban expansion of the BMR.

Urban population in the UCR in 1987 is about 742 thousand, or 27% of the total, which is lower than the national average being 30%. On the other hand, the annual growth rate of urban population in the UCR between 1981 and 1987 was just 0.56% per annum on the average which is significantly lower than that in the total population in the UCR, 1.16% per annum as shown in Table 11.1. The urban population, therefore, is assumed to be migrating out at a rate higher than that of the rural population.

This stagnant trend is attributed mainly to the laborer's out-migration and the unstable employment structure which is inherently characterized by natural conditions of the Chao Phraya Delta.

All Changwats in the UCR have suffered from out-migration since the 1950s. Particularly four Changwats located in the Chao Phraya Delta, Ayutthaya, Chai Nat, Sing Buri and Ang Thong, have been situated at the outstanding out-migrating areas in the nation (see Table 11.2). Recent population change within the UCR indicates that this trend has still been continuing (see Fig.11.2).

The Fig. 11.2 also indicates that, among the areas in Chao Phraya Delta, population decrease is significant especially in the areas close to the BMR and that population is increasing in the areas with good access to major urban centers and those with high potential of agricultural diversification.

Table 11.1 Urbanization In the UCR In 1981 and 1987

	No. of Centers	Urban Population		Growth Rate (% p.a.)	Population 1987	Urban Pop. Ratio 1987
		1981	1987			
Chai Nat	8	38,281	36,742	-0.68%	344,362	10.7%
Municipalities	2	18,670	18,094	-0.52%		
Sanitary Dst.	6	19,611	18,648	-0.84%		
Sing Buri	7	64,241	67,513	0.83%	220,066	30.7%
Municipalities	1	18,241	30,369	8.87%		
Sanitary Dst.	6	46,000	37,144	-3.50%		
Ang Thong	9	67,960	70,969	0.72%	273,623	25.9%
Municipalities	2	20,123	19,927	-0.16%		
Sanitary Dst.	7	47,837	51,042	1.09%		
Ayutthaya	23	201,285	227,867	2.09%	670,598	34.0%
Municipalities	3	63,800	75,296	2.80%		
Sanitary Dst.	20	137,485	152,571	1.75%		
Lop Buri	13	121,075	133,284	1.61%	720,591	18.5%
Municipalities	3	52,695	52,198	-0.16%		
Sanitary Dst.	10	68,380	81,086	2.88%		
Saraburi	20	224,459	205,513	-1.46%	511,737	40.2%
Municipalities	4	117,062	114,181	-0.41%		
Sanitary Dst.	16	107,397	91,332	-2.66%		
UCR Urban Population	80	717,301	741,888	0.56%	2,740,977	27.1%
Municipalities	14	290,591	310,065	1.09%		
Sanitary Dst.	65	426,710	431,823	0.20%		
UCR Total Population (thousand)		2,557	2,741	1.16%		
UCR Urban Pop. Ratio (%)		28.1%	27.1%			

Source: Department of Local Administration, Ministry of Interior

Table 11.2 Inter-Changwat Migrants (Net)

