2.2 Strategic Industries and Profile of Strategy for their Development

(Summary)

In drafting a vision for industry and a strategy for industrial development focused on the manufacturing sector, Myanmar must directly address the questions of which industries it should foster as strategic industries for the future and which industries have the greatest potential for expansion and development. An analysis of the current status of individual industries (except for the garment and footwear industries) and the issue of industry growth strategies do not, however, fall within the scope of this study project; small-scale master plans have been written separately for the first two industries. The relatively small weight of the manufacturing sector within the country's overall industrial structure and the inadequate awareness among policy development and industrial circles of the importance of analyzing data on individual industries and drafting strategies on that basis have resulted in a severe shortage of information on conditions in individual industries.

While it is assumed that the government does have access to a certain amount of data and reference materials via SOEs, industry associations, and its own independent studies, the vast majority of these data/materials are shared only among an extremely small number of executives and this project was unable to obtain access to these. Intermediate- to long-term plans for major industries spanning the next twenty years or more have also been drafted by or for the government, but these were also not available to this project.

Basic information on conditions and trends in individual industries was thus not obtainable but, using information and materials acquired through interviews conducted with private sector companies, we conducted an analysis of several strategic industries from the perspective of current conditions and development conditions/opportunities for the future are able to conduct. The shortage of basic information on specific industries within the manufacturing sector made it difficult to rationally determine which industries to select as strategic industries but, judging that the fundamental approach to industry selection described below was important, we chose a number of representative industrial sectors in accordance with this fundamental approach and examined strategic measures for their development.

Given the extremely great need to work out a short- to intermediate-term export-oriented policy to break out of the vicious cycle generated by a shortage of foreign currency, priority is likely to be given to expectations of fostering or developing export industries and industries having a great potential for obtaining foreign currency. Even more preferable would be export industries established in those areas in which Myanmar has a comparative advantage. The progressing liberalization of industry in Myanmar through the AFTA within ASEAN and the FTA agreement between China and ASEAN will also no doubt prompt an industrial reorganization in the country that favors industries with comparative advantage. Consequently, as one criterion in selecting industries, top priority from the standpoint of the manufacturing sector should be given to

* 1 "labor-intensive and resource-intensive" industries in which Myanmar enjoys a comparative advantage.

These labor-intensive industries include the electronic component assembly industry as well as the garment and footwear industries, while resource-intensive industries comprise mineral resource industries such as natural gas, copper, and gemstone processing, as well as agricultural, forestry, and fisheries-related industries such as marine products processing and woodworking. Food processing might also have future potential as an industry with comparative advantage, though exports are difficult at present given the level of management know-how. While not part of the manufacturing sector, the tourism industry built on tourism resources is also very important.

On the one hand, agriculture accounts for a high proportion of Myanmar's GDP, and the country could potentially enjoy a high comparative advantage in this agriculture. The development of the agricultural sector itself will depend on a radical improvement in productivity, however, and it is difficult to determine its future potential in light of present circumstances; nevertheless, the development potential of "agro-based industries" (manufacturing sector) is perhaps another important topic for examination. In selecting industries from this standpoint, priority should be given to

* 2 "agro-based industries," seen by the government, too, as the core of industrial development

from the perspective of enhancing the manufacturing sector and enabling these industries to pursue export business.

There is an extremely great need in the short to intermediate term to utilize the technology, sales, and management capabilities of foreign companies in promoting these export industries grounded on comparative advantage. Consequently,

* 3 the possibility of utilizing foreign companies

will likely become another important criterion in selecting strategic industries.

The electronics, garment, footwear, natural gas, copper, gemstone processing, marine products processing, woodworking, food processing, and tourism industries are all industries that could very likely utilize foreign capital. In making use of such foreign capital, these industries will need to join in the trend towards industrial reorganization taking place within ASEAN and participate in international production networks. In the international production networks within ASEAN, there is a tendency for labor-intensive industries to relocate from higher-income countries such as Singapore, Malaysia, and Thailand to lower-income countries. This can be seen, for example, in the electronic components industry. Myanmar should actively try to attract companies from the electronic component assembly industry and should promote participation in international production networks.

Progress in attracting FDI and training personnel will lead to the development of skill-intensive industries as the core of Myanmar's future manufacturing industry, which in turn will open up the possibility of moving ahead to technology-intensive industries such as the machinery, electronic component processing, and electronics and electrical industries. In

other words, strategic industries should be selected with the aim of

* 4 increasing the sophistication of industry over the intermediate to long term.

While the likelihood for this in the short term is low in such industries as garment and footwear, the electronics industry and others could achieve greater sophistication from a technological perspective, and industries such as the machinery industry that could become more advanced through the formation of industrial clusters are of great strategic value. The plastics industry is important from the perspective of supporting a broad range of other industries, and the software industry from the perspective of forming new industries.

In the intermediate to long term the development of industries oriented toward meeting domestic demand will likely also become an important issue. Many industries could be expected to develop from the perspective of

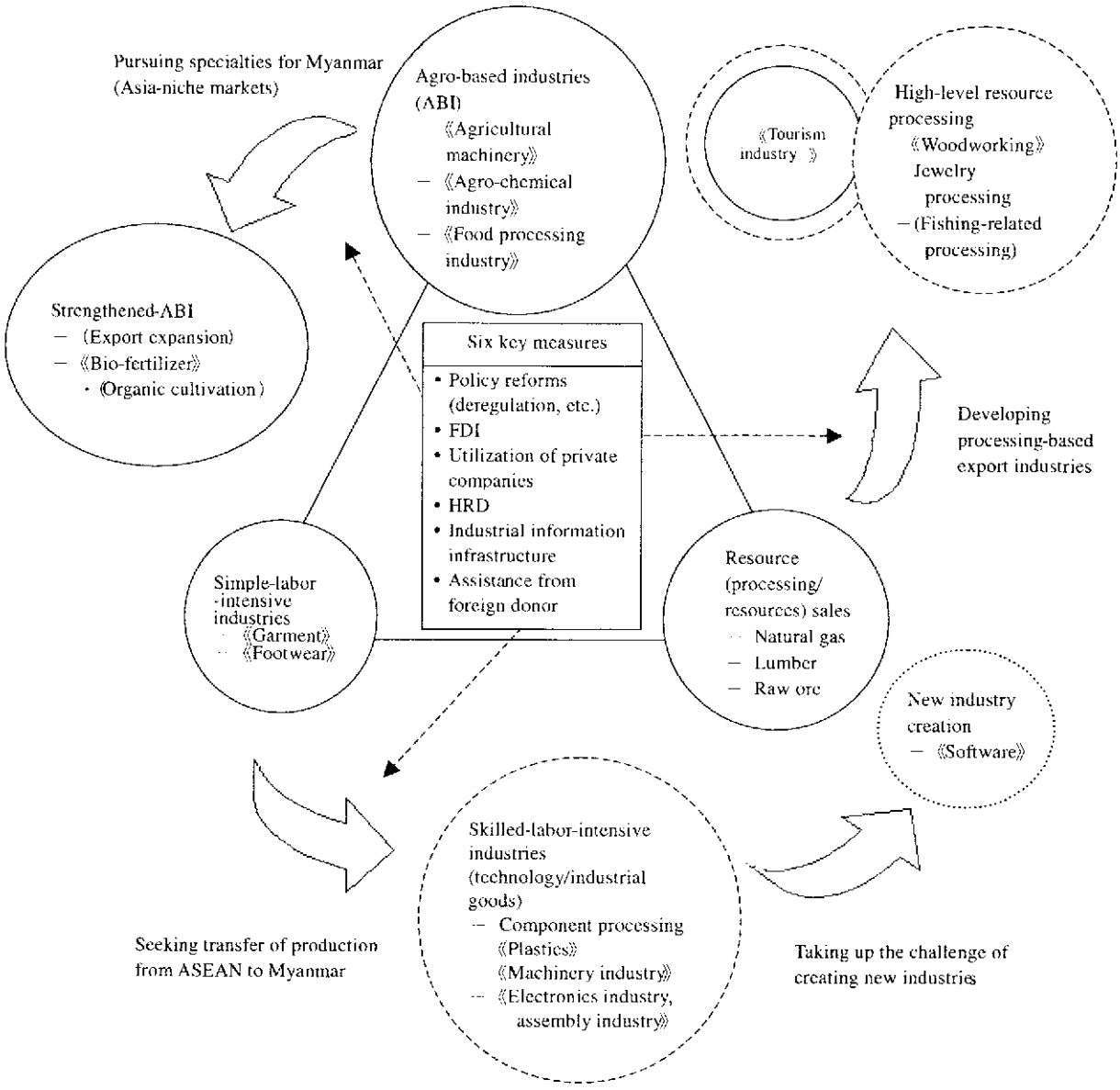
* 5 improving the people's livelihood and building social infrastructure for Myanmar in future.

Another important criterion for selecting industries is ensuring a balance vis-à-vis the development of export-oriented industries in the short to intermediate term in order to achieve a more stable industrial structure. Development should also be pursued in basic industries such as food processing to meet domestic demand and cement to support domestic construction. Local private companies should perhaps play the key roles in these industries. Even in those industries in which there is little choice for the time being but to allow state-owned enterprises (SOEs) to continue playing the dominant role, policy management should be conducted with a view to transferring this role to private companies over the intermediate to long term.