Rank	1955~60			1965~70			1975~80		
	Code	Changwat	Prs.	Code	Changwat	Prs.	Code	Changwat	Prs.
1	101	Phra Nakhon-Thon Buri	68,479	101	Phra Nakhon-Thon Buri	168,219	101	Phra Nakhon-Thon Buri	170,400
2	215	Udon Thani	35,485	206	Hong Khai	40,182	117	Samut Prakan	42,759
3	409	Phetchabun	19,826	401	Kamphaeng Phet	39,521	103	Nonthaburi	31,897
4	118	Lop Buri	17,833	409	Phetchabun	29,134	401	Kamphaeng Phet	21,076
5	401	Kamphaeng Phet	15,317	110	Chon Buri	24,085	104	Pathum Thani	19,824
6	206	Hong Khai	13,855	215	Udon Thani	24,080	110	Chon Buri	16,020
7	402	Chiang Rai	13,012	117	Samut Prakan	21,258	111	Chanthaburi	9,723
8	203	Chaiyaphum	12,223	126	Rayong	20,376	109	Kanchanaburi	8,132
9	113	Prachuap Khiri Khan	8,803	402	Chiang Rai	17,507	311	Songkhla	7,351
10	313	Yala	8,707	113	Prachuap Khiri Khan	15,383	313	Yala	6,816
11	110	Chon Buri	8,616	210	Loei	14,963	113	Prachuap Khiri Khan	6,719
12	103	Nonthaburi	4,713	103	Nonthaburi	11,932	304	Phangnga	6,503
13	309	Trang	4,302	310	Satun	11,927	403	Chiang Mai	6,494
14	314	Narathiwat	3,647	212	Sakon Nakhon	9,194	123	Trat	5,856
15	210	Loei	3,535	111	Chanthaburi	9,111	125	Prechin Buri	5,659
16	303	Surat Thani	2,700	313	Yala	8,199	306	Phuket	5,188
17	301	Chumphon	2,487	304	Phangnga	7,217	206	Hong Khai	4,012
18	404	Tak	2,378	123	Trat	7,097	314	Narathiwat	3,824
19	414	Sukhothai	2,334	403	Chiang Mai	6,172	408	Phitsanulok	3,374
20	403	Chiang Mai	2,329	109	Kanchanaburi	6,120	210	Loei	3,245
21	408	Phitsanulok	1,504	301	Chumphon	5,708	301	Chumphon	3,144
22	307	Krabi	1,448	307	Krabi	5,518	126	Rayong	2,917
23	111	Chanthaburi	1,269	408	Phitsanulok	5,373	115	Samut Sakhon	2,657
24	126	Rayong	1,125	302	Ranong	3,948	307	Krabi	2,488
25	125	Prechin Buri	1,096	204	Nakhon Phanom	2,758	404	Tak	1,970
26	415	Uttaradit	836	207	Buri Ram	2,671	302	Ranong	1,851
27	302	Ranong	759	303	Surat Thani	2,543	417	Phayao	958
28	304	Phangnga	260	314	Narathiwat	2,009	411	Mae Hong Son	328
29	123	Trat	161	411	Mae Hong Son	1,921	416	Uthai Thani	150
30	310	Satun	140	306	Phuket	1,526	310	Satun	-4
31	306	Phuket	-28	118	Lop Buri	738	105	Nakhon Pathom	-510
32	411	Mae Hong Son	-141	404	Tak	102	124	Saraburi	-849
33	109	Kanchanaburi	-364	416	Uthai Thani	-617	415	Uttaradit	-1,241
34	212	Sakon Nakhon	-495	309	Trang	-753	409	Phetchabun	-1,856
35	308	Phatthalung	-723	415	Uttaradit	-881	406	Itan	-2,390
36	207	Buri Ram	-866	125	Prechin Buri	-1,327	410	Phree	-2,421
37	406	Nan	-1,069	203	Chaiyaphum	-2,041	413	Lamphun	-3,465
38	124	Saraburi	-1,143	406	Nan	-2,415	303	Surat Thani	-3,612
39	204	Nakhon Phanom	-1,519	104	Pathum Thani	-2,890	118	Lop Buri	-3,642
40	416	Uthai Thani	-2,289	414	Sukhothai	-4,881	108	Sing Buri	-4,034
41	117	Samut Prakan	-2,561	410	Phree	-5,132	212	Sakon Nakhon	-4,175
42	115	Samut Sakhon	-2,618	115	Samut Sakhon	-5,943	312	Pattani	-4,672
43	122	Nakhon Hayok	-2,813	308	Phatthalung	-6,381	412	Lampang	-4,730
44	311	Songkhla	-3,092	107	Phetchaburi	-6,765	106	Ratchaburi	-5,132
45	104	Pathum Thani	-3,629	413	Lamphun	-6,808	309	Trang	-5,188
46	405	Nakhon Sawan	-3,766	108	Sing Buri	-6,915	114	Chachoengsao	-5,232
47	116	Samut Songkhram	-4,083	312	Pattani	-7,732	414	Sukhothai	-5,251
48	108	Sing Buri	-4,341	311	Songkhla	-8,666	203	Chaiyaphum	-5,536
49	410	Phree	-4,438	205	Nakhon Ratchasima	-9,266	107	Phetchaburi	-6,650
50	106	Ratchaburi	-4,912	116	Samut Songkhram	-10,100	204	Nakhon Phanom	-6,766
51	412	Lampang	-5,072	122	Nakhon Hayok	-10,788	122	Nakhon Hayok	-7,015
52	107	Phetchaburi	-5,331	211	Si Sa Ket	-11,084	121	Ang Thong	-7,130
53	413	Lamphun	-5,461	412	Lampang	-11,288	116	Samut Songkhram	-7,580
54	121	Ang Thong	-6,441	121	Ang Thong	-11,512	207	Buri Ram	-7,747
55	105	Nakhon Pathom	-6,836	106	Ratchaburi	-11,516	308	Phatthalung	-7,984
56	312	Pattani	-7,440	124	Saraburi	-11,922	405	Nakhon Sawan	-8,157
57	112	Chai Nat	-8,124	201	Kalasin	-13,707	216	Yasothon	-8,700
58	201	Kalasin	-8,288	213	Surin	-16,927	402	Chiang Rai	-9,561
59	305	Nakhon Si Thammarat	-8,325	112	Chai Nat	-18,594	201	Kalasin	-9,676
60	407	Phichit	-8,710	105	Nakhon Pathom	-21,888	112	Chai Nat	-9,906
61	114	Chachoengsao	-8,998	114	Chachoengsao	-22,751	205	Nakhon Ratchasima	-12,167
62	211	Si Sa Ket	-10,618	214	Ubon Ratchathani	-23,971	211	Si Sa Ket	-12,885
63	119	Suphan Buri	-11,004	405	Nakhon Sawan	-26,326	407	Phichit	-13,063
64	213	Surin	-11,632	305	Nakhon Si Thammarat	-27,248	208	Maha Sarakham	-14,605
65	202	Khon Koen	-12,979	208	Maha Sarakham	-27,754	213	Surin	-17,677
66	205	Nakhon Ratchasima	-13,780	119	Suphan Buri	-29,845	119	Suphan Buri	-18,991
67	214	Ubon Ratchathani	-14,458	407	Phichit	-30,308	215	Udon Thani	-21,346
68	120	Ayutthaya	-17,093	120	Ayutthaya	-33,612	120	Ayutthaya	-22,538
69	208	Maha Sarakham	-17,870	209	Roi Et	-36,598	202	Khon Koen	-22,872
70	209	Roi Et	-23,759	202	Khon Koen	-40,032	305	Nakhon Si Thammarat	-23,974
71	-	-	-	-	-	-	209	Roi Et	-26,729
72	-	-	-	-	-	-	214	Ubon Ratchathani	-33,678