The example industries covered in this study have been selected in accordance with the ideas described above. In making specific selections, priority are given to "industries in which private companies are the key players or in which they could grow into key players in future." For instance, there are some industries such as the urea fertilizer industry, an agro-based industry, with a fixed segregation of niches between SOEs and the private sector—100% of production is in fact carried out by SOEs (with this SOE production also sold by SOEs) with private sector imports accounting for 90% of sales to meet domestic demand—offering little possibility that the private sector would be able to participate in production, but at the same time there are also industries such as the plastics industry driven by the private sector (though raw material imports are 100% under government regulation) in which SOEs produce products inferior in quality competitiveness to private companies and essentially sell a portion of these products as recycling material to the private sector (the portion thus sold can be considered a social loss). A variety of formats are apparent in different industries.

Prepared with a particular focus on industries from the perspective of industry selection discussed thus far, the diagram below depicts the directions of industry development in Myanmar.

Figure 2-11 Directions of Industry Development in Myanmar



Source: JICA Study Team

The diagram offers an overview by industry group of the directions of Myanmar's industrial development. Broadly dividing industries into three groups—agro-based industries, which are the principal constituent of GDP, the garment and footwear industries, whose competitiveness derives from cheap labor cost and the simple-labor-intensive nature of the

work, and resource industries, whereby the country's plentiful natural resources are mainly exploited for domestic use and export—the diagram shows what direction of development would be desirable for each industry group and whether it can be reasonably expected to achieve this development.

Separate materials (5-10 pages for each industry) have been compiled for the industries shown in double brackets in the diagram—agro-chemical, agricultural machinery, bio-fertilizer, food processing, garment, footwear, plastics, machinery, electronic components and assembly, natural gas, marine products and supporting, woodworking, construction, software, tourism industry, etc.—providing an overview of the industry and describing the problems faced at present and the conditions/opportunities for development. As was mentioned earlier, a detailed analysis of the garment and footwear industries and policy proposals for industry development have been provided in a separate chapter. Here we shall restrict our discussion to several other industries are highlighted.

The food processing industry is a key industry holding the largest single share of Myanmar's manufacturing output. Estimates put the number of food processing companies between 20,000 to 30,000 (depending on the statistical data used), and their production accounts for around 75% of the total for the manufacturing sector. A considerable portion of this production involves the primary processing of materials: rice polishing, oil refining, flour milling, sugar processing, etc. Facility-intensive products such as liquors and other spirits, beer, soft drinks, and instant noodles are mostly supplied by medium- and large-sized companies such as joint ventures between SOEs and private companies, while bread, ham, sausage, dairy products, and similar foodstuffs are supplied mainly by small companies. Many food processing industries do not have export competitiveness. Though a limited range of goods such as polished rice and frozen shrimp are exported, the majority of goods are produced for the domestic market. The Ministry of Industry 1 operates 19 state-owned factories, while the Ministry of Commerce, the Ministry of Agriculture and Irrigation, and the Ministry of Livestock and Fisheries have their own state-owned enterprises dealing respectively in processed rice goods, sugar, and processed marine products. With the exception of liquors and other spirits, beer, and juice—which mostly fall under the jurisdiction of the Ministry of Industry 1—many areas of food processing are open to the private sector. FDI companies have been directing their capital to other ASEAN countries, particularly into businesses run by overseas Chinese in Thailand, Malaysia, and Singapore, to establish soft drink operations aimed at domestic markets and to begin processing frozen shrimp and other marine products and canning/bottling agricultural produce for export. FDI companies from Thailand and elsewhere looking to expand their export business have set up operations in Myanmar to gain access to its food materials and cheap labor force, but many of these companies have run into problems such as the difficulty of procuring a stable supply of food materials, the instability of local electric power supply, the need to rely on imports for bottling/canning and packaging materials, and mismatches in terms of business management with their SOE partners in joint ventures.

Food processing in Myanmar has tended thus far to be very much an import substitute industry but, from the perspective of using the country's agricultural and marine product resources, it does have the potential to become an export industry. When one considers that the full-scale promotion of exports will require grasping consumer needs in overseas markets, introducing processing know-how and facilities equipped with the latest technology, and acquiring users and sales channels, though, greater dependence on foreign capital appears inevitable. Most of the needed technology, funding, and sales channels will become possible by attracting foreign companies. Myanmar should pursue a policy of actively inviting foreign companies to the country and establishing an attractive domestic business environment in terms of both "hardware" and "software."

The main agro-based industries other than food processing are the fertilizer, agricultural chemicals, agricultural machinery, and farm implement industries. The production of urea fertilizer is limited by the supply of natural gas and plant procurement (investment), and agricultural chemicals require foreign investment and technology procurement through FDI. Agricultural machinery is today a core industry within the machinery sector and one in which China is actively involved, most visibly by supplying engines. Rebuilding and expanding the agricultural machinery business is essential for improving agricultural productivity in Myanmar and promoting the machinery sector.

Fishing-related industries in Myanmar today include the shipbuilding, fishing net, shrimp and other seafood farming, ice-making machine, and freezer warehouse industries. The amount of fish caught is limited by the number of 100-ton offshore vessels (now approximately 2000), and acquiring and expanding ship construction capability is key to the industry's development; in addition, increasing the number of vessels will be the initial barrier faced in expanding exports. Some ice-making machines are produced domestically, but freezer warehouses and many other industrial goods must be imported, and there is considerable demand among fisheries-related companies for greater domestic production. There have also been loud calls for improvements in the ship repair industry.

Myanmar's machinery industry, including electrical and electronic machinery, accounts for no more than about 1% of total industrial production. Imports of finished products are restricted by tariffs and import licenses, and major components must be imported; SOEs and other companies assemble these components into products for the domestic market. In the electrical/electronic sector, the state-owned Myanmar Heavy Industry (MHI) Enterprise predecessor of MTEI (Myanma Machine Tool and Electrical Industries) produces heavy electrical machinery and electrical appliances, but none of its products are internationally competitive. Several Japanese and South Korean companies have set up assembly export operations in Myanmar for electronic components (e.g., coils and transistors). A South Korean company (Daewoo Electronics) engaged in assembling VCR heads continues to operate with a staff of several hundred, but two Japanese companies have been compelled to close up their local operations before achieving their initial objectives because of the disincentive policies of the Myanmar government (problems with procuring imported parts/materials and difficulties

in receiving authorization to change to a new area of assembly parts) and restructuring problems at the Japanese head office. Although not a foreign company, Earth Industry has been the focus of much attention as a local company engaged in the assembly export of electronic components. This company is a locally funded CMP company provided with assembly technology and supplied with parts/materials by a Japanese component company having an assembly site in Malaysia; all of the assembled components are exported. Though locally funded, the company has succeeded in the export business. This suggests that electronic components assembly operations will pay off for foreign companies even in Myanmar if a suitable investment environment can be established. Japanese companies would be the FDI target companies for electronic component assembly. Component companies that expanded into Malaysia and other ASEAN countries are now moving more aggressively into China, while the investment environment in Malaysia, the ASEAN country with the greatest concentration of electronics-related companies, has worsened as a result of inadequate labor resources and rising costs. These companies are beginning to examine measures to strengthen their competitiveness by redesigning the production system to create a more effective division of labor throughout the ASEAN region. With the conclusion of AFTA, this improved division of labor in the ASEAN region as a whole, including Myanmar with its great potential, is expected to be pursued in earnest.

The plastics industry, a supporting industry for a broad range of other industries that also supplies a variety of daily necessaries to the general public, features the participation of both state-owned and private companies. Problems with electric power supply have encouraged not a few private companies to move their operations to military-managed sites, and location conditions have created an obviously unequal competitive footing between SOEs and private companies and among private companies themselves. With private companies playing an expanded role in improving product quality, obstacles to resin imports (foreign currency procurement, etc.), should be eliminated and production transferred from SOEs to the private sector.

The software industry is one industry in which rapid expansion is possible. Investment efficiency is good as the principal investment required is personnel training, and it is very probable that the industry can be developed into an export-oriented one. In addition to personnel training, the start of sales development efforts to secure production orders from overseas and the modernization of computer/communications facilities through ODA and other foreign government support will be key triggers for industry development. Other triggers for the development of the software industry include free Internet access, greater use of broadband access, and expanded mobile communications, necessitating a variety of reforms in government regulations.

Although it is not part of the manufacturing sector, the tourism industry was also analyzed as described in the appended material. There are now a maximum of 10,000 seats available per week (200,000 per year at present) on airlines flying into Myanmar, but using Vietnam's target of 1 million tourists in the first half of the 1990s as an intermediate-term

objective, Myanmar could potentially secure US$4-5 million in foreign currency revenues. This is a considerable opportunity to acquire foreign currency in light of the present scale of the country's exports. A series of measures should be urgently implemented in this regard, such as improving the issue of visas, increasing government efforts to promote tourism, supporting the development of package tours by private companies, and implementing tax reforms to help tourist companies strengthen their competitiveness.

The following table gives a general picture of the degree of the comparative advantage enjoyed by these strategic industries, the scale of the domestic market and the potential for acquiring foreign currency (through exports), the need for FDI in industry expansion, the burden of capital restrictions on industry growth, the technological level currently attained by Myanmar, and the possibility of the industries evolving over the long term (10-20 years).