Source : Population and Housing Census, NSO

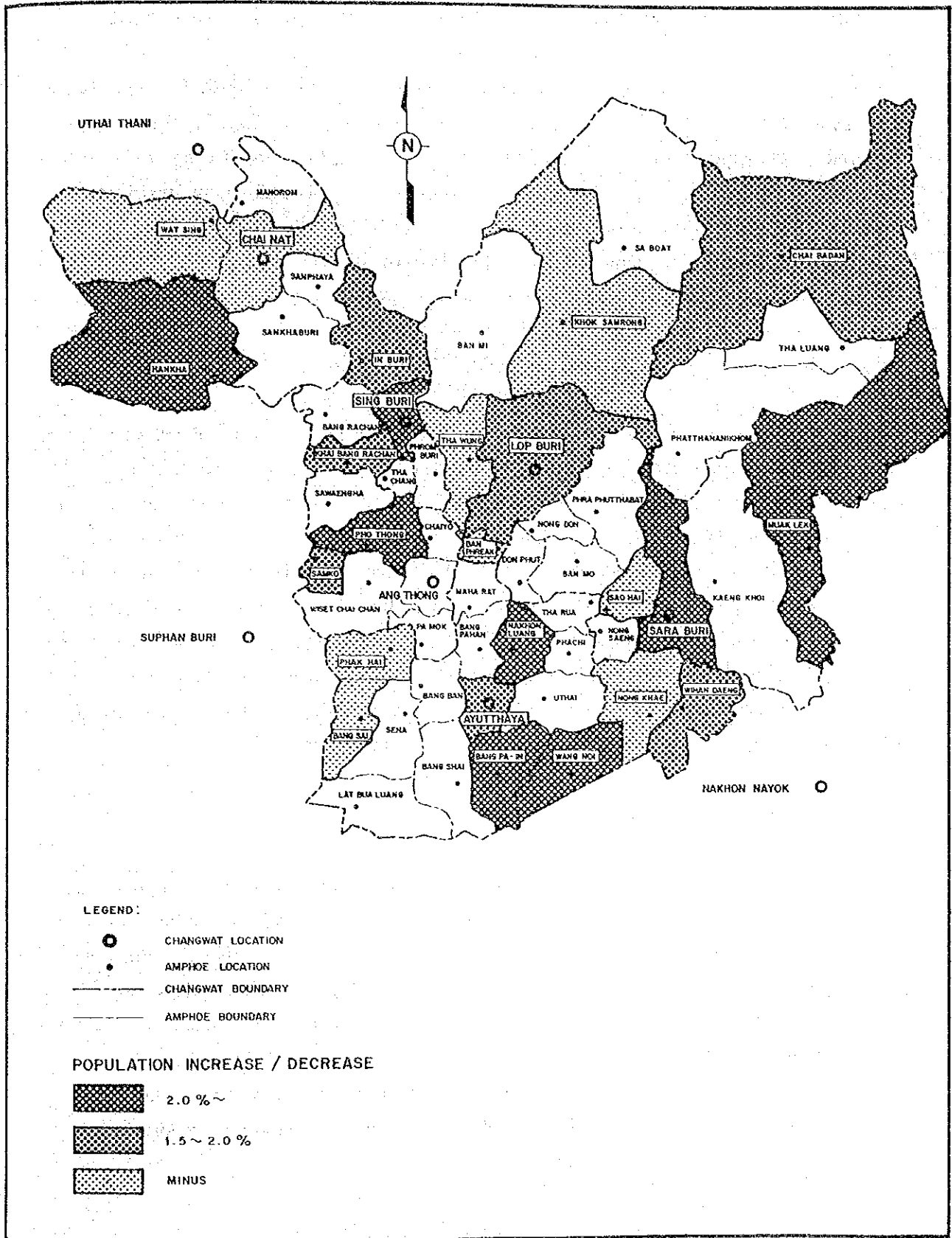


Fig. 11.2 Population Change in UCR : 1982-1987

11.2 Key Issues on Urban and Human Settlement Development

Urban centers are strengthened for two economic reasons in general : one is to support the agricultural and industrial activities, and the other is to increase job opportunities in service sector. Through strengthening of service sector's activities, the regional economy will become more resilient, stable and capable to attract more economic activities, thereby providing a favorable cycle for regional growth. In view of present pattern of urbanization, the following are key issues for urban development in the UCR.

1) Strengthening of the Service Sector Economy in the UCR

Weakness of the service sector economy will be a critical constraint for UCR development. According to the 1987 GDP data, per capita service sector output at 1987 prices is about 9,700 baht in the UCR, compared with 62,710 baht in the BMR and 13,030 baht in the whole nation. The relative size of service sector in UCR economy is only 15% of that in the BMR, and three quarters of that in the nation. The UCR is considerably dependent upon Bangkok economy due to its proximity, and has not developed its own service sector. The ultimate result is the immaturity of urban activities within the UCR. Strengthening of the service sector economy is a substantial issue for UCR development.

2) Stimulation of Existing Potentials and Functions

Existing accumulation of urban economies should be more stimulated, because it must be a seed for further growth. Looking at the per capita output (GRP) by sector, the sectors which are comparatively intensive in the UCR are "mining and quarrying", "public administration and defence", and "electricity & water supply". On the other hand, the comparatively weak sectors are "manufacturing", and "banking & financing". A comparison of the per capita output by sector in the UCR can be seen in Table 11.3. The sectors with comparative predominance are :

- Mining and quarrying sector in Sara Buri;
- Manufacturing sector in Sara Buri;
- Construction sector in Chai Nat and Lop Buri;

Table 11.3 Comparison of Per Capita GRP by Sector in the UCR in 1986

1) Baht at 1986 Prices

	UCR	Sara Buri	Lop Buri	Sing Buri	Chai Nat	Ang Thong	Ayutthaya
AGRICULTURE	3,329	3,738	3,260	3,359	4,779	3,208	2,386
MINING AND QUARRYING	1,112	5,084	119	118	30	696	198
MANUFACTURING	1,712	5,010	456	1,557	639	305	1,720
CONSTRUCTION	799	834	960	566	1,560	477	416
ELEC. & WATER SUPPLY	574	1,541	331	288	141	345	508
TRANSPORT AND COMM.	1,489	1,183	1,415	2,188	1,038	2,495	1,395
WHOLESALE, RETIAL TRADE	3,752	3,815	3,622	3,996	3,566	4,199	3,676
BANKING, INSURANCE	881	966	760	1,246	793	936	850
OWERING OF DWELLINGS	297	295	296	318	306	306	283
PUBLIC ADMI. AND DEFENCE	1,169	1,087	1,723	962	1,355	812	754
SERVICES	1,360	1,490	1,082	2,026	1,664	1,269	1,223
Total	16,473	25,042	14,024	16,624	15,870	15,048	13,408

2) Specific Coefficient to the UCR Average

	UCR	Sara Buri	Lop Buri	Sing Buri	Chai Nat	Ang Thong	Ayutthaya
AGRICULTURE	1.0	1.1	1.0	1.0	1.4	1.0	0.7
MINING AND QUARRYING	1.0	4.6	0.1	0.1	0.0	0.6	0.2
MANUFACTURING	1.0	2.9	0.3	0.9	0.4	0.2	1.0
CONSTRUCTION	1.0	1.0	1.2	0.7	2.0	0.6	0.5
ELEC. & WATER SUPPLY	1.0	2.7	0.6	0.5	0.2	0.6	0.9
TRANSPORT AND COMM.	1.0	0.8	0.9	1.5	0.7	1.7	0.9
WHOLESALE, RETIAL TRADE	1.0	1.0	1.0	1.1	1.0	1.1	1.0
BANKING, INSURANCE	1.0	1.1	0.9	1.4	0.9	1.1	1.0
OWERING OF DWELLINGS	1.0	1.0	1.0	1.1	1.0	1.0	1.0
PUBLIC ADMI. AND DEFENCE	1.0	0.9	1.5	0.8	1.2	0.7	0.6
SERVICES	1.0	1.1	0.8	1.5	1.2	0.9	0.9
Total	1.0	1.5	0.9	1.0	1.0	0.9	0.8

Source : NESDB

- Electricity and water sector in Sara Buri;
- Transport and communication sector in Ang Thong and Sing Buri;
- Wholesale and retail sector in Sing Buri and Ang Thong
- Banking and insurance sector in Sing Buri; and
- Public administration sector in Lop Buri and Chai Nat.

These characteristics will imply a general direction of the urban development in each center. Development policies may place emphasis basically on these comparatively predominant activities.

3) Creation of Business Investment Opportunities

Looking at the regional money flow in terms of the deposit-to-credit ratio (D/C ratio), the D/C ratios in the UCR were always more than a unity (1.0), as shown in Table 11.4 and Fig. 11.3. In the nation as a whole, the D/C ratios have been over the unity since 1981 along with economic growth. From a macro-economic point of view, this proves a fact that the savings in Thailand have boosted Thai economy. However, in the regional context, this table implies another structure of regional money flows.

The D/C ratios in the UCR were always significantly larger than those in the BMR and even the other regions. This means that the UCR are always the saving area, and the money is not invested in the UCR. In other words, money deposited in the UCR is floating out and utilized in the BMR rather than in the UCR. The conceivable reason would be that there are less business investment opportunities in the UCR. Creation of business opportunities is needed. In the regional context, the amount of the regional credits, which would bear larger deposits in turn, may be great to initiate regional economic growth.