Table 2-25 General Picture by Strategic Industries in Myanmar

Industry		Comparative advantage	Scale of domestic market	Potential for acquiring foreign currency	Need for FDI in industry expansion	Burden of capital restrictions on growth	Technological level attained	Potential for long-term evolution
Agro-based industries	Fertilizer (production)	○~△	○	×	○	Great	○	△
	Bio-fertilizers	○	○	×	○	Slight	△	○
	Insecticides	×	○	×	○	Slight	×	○
	Food processing	○	○	○	○	Moderate	△	○
Simple-labor-intensive industries	Garment	○	△	○	○ (CMP)	Slight	○	×
	Footwear	○	△	○	○ (CMP)	Slight	○	△
	Electronic component assembly	○	△	○	○	Slight	○	○
Skilled-labor-intensive industries	Plastics	○~×	○	×	○	Great	△	△
	Machinery	△	○	○~△	○	Great	×	○
	Electronic/electric	△	○	○~△	○	Great	×	○
Resource utilization industries	Natural gas	○	○	○	○	Great	○	△
	Lumber	○	○	○	○	Moderate	△	○
	Gemstones	○~△	○	○	○	Slight	△	○
	Tourism	○	○	○	○	Moderate	△	○
Other	Software	△	○	○	○	Slight	△	○
	Construction	–	○	×	○	Slight	△	○
	Shipbuilding	×	○	○	○	○	×	○
	Freezer warehouses	×	○	△	○	○	×	○

○: High/large △: Moderate ×: Low/small

Source: JICA Study Team

Overall, the following can be said with regard to the division of roles and level of competition between SOEs and private companies in the industries examined in this study.

- In the conditions of competition between SOEs and private companies, there are inequalities in a broad range of areas such as electric power costs and raw material procurement (one or two specific examples will be discussed later for reference).
- There are no clear-cut government guidelines on determining the respective roles to be played by SOEs and private companies.
- The government regulations and pressure imposed on private companies in no way seem designed to promote private companies as leading economic entities that act in accordance with economic rationality (in plant investment, development of sales networks, etc.), and in a number of cases the development of companies and industries is actually being hindered.

Research on designing strategies for the future development of individual industries should be conducted as soon as possible; this will entail clarifying the status of industry organizations in each industry, accurately ascertaining the level of cooperation and competition between SOEs and private companies, conducting a detailed analysis of domestic markets, and analyzing trends in overseas markets and foreign companies (e.g., the possibility of FDI investment). Once strategies for individual industries have been drafted, it will be necessary to design an in-depth industry development strategy from a more macroeconomic perspective for the country as a whole. There is good reason to doubt the feasibility of the long-term industry development plan being implemented by the government based on reports from SOEs (on scheduled production volumes).

The following table provides more specific information on major strategic industries, indicating whether production is carried out principally by SOEs or private companies and what measures will be key to development of the industry in future. Considering generally the measures deemed necessary, we can make the following proposals.

(1) The division of roles between SOEs and private companies and the cooperation/competition between the two should be set out clearly. Although it is demacated the type of industries to be carried out in the State Economic Enterprise Law(1989). Afterwards, the areas in which private companies can participate should be expanded in order to use the vigor and economic rationality of private companies to drive economic development.

(2) Even in those industries in which SOEs are already the principal driving force agricultural machinery, fertilizer, and natural gas, for example—production of components should be ordered to private companies and facility maintenance should be outsourced more often to them, equipment/software/engineering should be procured from private companies, and the closed production systems within SOEs should be opened to the private sector.

(3) Industry development priorities should be immediately considered and set to foster rapidly and in order of importance those industries having the highest likelihood of substantial growth with relatively small investments, especially export industries—for

example, the software industry and a tourism industry several times its current size (in terms of the number of tourists).

Table 2-26 Key Measures to Industrial Development of Strategic Industries in Myanmar

	Production: SOEs/private sector		Measures key to industrial development
Agro-Based Industry	Fertilizer (urea)	Production monopolized by SOEs	• Expansion of natural gas supply (government distribution) • New plant construction (planning underway) • Support of expanded private sector exports (foreign currency)
	Bio-fertilizers	SOEs and private companies operate in parallel	• Promotion of expanded private sector participation • Government promotion of organic agriculture
	Insecticides	100% dependence on imports	• Introduction of FDI/technology
	Food processing	SOEs/private companies operate in parallel (overwhelmingly larger number of private companies)	• Introduction of FDI, improved technology for exports • Fostering of private companies • Strengthening of food processing administrative functions • Construction of logistics systems and related infrastructure
Simple-labor-intensive industries	Electronic component assembly	SOEs, locally-funded PMIs, some foreign companies	• Transfer of production from ASEAN, FDI introduction
Skilled-labor-intensive industries	Plastics industry (processing)	SOEs: 25-30%, private companies: 70-75%	• Transfer of SOE facilities to the private sector • Liberalization of resin imports • Liberalization of secondhand machinery imports • Stable supply of electric power to industrial complexes
	Machinery industry	• SOE-dominated industries (agricultural machinery, machine tools, other tools, engineering) • Small- and medium-sized metals processing companies (repair, etc.)	• Development of linkage between SOEs and private companies (order placement/receipt relationship and technology transfer to private companies) • Reform of agricultural machinery business into a core industry • Production for orders from ASEAN, solicitation of FDI (Reference: some private companies currently produce plastics machinery and copies of low-end machines)
	Electronic/ electric industry	• SOEs and some foreign companies (small-scale industry at present)	• Introduction of FDI • Receipt of orders for products and components as well as transfer of production from ASEAN
Resource sales	Fisheries Natural gas Lumber Gemstones	Consists mainly of 30 major private companies (offshore)	• Acquisition of offshore fishing vessel construction capability • Improvements in price controls and other government regulations
	Tourism industry	State-owned and private sector; private sector plays the principal role	• Policy improvements (visaless entry, arrival visas) • Investment in PR (especially assistance for the private sector through government investment) • Doubling of airlines flying into Myanmar • Intermediate- to long-term Infrastructure investment
New industry creation	Software	Main role played by approximately 1000 engineers in the private sector (there are also several hundred software engineers in the government, though not for business purposes)	• Creation of domestic markets through infrastructure investment and computerization of government organs (software order placement) via support from overseas • Expansion of industries receiving subcontract work from leading overseas software companies • Training of engineers (quantitative expansion, qualitative improvements)

Source: JICA Study Team

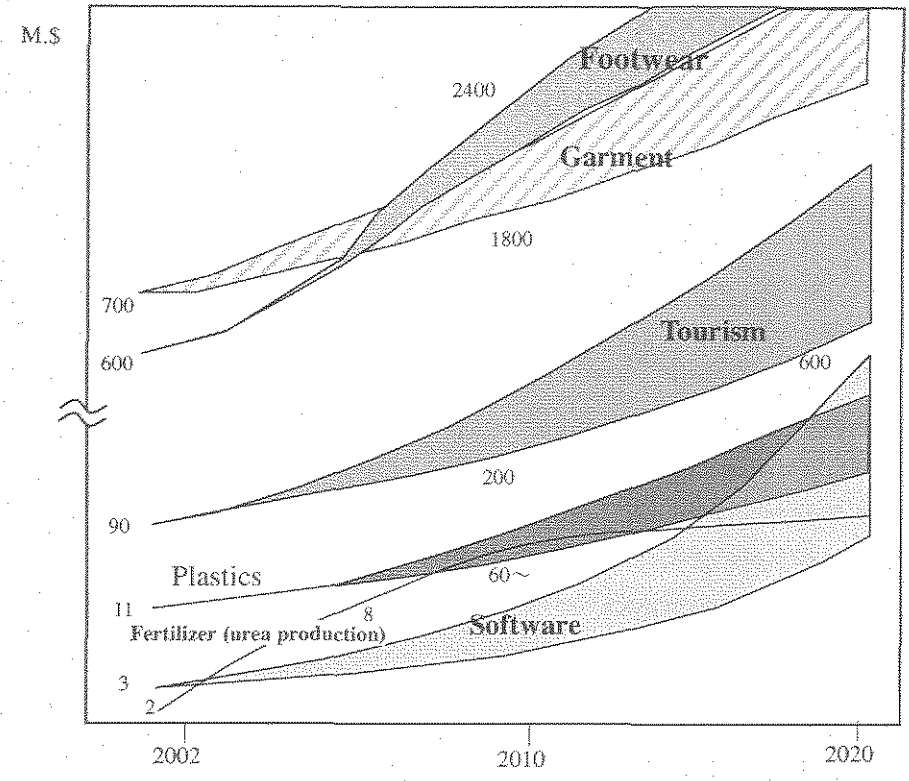
(4) Regulations that have hindered the expansion of private company activities—the ban on imports of secondhand machinery, the issue of tourist visas—should be reformed (by, for example, permitting visaless tourism by Japanese tourists).

(5) Attracting FDI plays an important role in many industries in the industrial sector. FDI is absolutely essential in strengthening the competitiveness of domestic industries (technical/management capabilities), training industry personnel, creating new industries, and dramatically expanding the acquisition of foreign currency in order to establish a next-generation industrial base for Myanmar. Naturally the ways in which foreign currency will be attracted will differ by industry, but a specialist office that cuts across the boundaries between ministries and agencies should be established and given comprehensive FDI strategy functions as well as responsibility for setting industry-specific solicitation priorities and implementing measures to attract FDI. One urgent measure that should be taken is the creation of a ministerial post with responsibility for FDI strategy and without SOEs (plants) to oversee.