4) Provision of Supporting Functions for Agriculture

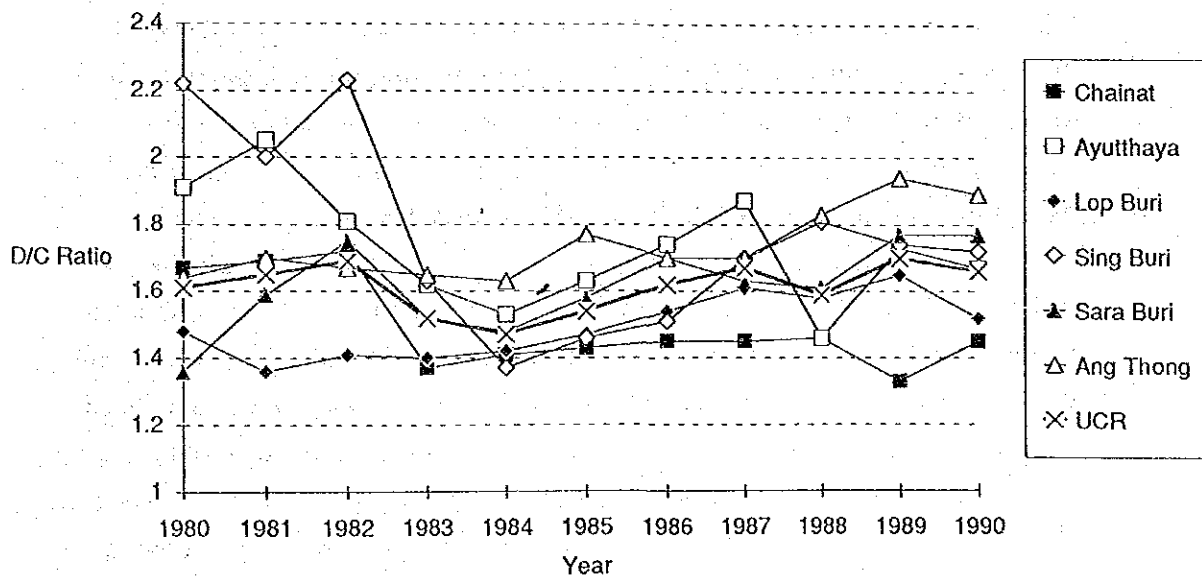
Since the UCR is based inherently on agriculture, the urban sector's primary function is to make the market distribution of agricultural products more efficient, by strengthening the potential marketing centers such as Sara Buri, Ang Thong, and Sing Buri, related to other

Table 11.4 Regional Money Flow (Regional Comparison in Deposit-to-Credit Ratios)

	W. Kingdom	BMR	Central	North	Northeast	South
1980	0.98	0.83	1.46	1.39	1.69	1.46
1981	1.01	0.87	1.52	1.34	1.45	1.47
1982	1.07	0.93	1.61	1.39	1.36	1.43
1983	1.01	0.90	1.39	1.23	1.13	1.32
1984	1.04	0.96	1.35	1.18	1.13	1.32
1985	1.06	0.96	1.46	1.17	1.21	1.42
1986	1.15	1.05	1.58	1.30	1.31	1.51
1987	1.11	1.01	1.60	1.34	1.30	1.46

Source: Bank of Thailand

Notes: All banking institutions are included.



Source: Bank of Thailand

Notes: All banking institutions are included.

Fig. 11.3 Comparison in Deposit-to-Credit Ratios in the UCR

sub-marketing centers. At the same time, agricultural inputs including capital, information, machinery and parts should be supplied through the urban economies.

5) Provision of Job Opportunities

Looking at the farmers' household income in the UCR, average net income per family amounts to 29,168 baht at 1986 prices, of which 17,578 baht, or 60%, comes from non-farming sources. This implies that farmers' demand for the employment outside agriculture may quite be strong. In addition, the demand for work to compensate the seasonal unemployment in the agricultural sector should be taken into account in regional cities. If regional cities in the UCR are not able to accommodate this demand, the migration to Bangkok will continue unabated.

We predict that the number of jobs in the service sector will be about 929 thousand, compared with 578 thousand at present. Thus, about 351 thousand jobs should additionally be created in the service sector, most of which will be provided in the urban areas.

6) Activation of Inter-regional Economic Transactions

Although the UCR is located at the gateway to the Bangkok as well as the northern and northeast regions, as far as the goods transport flows are viewed, the UCR's inter-regional economic transactions have not been activated yet, but have functioned as merely a mineral material supplier.

Looking at the present pattern of goods transport, the major commodities transported from the UCR to Bangkok is "earth, sand and gravel" (50.9% of the total), followed by "cement" (18.7%) and "rice" (15.6%). The share of these three commodities was more than 85%. On the other hand, major commodities transported from Bangkok to the UCR were "petroleum products" (29.6% of the total) and "manufacturing goods" (25.7%). Thus the UCR is a material supplier of limited mineral-related materials. A more diversified economic relation to Bangkok needs to be formed through the regional economic diversification.

7) Development of Basic Infrastructures

One of the most crucial urban problems is floods in the cities located alongside Chao Phraya River : Ang Thong, Sing Buri, Chai Nat and the other sanitary districts. Significant economic damages in these centers occasionally happen. Development of drainage systems and banks which are necessary to protect those damages should be undertaken with the first priority.