(6) In order to not only enhance competitiveness and expand the major industries at present but also to foster future strategic industries, attract FDI from the neighboring Asian countries, analyze the possibility of expanding exports to Asia and the Western countries and design a strategy for doing so, collect information from various industries, provide it to a broad range of interested parties and promote its use, an "Industrial Research Center" (tentative name; see the chapter on HRD in this report) with research functions regarding individual industries must be established for the purpose of providing industry information.

Taking several of the aforementioned manufacturing industries as examples, the following diagram illustrates the scale of each industry from an intermediate- to long-term perspective.

Figure 2-12 Long Term Perspective (Scale of Industries for Industries in Myanmar)



Source: JICA Study Team

For reference purposes, it is to discuss the disparity in competition conditions (the level of the playing field) for SOEs and private companies in plastics factories and legume sorting plants.

Assuming the market selling price for plastic to be 400 kyats/lb, the cost of the raw materials accounts for 85% of the total cost and electric power 12%. Resin costs SOEs 6 kyats/$, while private companies must procure it at market rates (essentially an 8%+ increase in the import price because of dollar-denominated purchases from export companies), producing an overwhelming disparity in product pricing in the market. Because of their low quality, however, most SOE products are in fact only sold in mostly government markets. A considerable portion of these products becomes recycling raw material for private companies. In other words, SOE products are priced so cheaply that they can hold up to competition from private companies even as recycling material.

There is an extreme disparity of 1:50 in electric power costs between SOEs and private companies operating in industrial complexes. Many private companies have set up their production bases on military-owned sites, however, so the electric power consumption of individual companies cannot be determined; even including miscellaneous costs, however, these companies incur only 20-25% of the costs that companies in industrial complexes do. Private plastics companies in industrial complexes are not so much in competition with SOEs

as they are with private companies who, through special routes, are allowed to operate on military-owned sites. Electric power consumption on military-owned sites has recently become subject to restrictions, though, and private companies are being directed to relocate.

The legume sorting plants of state-owned enterprises (both SOEs and private companies can freely export their products) presently enjoy several advantages due to government policies and systems. The disparity in electric power costs is similar to that above. A 10% export tax is applied to private companies, but there is no major disparity in wage levels between the two. SOEs are able to obtain the latest market information in weekly bulletins from the Department of Agricultural Planning. The biggest difference is the facilities they possess; SOEs have introduced more up-to-date facilities, paid for out of the national treasury, with which they are able to achieve higher quality than private companies.

Table 2-27 Comparison of Competition Conditions between SOEs and Small- to Medium-sized Private Companies in Plastic Bag Production (Private Company A Operating in an Industrial Complex)

Major areas of divergence	SOE	Private company A
Raw material procurement (resin import)	Foreign currency allotted by government at 6Kyat/$ (making possible a low selling price for products) Import price unknown Licensing easy	Foreign currency purchased at market rate + alpha (products sold in general competition) CIF $550/ton Three months from payment to import (interest rate 15-16%) Risk of confiscation of raw materials by government (Note 1)
Electric power and other costs (Electric power rates)	0.5 Kyat/kwh	25 Kyat/kwh (non-private electric power generation) (Note 2: plants on military-owned sites separate)
(Land)	Almost entirely free	8-9 million Kyat/acre in an industrial complex Plants dispersed for production because of unstable electric power supply, a factor in higher costs
(Machinery import)	Costs unclear (ban on import of secondhand machinery)	Possible to obtain more cheaply than SOEs (Case of Company D starting business with imported secondhand machinery)
Worker wages	- 3,000-10,000Kyat/month - Paid in rice or other goods - Purchase of SOE products at discount price	8000-15,000 Kyats/month or meal expenses and housing
Plant operation	24 hours (3 shifts)	24 hours (2 shifts)

(Non-PP woven bags)

Note 1: The risk arising when one of several foreign currency sales customer companies (company C, which desires imports) of export company B (company A purchases the foreign currency) commits an illegal act and the government prosecutes company B.

Note 2: Unstable electric power supply has driven many plastics companies to set up operations on military-owned sites. The electric power rates are extremely vague (joint use throughout the military facilities and no individual meters).

Source: JICA Study Team

2.2.1 Agricultural Sector

Agricultural sector is one of the most important sectors in Myanmar since its share of the GDP of Myanmar is around 50% for the past 6 years. Its share of the GDP has fallen to 49% in 2001. There are some hidden problems in this sector that cause the agricultural exports fall constantly except only in 2001. The agricultural exports account for nearly 50% in 1995 that has fallen to only 19% in 2001.

Myanmar stretches for about 1,275 miles (about 2,052 km) from north to south and 582 miles (about 937 km) from east to west, while approximating 261,228 square miles, in total area.

In Myanmar, real agricultural growth has been almost as fast as those other sectors. Agriculture in 1997 had an unusually high share (counting livestock, fishery, and forestry) of 59% of total measured GDP in current prices. Even in 1971, Indonesia had a similar ratio of only 45%. Agricultural share of total measured GDP in 1997 in Myanmar and in other nations such as Cambodia and Vietnam are 50%, and 26% respectively.

Major supporting industries in the agricultural sector could be seen as follows.

- Fertilizer and pesticide industry
- Agricultural machinery production industry
- Dam and River water pumping projects for irrigation (supporting projects for the development of Agricultural sector)
- Land cultivation (supporting projects for the development of Agricultural sector)

Since the fertilizer industry and pesticide industry are reviewed in other chapters, supporting projects that are important for the development of Agricultural sector shall be overviewed in this chapter.

(1) Dam and River water pumping projects for irrigation

Water supply is vital for crops and important for extension of multiple cropping areas. Efficient supply of water, dam and river water pumping projects play the vital role.

As of September 2002, 137 dam projects have been implemented and 42 dam projects are being implemented as follows.

Table 2-28 Number of Dam Project in Myanmar

	Number of Projects	Acres benefited (in mil)	Cost (Kyats in mil)
Already implemented	137	1.99	57,540
Being implemented	42	0.75	58,600

Source: Ministry of Agriculture and Irrigation

There are 1 dam project being implemented in Kachin State that will benefit 4,000 acres, 3 in Sagaing division that will benefit 5,600 acres, 12 in Bago division that will benefit 527,000 acres, 14 in Magwe division that will benefit 131,060 acres, 8 in Mandalay division that will benefit 90,500 acres, 2 in Mon state that will benefit 35,000 acres, 2 in Rakhine state that will benefit 5,000 acres, 3 in Yangon division that will benefit 9,000 acres, and 3 in Ayeyarwaddy division that will benefit 55,000 acres.

River water pumping projects are also important for the supply of water to crops production areas. 262 river water pumping projects have been implemented throughout the country and as the result; 250,000 acres are benefited from the projects. In addition, 6 big electric river water pumping projects are implemented as follows.

Table 2-29 Electric River Water Pumping Projects in Myanmar

	Location	Acres to be benefited
Yayboatalin	Sagaing division	40,000
Inntaw	Sagaing division	10,000
NyaungPinGyi	Sagaing division	10,000
SiMiKhone extension	Mandalay division	11,000
MinYwa	Magwe division	3,000
KanKalay	Yangon division	5,000
Total		79,000

Source: Ministry of Agriculture and Irrigation

River water is pumped to the areas where crops are produced. Although river water pumping projects are implemented for large crops producing acres to be benefited, it is found that these projects could actually benefit 51,386 acres effectively in 2002. Out of that 80% of benefited acres are paddy sowing areas.

(2) Agricultural machinery

Agricultural machinery and equipments are mainly produced by SOEs under Ministry of Agriculture and Irrigation, SOEs under the Ministry of Industry 2 and some private companies. Some types of machinery are also imported by private sector.

There are 4 production factories and 1 assembling company under the Ministry of Agriculture and Irrigation. 5,826 power tillers are manufactured in 2002 by factories under this Ministry.

One big factory, which could produce 10,000 numbers of 16hp driven power tillers and 5000 numbers of 3.6hp driven harvesting machine per year, is being established by the Ministry of Agriculture and Irrigation.

Cooperatives societies under the Ministry of Cooperatives have also been producing various kinds of agricultural-related machinery. The various kinds of agricultural-related machinery produced by cooperatives relations in 2001 could be seen as follows.

Table 2-30 Machinery Project in Myanmar

Sr.	Machinery produced	Production (Pcs)	Value (Kyats in mil)
1	Paddy threshing machines	42	2
2	Paddy peeling machines	68	6.4
3	Water pumps	450	2.1
4	Water transport pumps	35	3.5
5	Seed drills (harrow)	137	0.4
6	Seed drills (plough)	107	0.2
	Total		14.6

Source: Prepared by the JICA Study Team based on data of MOI(2), Ministry of Agriculture and Irrigation

There are 2 Agricultural Machinery Factories under Myanma Agricultural Machinery Industries under the Ministry of Industry 2 that have been producing assorted products including agricultural related machinery and equipments. The following items are manufactured by No. 1 Agricultural Machinery.

- Pumping sets (SC4C, KND5B, KND7, SVO102KB)
- Agricultural hand tools & Machinery hand tools
- Welding rods (Size 2, 2.5, 3.25, 4.2 mm)
- Electric generators (BSK120, BSK140)
- Electric fans, Watt hour meters
- Power tillers (Ayeyar-I)
- Lighting fixtures
- Pesticide equipment
- Forged products
- Cast products
- Electric motors

The production of pumping sets is found to have declined since 1995/96 but has picked up since 1998/99. The production is found to have peaked in 1994/95 as 3,807 sets were produced in the said year.