Basic utilities such as sewage and solid waste treatment systems are also important because the water quality of all the rivers must not be worsen anymore.

8) Provision of Social Services

Cities must provide the social services to cope with socio- economic requirements : commercial, social, medical, educational, and recreational facilities. These necessary public amenities must be developed to assure a "social infrastructure", which is a basic need to attract industries and related business. The development of all the Changwat centers, at least, needs to highlight this aspect, and the higher potential centers such as Ayuthaya, Sara Buri and Lop Buri should be provided with higher standard social services.

11.3 Urbanization Projection

Based on the macro economic targets, in which manufacturing and service sectors are aimed to boost the regional economy, about 1,339 thousand jobs will be provided for these two sectors, compared with the present number of 741 thousand. Urban population must expand for absorbing this employment. According to our projection of urban population, about 1,288 thousand people will live in the urban areas in 2010, an increase of about 546 thousand after 1987, as shown in Fig. 11.4. The urbanization, in terms of urban population ratio, will be 37.2% in 2010 with an average annual growth rate of 2.5%, compared with 1.1% in the UCR. This projection implies that since urban growth rate will be higher than that in the total population, population concentration in the urban areas will take place in the UCR. Looking at the distribution pattern of the projected urban population, it provides the

following implications in terms of urbanization structure in the UCR as follows:

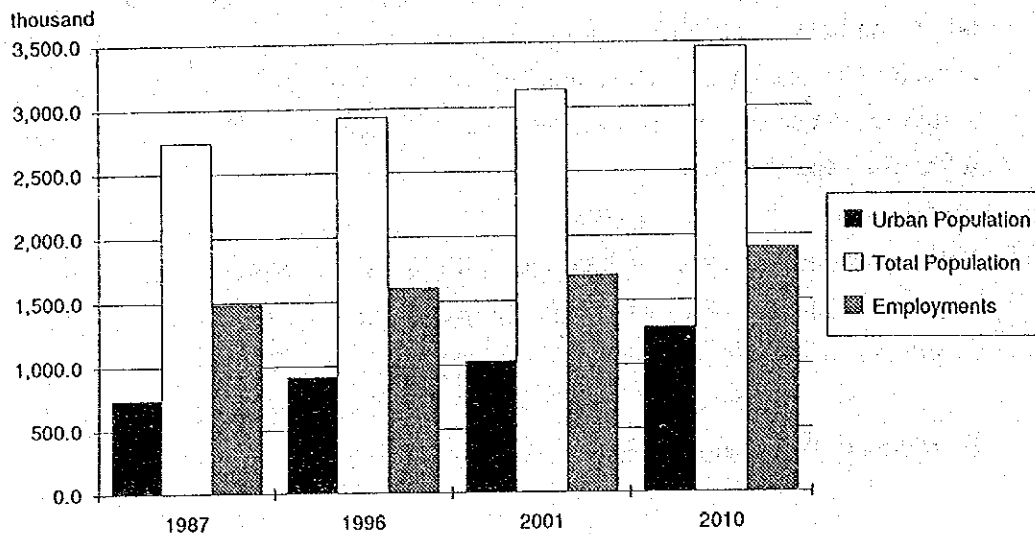


Fig. 11.4 Projection of Urbanization in the UCR

- (1) Sara Buri and Ayutthaya Municipalities will become major urban centers with more than 140 thousand population and 130 thousand population respectively in 2010. Both will function as sub-regional centers to support urbanization and industrialization in the UCR. However, both will confront a serious urban problem of the provision of public services and land to accommodate increased population. This problem will be serious particular in Ayutthaya Municipality, due to its limited municipal territory.
- (2) As a significant service center for upland agricultural development, Lam Na Rai (Lop Buri) will grow rapidly, and will have 70 thousand population in 2010, compared with 26 thousand population at present. This center is a sanitary district, but will meet the municipal criteria soon. The administrative arrangement for shifting it to a municipality will be needed. Similarly the following eleven (11) sanitary districts will meet the municipal criteria in 2010 : San Chao Rong Thong (Ang Thong), Tha Luang (Ayutthaya), Bang Len (Ayutthaya), Pak Hai (Ayutthaya), Bang Shai (Ayutthaya), Nong Muang (Lop Buri), Kok Toom