Only small numbers of power tillers are found to be produced but the production of the said item is found to be not constant since level of production is quite volatile every year. The level of production was found to be quite high in 1993/94 with 620. Yearly production was 919, 1,015, 1,075 and 1,097 items in 1996/87, 1998/99, 1990/00 and 2000/01 respectively. The level of production is found to be in the up-trend although the production fell quite significantly in 1997/98.

Now we shall look at other agricultural-related items manufactured by No. 2 Agricultural Machinery Factory under the Ministry of Industry 2 as follows.

Zwe tractors (50, 60 & 80 HP)

- 4 ton trailers (ZTM-40)
- 1 ton trailers (GTM-10)
- Injection pumps & nozzles (for tractors, 6.5 ton truck & pumps)

- Diesel engines (50 HP)

It is found that the trend of tractors production has been in the up-trend since 1995/96. The production level declined in 1998/99. The maximum number of tractors manufactured by the said factory could be found in 1999/00 with 750 units. The production is based on the number of orders received.

The production of major agricultural related machinery and equipment could be seen as below.

Table 2-31 Production of Major Agricultural related Machinery and Equipment (Ministry of Agriculture and Irrigation)

Year	Pumping sets	Power tillers	Tractors	Trailers
1995	3,897	273	100	700
1996	2,950	854	130	100
1997	2,300	921	350	850
1998	3,902	256	450	507
1999	1,990	1,015	242	300
2000	2,345	1,075	750	276
2001	2,405	1,097	775	450

Source: Ministry of Agriculture and Irrigation, CSO

It is found that there are only slight and insignificant increases in production of pumping sets, tractors and trailers, power tillers.

Although the agricultural sector is one of the important sectors in Myanmar, it still has been relying on the imported agri-related machinery and equipments since the domestic production are still found to be inadequate although private sector companies are also involved in assembly and production of agri-related machinery and equipments.

(3) Land cultivation

Cultivation of land is one of the major supporting industries that help develop the agricultural sector. 97 numbers of private companies are given rights to cultivate wastelands. The status of land cultivation in 2002 by private companies by state and division could be seen as follows.

Table 2-32 The Status of Land Cultivation in 2002 by Private Companies by State

State/Division	No. of private companies	Rights given (Acres)	Cultivated land (Acres)	Sown area (Acres)
Kachin state	3	31,800	1,100	207
Kayin state	3	13,000	863	25
Sagaing division	1	5,997	5,981	3,576
Taninthari division	16	398,695	56,759	11,249
Bago division	19	164,471	33,479	8,077
Magwe division	11	244,733	36,558	19,204
Mandalay division	2	1,608	415	79
Yangon division	7	57,562	40,062	12,112
Shan state (south)	7	26,903	14,028	4,910
Ayeyawaddi division	28	235,071	125,052	17,404
Total	97	1179,840	314,297	76,843

Source: Ministry of Agriculture and Irrigation

It is found that only 27% of the total areas of land given to private sector are so far cultivated and out of cultivated land, only 24% of the total cultivated areas is sown. Hence only 7% of the total areas of land given to private sector are so far sown. Thus the cultivation of land by private sector is so far not effective at all.

If we analyze the cultivation by state and division, the status of cultivation in Sagaing division is found to be the best since 60% of total land areas given to one private company is already sown. Second best cultivation activities could be found in Yangon division where 70% of total land given is already cultivated and 30% of total cultivated land is already sown. The third best is found to be in Shan state where 53% of total land given is cultivated and out of total cultivated land, 35% is already sown. The worst cultivation activities could be found in Kayin state where only 7% of land given to private sector is cultivated and out of cultivated areas, only 3% is sown thus only 0.2% of total areas given to private sector is sown.

Measures should be taken by the government to supervise the activities of private sector in land cultivation. Some private companies are found to play mischief by getting the rights to cultivate several acres of land from government in order to be able to borrow low-interest loans from the Agricultural Development Bank. Then, instead of conducting cultivation, low-interest loans acquired from the government are deposited at private financial institutions that pay 10% interest on deposits. Then they get the benefit of the interest rates difference. Thus the government's efforts to boost up the agricultural sector by arranging the low-interest loans for private sector involved, are coming to blank. Thus it should be understood that implementation and enforcement of policies are as important as making policies.

(4) Problems and recommendations

Irrigation and land cultivation are important for the development of Agricultural sector. It is more important for a country like Myanmar, which rely on this sector for the development of its nation. Measures are being taken and policies and directives are often issued for the expansion of irrigated areas and land cultivation. Private sector participations are also allowed to be involved in this development. But whether the efforts for the expansion of irrigated areas are effective or not is still standing as question mark. In terms of number of irrigated acres, it is always in the up trend as it could be seen in the following table.

Table 2-33 Total Irrigated Area in Myanmar

(Unit: Acres)

	Total irrigated area	Growth %
1995	3,843	
1996	4,341	13%
1997	3,846	-11%
1998	3,933	2%
1999	4,182	6%
2000	4,550	9%
2001	4,720	4%

Source: Ministry of Agriculture & Irrigation, CSO

But in terms of growth rate, it has been falling quite significantly since 1997. The growth rate of irrigated acres bounced up only a little bit during 1999-2000 and went down again in 2001. Thus the situation calls for supervision both on the activities of government sector and private sector with the view to capture the main causes that hinder the expansion of irrigated areas. The average rate of increase in total irrigated areas for the last 6 years from 1995 to 2001 is found to be 4% while the rate of increase in rice yield for the same period is found to be only 1%. Normally, if irrigated area increases, yields do too but it is not the case currently. Forced growing of paddy in unsuitable areas, lack of incentives provided to farmers who are even forced to sell rice to the government organization at the price about more than 60% less than the market price, unfavorable weather and systemic environmental problems are factors that attribute to the problems. Other problems include lack of adequate price incentives and credits.

Total areas of more than one million acres of land have been given out to private sector for cultivation. It is noted that only 27% have been cultivated and only 7% of the total areas given is found to be sown. The inefficiency of land cultivation activities of private sector is highlighted by this fact.

The above findings are based on the data of the Ministry of Agriculture and Irrigation. Thus there is high possibility that these data might be inflated or exaggerated. If inefficiency could be pointed out even with the possible inflated or exaggerated data, the actual efficiency in irrigation and land cultivation could be worse.

That is one of the reasons why the prices of some agricultural products have not been stable although the official data on production of them has always been in the up-trend.

We shall take rice as example and overview the amount of rice left for local consumption. The amount of rice left for local consumption is arrived at by subtracting the quantity of rice exports from the quantity of rice production in Myanmar. The amount of rice for local consumption is found to have increased by 18% in 2000 and 5% in 2001 according to government's published data while the total population has increased only by 2% both in 2000 and 2001. Thus it is understood that the quantity of rice available for local consumption of existing population is enough and there is no severe supply shortage according to official data. But it is quite contradictory that the price of rice has been going up quite vigorously while the quantity of rice available in Myanmar is adequate enough for local consumption leading to the situation that there is a question mark on whether government's published data in Agricultural sector is reliable.

This kind of situation could be seen mostly everywhere in government sector as concerned governmental organizations always tend to make flowery reports to the central authorities. The flowery reports and data (that do not depict the actual situation) are based on in making policies recommendation leading to the situation that the policy recommendations do not strike on the head of the nail and could not remedy the actual problems. The whole situation could be remedied only with the existence of independent organization or business associations that undertake necessary supervision on the activities in respective sectors and

industries collect actual data and make reports that could depict the actual situation in the said sector and remedial recommendations should be made.

The activities of private sector in land cultivations should also be closely supervised. It should be understood that forcing the private companies (whose line of business is different from agricultural related businesses) to be involved in agricultural sector with the view to develop this sector is not the solution for its development. There is a conflict of interest between the concept for the development of agriculture sector and nationalism concept according to which foreign investors are not explicitly allowed to be involved in land cultivation and plantation for the production of agri-related products. As the results, interested foreign investors who want to make huge amount of investment in cultivation and plantation of various crops are discouraged while less interested local companies having limited technical knowledge in agriculture are forced to be involved in this sector. The whole situation leads to inefficiency and slow growth in Myanmar agricultural sector.

Government's control on rice exports should be liberalized with the view to promote motivation of farmers and exporters in agricultural sector. This control is meant to stabilize the price of rice in domestic market as the result of higher amount of rice available for domestic market but actually this control has turned out to be detrimental and price of rice in the domestic market is going up instead. If farmers could earn more on exports as the result of liberalization, their motivation shall be enhanced for expansion to raise production. Higher level of production shall be allocated not only for export but also for domestic consumption leading to the situation that the price shall be more or less stable as the result of the increased level of supply in domestic market. But government forces farmers to sell certain amount of rice at the price lower than the current market price. It is worsen by the situation currently that government organizations have been forcing farmers to sell the amount of rice even much more than the amount they are supposed to sell at the price much lower than the market price and this situation have severe negative impact on the motivation of farmers.

Several encouragements are made by the government to induce private sector participation in agricultural sector by allowing private sector get hold of cultivable wastelands for the plantation of various crops including paddy and allowing paddy planters have the right to export 50% of rice production out of their plantation. But some unscrupulous private organizations are found to make false report on the production amount and export 50% of reported production that is higher than their actual production. Thus this situation also calls for the need to supervise on the activities of private sector in agricultural sector. It should again be understood that enforcements and supervisions are as important as issuing policies and directives for the development.

The major problems in agricultural sector could be seen as follows. The agricultural sector in Myanmar is growing up these days but the rates of growth are found to have been falling. It is also highlighted by the fact that the share of agricultural production in GDP has fallen to 49% in 2001.

There are a lot of potentials in agricultural sector and the future is quite promising. But

the growth is not found to be satisfactory on account of several problems in this sector. If measures are taken to dissolve these problems, the growth of this sector shall be significant and the significant growth in agricultural sector shall have positive impact on the overall development of Myanmar.

2.2.2 Agro-based Industry: Opportunities for the Development of the Fertilizer and Agricultural Chemicals Industry

(1) Agriculture-related Industries

The major agriculture-related industries are food processing, agricultural machinery, fertilizers, agricultural chemicals (mainly pesticides, fertilizers, plant-growth regulators (PGR) and various seed industries). These industries also include the related activities of agricultural extension agents who provide leadership to farmers regarding agricultural technology and promoting the dissemination of agricultural technology, especially irrigation-related projects concerning rice.

The fertilizer and agricultural chemicals industry specified in this document covers almost all of the agro-chemicals used in Myanmar. This industry, including bio-fertilizers, is the major "agro-based industry" other than the agricultural machinery and food processing industries.

As can be seen in the table (which excludes the food processing industry), with regard to agro-chemicals, Myanmar is currently dependent on the importation of fertilizers for 90% of its requirements; however, this excludes the supply of urea fertilizers from the three plants in Myanmar (state-owned enterprises). Moreover, the number of allocated agricultural extension agents is estimated to be about 7,000 to 8,000 throughout the 340 townships and even at the village level, which is below the township level. If we look at the actual activities of these agents, the amount of work involved in providing advice on agricultural cultivation methods and technology is relatively small, and most of the work involves following-up production goals (yields) (according to interviews with private companies).

Outlines of the three fertilizer plants are shown in the table.

The imported quantity of fertilizers is highest (from Saudi Arabia, UAE, Kuwait and Indonesia) followed by domestic products and Chinese products (border trade). The prices per 50 kg as of October 2002 were 9,000 to 10,000 kyats for Middle-Eastern products, 8,300 kyats for Indonesian products, 6,000 to 8,000 kyats for domestic products, and 5,000 to 6,000 kyats for Chinese products. The total cost of imported fertilizers came to 255 million kyats for 2000/2001, which was 1.7% of Myanmar's total importation cost of 15,073 million kyats for the same period. (Selected Monthly Economic Indicators)

Table 2-34 Agriculture-related Industries (Excluding the Food Processing Industry)

	Area	SOE	Private Sector
	1) Agro-Chemicals	Three plants (urea) are producing less than 10% of the total demand for fertilizers.	The private sector depends entirely on imports, which account for more than 90% of the total demand for fertilizers. (About ten major importing companies.)
	2) Bio-Fertilizers (non-chemical)	Production of bio-fertilizers has recently begun for the production of beans and rice. (Myanmar Agricultural Service (MAS))	The private sector has started production in cooperation with cooperatives. Five to six companies are participating in compost and EM fertilizer production.
Reference	3) Agricultural Machinery	The Ministry of Industry (2) and the Ministry of Agriculture and irrigation are providing Leadership.	There have been cases where only some machinery parts production orders were placed with the private sector. *Water pump, Thresher, Trailer, etc.
	4) Seeds	The government is providing leadership for more than 95%. (Production and management.)	There were cases of sunflower seeds (an Australian company), corn seeds (a Thai company), and vegetable seeds (Thai, Taiwanese and Japanese companies.)
	5) Agricultural Technology Research	Central Agricultural Research Institute (About 250 technological researchers.)	Seeds prepared overseas have only been cultivated experimentally in limited quantities.
	6) Dissemination Activities	340 offices with 25 to 30 staff members per office. (For townships.)	—

Source: Prepared by the JICA Study Team based on the Interview survey to enterprises in Myanmar

- The domestic consumption of fertilizers is estimated to be about 400,000 tons per year. However, since private companies cannot procure sufficient quantities of US dollars required for the importation of fertilizers, and since there are production restrictions due to the restricted supply of source gas mentioned previously, the demand for fertilizers is not being sufficiently satisfied. The private companies importing fertilizers believe that if the supply restrictions are eliminated, demand will increase to at least several times current consumption levels. One case estimates the potential demand at one million tons according to calculations based on the area of paddy fields. The imported volume and sales prices for imported fertilizers fluctuate significantly at present due to the exchange rate of the kyat. The kyat has been lower in the past several months, which has increased the purchasing cost burden on farmers who are fertilizer users.
- Three to four types of agricultural chemicals (pesticides) are mainly used. Almost 100% is imported. The government (the Ministry of Agriculture) also bids for imported products every few years. However, since not many major private companies participate

in the bidding, and pesticides that expire in a few years do not sell steadily, they are sold mainly by individual private companies who handle their importation and sale.

- One major import and sales company (with about 20 types of products, such as fertilizers and agricultural chemicals) sells 80% on a cash-on-delivery basis and 20% on a 25-day credit basis. Its established sales network categorizes Myanmar into seven areas covering the whole country, and sales are made via the channel comprising major wholesalers – dealers – retail shops / farmers.

Table 2-35 Urea Fertilizer Plants in Myanmar

(MPE: Myanmar Petrochemical Enterprise)

Plant	No. (1)	No. (2)	No. (3)	Remarks
Location	SA-LE	KYUN-CHAUNG	KYAW-ZWA	
Capacity - Urea - Ammonia	(A) 205Tons/Day (B) 260 Tons/Day (A) 100 Tons/Day (B) 120 Tons/Day	207 Tons/Day 100 Tons/Day	600 Tons/Day 360 Tons/Day	SA-LE Factory has 2 Fertilizer Plants as Plant (A) & (B)
Establishment	1964/1984	1969-70	1984	
Maker	HITACHI Japan	UHDE Germany	UHDE Germany	
Process	UREA Process Totally Recycle-C (Japan License)	Stami-Carbon (Netherland License)	Stami-Carbon (Netherland License)	
Employee	1,100 persons in total of Plant (A) + Plant (B)	550 persons	840 persons	
Others Reference Data (if any)	Those Plants are necessary to make Replacement with new parts about 80%. • Renovated between 1998 and 1999. (Production volume increased.)	• Renovated between 1998 and 1999. (Production volume increased.)	This Plant is being made Renovation under NEDO in accordance with the information. • (Energy-saving)	Just for Reference Sake, the Brochure which was printed in 5-years ago, is attached herewith.

Source: Prepared by the JICA Study Team base on Interview survey to Myanmar Petrochemical Enterprises

(2) Evaluation of Infrastructure for the Development of an Agro-Chemical Industry

- The agro-chemical industry in Myanmar is centered on the production of urea fertilizers. Urea fertilizers and natural compost make up all the domestic fertilizer production. Due to the lack of domestic raw materials, all other fertilizers (TSP, Potash) are imported. The main raw material for urea fertilizers is natural gas. The gas is conveyed through pipelines to the three plants, which are state-owned enterprises (SOEs), and fertilizers

are produced. However, natural gas itself is an important means of acquiring foreign currency [Note 1] for Myanmar, and it is exported to Thailand. It is also planned to export natural gas to Malaysia. Accordingly, the volume of gas supplied to domestic industries is limited and it is also claimed that its supply to the cement industry is a priority among the domestic industries. Consequently, the shortage of source gas is a serious problem for the fertilizer industry.

[Note 1] The volume of natural gas produced in 2001/2002 was 310.3 BCF, and of this 237.1 BCF was for export while 73.2 BCF (about 23.6%) was set aside for domestic consumption. The exported volume all comes from the Yadana offshore gas field and goes to Thailand. The volume for domestic consumption consists of Yadana gas for domestic supply combined with onshore gas for 14 major facilities, such as fertilizer plants, gas turbine power stations, and cement plants.

- The volume of fertilizers produced in 2000/2001 was 160,000 tones. (Production took place at the three plants belonging to the Ministry of Energy, and the total volume was marketed by the Agricultural Service of the Ministry of Agricultural and Irrigation.) As mentioned before, the production volume of fertilizers is primarily determined by the supply volume of the source gas.
- Demand for pesticides is large. The supply-demand gap is much larger than that for fertilizers. The importers estimate that demand is five to ten times actual consumption.
- Both inexpensive fertilizers and pesticides made in China have been marketed in limited quantities. However, problems are occurring such as incorrect descriptions of ingredients.

(3) Conditions for the Future Development of the Fertilizer and Agricultural Chemicals Industry

- A ten-year agricultural development plan has been formulated, and the aims are to nurture and reinforce each industry. With regard to agricultural produce, rice, beans, oilseed crops (peanut, sesame, sunflower), vegetables and fruit are the focus of the reinforcement plan. Expanding and reinforcing the food processing industry is also a major theme. One of the plan's major targets is for Myanmar to become a leading agricultural country in ASEAN.
- It is very difficult to establish an industry to produce fertilizers domestically, including supplementation by imported fertilizers, because the raw materials are not available inside the country, except for urea, and it is difficult to acquire technology (plant technology.) Some major private companies would consider participation in the urea business (domestic production) if a stable supply of source gas are possible. However, it seems that currently there is no possibility of full-scale participation by private companies in areas other than bio-fertilizers, such as compost.
- Staff in agricultural regions of Myanmar are said to have a high-level of extensive

knowledge and experience. The quality and quantity of human resources are important resources for agricultural development. For example, Company A, a private fertilizer and agricultural chemical import and sales company, has 30 employees at its headquarters, and more than 80% of these are graduates of agricultural universities or people with professional agricultural education.

- Only a small quantity of agricultural chemicals or chemical fertilizers is used for the soil and environment in Myanmar's agriculture. Pesticides are also not used in large quantities. In short, Myanmar possesses the conditions appropriate for organic cultivation, which is attracting attention internationally. The need for agricultural produce in many Asian countries that have achieved economic development is rapidly changing to one of higher quality and safer agricultural produce. Organic products, such as organic foods and fruit and vegetables from Myanmar, will become one of the major weapons in the future development of agriculture in Myanmar, and agriculture-related parties in Yunnan in China are also paying attention to this (border trade). In this way, agricultural development in Myanmar depends on whether the country can shift from a system of agriculture that simply ensures a minimal subsistence lifestyle to a full-scale agricultural system producing products for sale in Asian and international markets.

(4) Other matters

- MPE is planning to establish a large new plant (still in the international tendering process as of September 2002) with the capacity to produce 1,000 tons/day of urea (and 650 tons/day of ammonia) domestically. Japan's NEDO is also considering cooperation in the area of funding. Under the precondition that this new plant enters full operation from 2005/2006, MPE's urea production plan is as follows.

Table 2-36 MPE's Urea Production Plan

95/96	00/01	01/02	02/03	05/06
140,000 tons	160,000 tons	38,000 tons (Note 1)	140,000 tons	500,000 tons (Note 2)

(Note 1) Due to renovation of the plant and the shortage of gas (used for power generation), production volume declined rapidly. The price for the Agricultural Service is 36,000 kyat/ton.

(Note 2) The newly constructed plant will be included. If the production volume is assumed to be 2,000 tons/day, the necessary volume of natural gas is estimated to be 50 MMCF/day.

Source: MPE data and estimated by the JICA Study Team based on interview survey

- In September 2002, the WTO, UNDP and other parties held an intensive seminar where

know-how was transferred regarding the prevention of insects based on an anti-pesticide approach. (SPS method: Sanitary and photo sanitary measures.) Anti-pesticide know-how is gradually being accumulated and used.

2.2.3 State of the food processing industry and industrial development policy

(1) Present state of the food processing industry

The food processing industry accounts for 80-90% of the value of Myanmar's industrial output, a greater proportion than any other sector of manufacturing. According to *Review of the Financial, Economic and Social Conditions*, Myanmar is estimated to have around 30,000 food processors. State-owned and joint state-private ventures each number a little over 200. According to data from the Directorate of Industrial supervision and Industrial Inspection, the number of private-sector small and medium-sized enterprises (SMEs) involved in food processing is in the region of 23,000 as of April 2001. The same data also indicate that food processing related companies account for over 60% of the total number of private-sector SMEs, around 50% of employment, 40-50% of investment, and 75% of the value of output.

Table 2-37 Number of Food Processors in Myanmar

	1989/90	(%)	1996/97	(%)	1997/98	(%)
State owned	242	1.8	209	1.0	209	0.7
Co-operate	322	2.3	219	1.1	220	0.8
Private	13,194	95.9	20,408	97.9	28,816	98.5
Total	13,758	100.0	20,836	100.0	29,245	100.0

Source: Review of the Financial, Economic and Social Conditions

A large proportion of food processing consists of primary processing of materials such as polished rice, refined oil, flour milling, and sugar. Most capital-intensive products, on the other hand, such as wines and spirits, beer, soft drinks and instant noodles, are supplied mainly by major state-owned enterprises (SOEs) and joint ventures with the private sector. Products such as bread, ham and sausages, and dairy products are supplied largely by small enterprises. Some SOEs and foreign-backed joint ventures manufacturing products such as soft drinks for domestic consumption have introduced comparatively new production facilities. Most of the processing machinery owned by private SMEs, however, consists of antiquated and poorly performing domestically-made equipment and used imports. The poor quality standards and the instability of supplies mean that most food processors have little export competitiveness, and aside from some exports, such as polished rice and frozen prawns, the majority of output is produced for the domestic market.

SOEs in the food processing industry (including joint ventures with the private sector) mainly falls under the control of the Ministry of Industry (1), which has 19 plants manufacturing among other things, wines and spirits, beer, juice, biscuits, ramen and confectioneries. The Ministries of Commerce, Agriculture and Fisheries respectively have control over SOEs making food products made from rice, sugar, and marine products. Apart from the production of wines and spirits, beer and juice, which mostly comes under the control of the Ministry of Industry (1), most of the food processing industry is open to the private sector.

FDI in the food industry comes to a large extent from within ASEAN from ethnic Chinese in countries such as Thailand, Malaysia and Singapore, and is concentrated in fields such as the manufacture of soft drinks for the domestic market, processing of marine products (such as frozen prawns) and canning and bottling of agricultural produce for export. Foreign direct investors such as those from Thailand investing in Myanmar for the purpose of exporting from there are attracted by the country's food resources and cheap labor supply. However, most companies face a number of problems, such as the difficulty of procuring stable supplies of food ingredients, unstable electricity supplies, dependence on imports of bottling, canning and packaging materials, and mismatches with the SOEs that are their partners in joint ventures.

(2) Problems presently faced by the food processing industry

Myanmar's food processing industry faces numerous problems.

- Approximately 80% of raw materials are procured through brokers and middlemen, and only a small proportion is imported directly from producers. Due to the instability of supplies, there are large fluctuations in prices. In the case of produce for domestic consumption, quality is not a major concern. Where products are produced for export, however, quality represents a serious problem. Companies need to have continuous access to stable supplies of food ingredients and be able to ensure that quality standards are up to the level required for exports.
- Private enterprises have, with a few exceptions, a free hand to produce any kind of processed food product. Because of the problem of access to food ingredients, lack of funds for capital investment, and distribution and logistical problems, however, SOEs are in an overwhelming stronger position. Conditions are thus not well suited to the development of the private sector in the industry.
- Most foreign investors and major domestic enterprises can operate in industrial zones. However, electricity shortages (and instability of supply) and the undeveloped state of the communications infrastructure, for example, hinder production activity. In the case of exporters and major food companies that cater to the domestic market, the poorly developed physical distribution infrastructure, such as the road network and means of transportation, is a hindrance to growth.

- In capital-intensive fields such as the bottling business, some companies--principally major enterprises—have introduced state-of-the-art equipment. However, the processing equipment found at many micro-enterprises consists of aged domestically-made and imported equipment, and the standard of processing technology is low. While attempts are being made to produce some machinery domestically to substitute for imports, there is little domestic demand and a shortage of skilled operators and engineers. There is also insufficient awareness of hygiene and quality control.
- Although key raw materials can be procured domestically, Myanmar is dependent on imports for the majority of additives, food colorings, seasonings, containers such as bottles and cans, and packaging materials. This seriously harms the profitability of the food processing business, and also makes it necessary to procure foreign exchange in order to pay for imports.

Food processing in Myanmar has until now been to a large extent an import-substitution industry. Given the extent of Myanmar's latent agricultural and marine resources, however, it has the potential to develop into an export industry. While one course would be for domestic companies to introduce advanced manufacturing equipment from overseas and expand exports as an extension of their domestic sales, the need for research on needs in overseas markets, introduction of cutting-edge processing know-how and equipment, and access to more users and markets mean that Myanmar will inevitably grow more dependent on foreign companies if exports are to really grow. Access to most of the required technology, funding and markets may be obtained by courting foreign investment. An aggressive policy of attracting inward investment should be introduced and the necessary arrangements and physical infrastructure required to improve the business environment put in place.

The biggest key to attracting more FDI in the food processing industry is to create a system enabling the stable supply of large quantities of high quality food ingredients. The standard of agricultural and fishery technologies must be improved and the sophistication of storage technologies and logistics systems increased making use of FDI. Active steps should be taken to cultivate and rear new agricultural and livestock produce for food products to meet the needs of overseas customers where geographical and other conditions permit without focusing solely on Myanmar's traditional specialties. For the meantime, domestic produce will provide the bulk of the ingredients for processing, but in the long term various ingredients should also be imported from overseas, as in the case of Thailand, in order to foster diversity in the food processing industry.

(3) Policy proposals for the development of the food processing industry

Below are summarized the policies that it is recommended that the Myanmar Government should adopt in order to foster the development of private enterprises in the food

processing industry.

1) Strengthening of administrative organs governing the food processing industry

- The Ministry of Industry (1) has six industries with jurisdiction over SOEs (textile and garment making, food processing, pharmaceuticals and cosmetics, ceramics, paper and chemicals, and general and maintenance), and a Directorate of Industry and Directorate of Industrial Supervision and Inspection. The function of the former is to draw up plans for the production and sale of products by SOEs, while the function of the latter is principally to supervise and inspect the plant and processed produce of private enterprises.
- The above organizational structure contains little provision for the development of the food processing industry by private-sector capital. Accordingly, an organ needs to be established within the Ministry of Industry (1) that is independent from those industries with responsibility for SOEs in order to foster the development of private enterprises in each of these sectors of industry. Unifying the food administration structure and concentrating the control of SOEs currently scattered among a number of ministries within the Ministry of Industry (1) is also required in order to improve the efficiency of administration.

2) Promotion of agriculture, livestock and fishery industries

- Policies to promote the development of the agriculture, livestock and fishery industries should be considered with an eye not only to domestic demand but also ultimately to exporting to neighboring countries such as China, ASEAN and India. A greater focus should also be placed on more highly processed foods that have higher value added or are more environmentally friendly.
- In order to raise the quality and improve the stability of supply of the agricultural produce in which Myanmar traditionally specializes, such as rice and sesame seeds, steps need to be taken to strengthen the various forms of support offered, such as technical guidance and financial support for crop cultivation and animal breeding, and economic and technical support for agricultural and fishing communities, by taking advantage of the support of developed countries.
- To encourage exports, a system enabling the supply of new products suited to market country needs as well as traditional agricultural, livestock and marine produce needs to be established. The consequent need to ascertain market needs, acquire licenses to technologies and introduce state-of-the-art technologies in fields such as biotechnology will as a result dramatically increase the role for FDI.
- The policies adopted to promote the development of the agricultural, livestock and fishery industries should naturally consist of a variety of support measures designed not

only to expand the supply of food materials, quantitatively and qualitatively, but also to raise the income and cultural level and living standards of those living in agricultural and fishing communities.

3) Promotion of agricultural, livestock and fishery supporting industries

- While Myanmar will initially be dependent on imports to meet its need for chemical products for fertilizer and animal feed and agricultural machinery and equipment such as tractors, fishing equipment to support the development of the agricultural and livestock industries, import substitution also needs to be pursued in line with the level of development and scale of demand.
- A key priority of agriculture, livestock and fishery industry promotion policy is the establishment of logistics and distribution systems. It is necessary to develop a transport and storage physical distribution system to serve the whole of Myanmar, and major support for developing exchange markets and the infrastructure (such as IT systems) essential to distribution systems will be required.

4) Attraction of FDI in the food processing industry

- In order to raise the level of the domestic food processing industry (moving from import substitution to fostering enterprises with export competitiveness), it is essential to gain information on overseas markets and acquire the advanced technologies and equipment required in food processing, and this requires government support.
- While it is also necessary for the Myanmar Government to continue policy-based support using ODA, a more effective approach is to attract FDI. Creating the necessary environment and conditions to do so is therefore a priority.
- Particularly promising sources of FDI are Thai and Japanese companies. In and around Bangkok are clustered many food processors. These make use of food materials from not only Thailand but also imported from around the world, which are processed and exported to the developed world. Recent rises in labor costs and growing demand for food ingredients from neighboring countries have strengthened the likelihood of the relocation of production and division of labor to countries such as Myanmar and Vietnam.
- Thai companies are investing in Myanmar and are enormously interested in its agricultural and fishery resources. Investment conditions in Myanmar are poor, however, and many investors subsequently withdraw. It is therefore necessary to progressively improve investment conditions taking a long-term perspective.
- If foreign investors are motivated primarily by securing domestic sources of food ingredients, it is not necessarily essential that they should be located in EPZs. To attract FDI, however, it is necessary to develop industrial zones equipped with the necessary

infrastructure. If investment is for export purposes, it is efficient for investors to locate in industrial zones adjacent to and equipped with infrastructure similar to that of EPZs. If the purpose of investment is to process agricultural and livestock produce, clustering is centered round Yangon and Mandalay. If the aim is to process marine products, on the other hand, then the optimum location is on the southeast coast of Myanmar, which offers the best logistical links with Thailand.

- It is crucial to develop the domestic logistics infrastructure for procurement of food materials and in particular to build an international logistics system linking Myanmar with Thailand. Current routes via Singapore incur considerable loss, and a new safe border route linking Myanmar to Bangkok in Thailand is required.

2.2.4 Fishing and Related Industries in Myanmar and Development Opportunities

Myanmar's wealth of fishing resources and the geographical features of its fishing grounds give its fishing industry a great deal of potential, and fishing is considered possible in 36,000 km2 of the Rakhine (Arakan), 105,000 km2 of the Ayeyarwady (Irrawaddy) and 84,000 km2 of the Tanintharyi (Tennasserim) areas. Myanmar's fishing industry is normally divided into inshore (river) and offshore (marine) fishing. The former is a traditional form of fishing, while the latter dates back to 1953 when the Moatama Fisheries Company was established jointly with Maruha (then Taiyo Fishery) of Japan. Offshore fishing has subsequently expanded, with the purchase in 1977, for example, of 63 fishing boats with a loan from the Asian Development Bank and United Kingdom among others. The industry now has around 22,000 inshore boats and 2,200 offshore boats.

The catch in 2001 came to 1,310,000 tons, of which 200,000 tons (934 million kyats) was exported. Exports have grown more sluggishly than catches, and account for only 7% of total exports, and exports in the industry have not grown as rapidly as in the garment making and footwear industries despite its considerable growth potential.

The following industries, which belong mainly to manufacturing, are the main four types supporting the fishing industry:

- Fishing boats
- Fishing gear and nets
- Shrimp and fish farming
- Ice-making and cold storage facilities

(1) Fishing boats

Inshore boats consist of traditional wooden, rudderless canoes. The fleet ranges in size from 15-40 feet, with canoes in the 40-foot class being equipped with engines. In 2001, there were 26,000 registered vessels of this kind.

Offshore boats, on the other hand, numbered 2,053 in 2000, down slightly to 1,987 in 2001.

Inshore businesses operate on an extremely small (one-man) scale. Finding workers presents a problem in the fishing industry, and numbers are declining year by year. The main region of boat production is Mawlamyine. Boats are made by hand using simple tools and traditional materials (such as pyinkado and ThinGun) and techniques. There are also guilds of boat-makers that tour around the country contracting with agents. 40-50 boats are made a year at many boat yards. Offshore boats in the 100-1,500-ton class are practically impossible to make, and 50-60-ton vessels are made in only very small quantities. This is a major constraint preventing the full-scale expansion of the fishing industry. 100-ton boat building capacity consequently needs to be quickly developed. Support from Japan and other developed countries should therefore be sought immediately.

(2) Fishing gear and nets

According to the Myanmar Fisheries Department, Myanmar's fishing industry had approximately 26,000 sets of nets in 2001. Although imports grew rapidly to 29 million kyats in 1998, the economic turmoil in Asia caused imports to subsequently plummet to 7 million kyats in 1999, and imports slumped further to 4 million kyats in 2001. Most fishing gear and nets are imported.

Table 2-38 Fishing Gear and Nets

Main gear & nets		Uses & characteristics
Encircling gill net for hilsa (nylon nets)	:	150 sets (for 60-ton catches at peak)
Large-type drift gill nets (nylon nets for hilsa)	:	60 ton/year catch per boat (hilsa)
Small gill net (for various fish)	:	28 ton/year catch per boat
Trammel gill (for shrimp)	:	Inshore shrimp nets (15 sets per boat)
Bottom gill nets (for large fish)	:	6-8.5-inch mesh for sharks and large bass
River gill nets	:	For river use (catches are normally sold at local markets)
Tiger mouth nets	:	Small nets for river fishing, large nets for inshore (within 4 miles) use
Long-line fishing nets (synthetic fibers)	:	

Source: JICA Research Group

(3) Shrimp and fish farming

Shrimp and fish farming is steadily growing. Private investment in farming of shrimp that fetch a high price on the market grew especially rapidly in 2000.

Table 2-39 Shrimp and Fish Farming

		2000	2001	2002
Shrimp	State/division	67,451	101,804	118,784 (acres)
	Production of post-larvae shrimps	—	(730)*1	(2,399)*1 (thousands)
	• Myanmar Fisheries Dept.		(68)	(121)
	Freshwater	—	4	—
	Seawater	—	64	(thousands) 121 (thousands)
	• Private sector		(641)	(2,198)
	Freshwater	—	—	26 (thousands)
	Seawater	NA	641	2,172
Fish	State/division	NA	57,331	90,733 (acres)
	• 58% growth in 2002. Especially strong growth in Tanintharyi division (from 5 to 80 acres).			
	Production of post-larvae fish			
	• Myanmar Fisheries Dept.	NA	2,120	2,273 (thousands)
	(12 production centers. 19 new centers planned.)			
	• Private sector	NA	NA	3,602 (thousands)

Source: Myanmar Fisheries Dept.

There are 15 ice-making facilities and 356 cold storage facilities in Myanmar. Both are far too few in number.

(4) Current problems and future growth prospects

The biggest problem is the lack of boat-making facilities. Most fishermen have to rely on traditional canoes. Boat prices are increasing due to the rise in wood prices, and cheap Chinese-made engines break down frequently. Even large boats are equipped with little more than radio sets, and are not normally equipped with GPS or radar systems. Action is required to improve the technical capabilities of traditional boat builders.

The second problem is the prevalence of the traditional method of "dynamite fishing", which, despite naval surveillance, cannot be prohibited. The root cause of this form of fishing, which results in the destruction of water resources and the environment, is the insufficient education of fishermen. (Dynamite is imported chiefly from Thailand.)

Another problem is the control of fish prices by the Government. The objective of the arrangements to ensure that fish prices in Myanmar do not fall below international market

prices is a reasonable one. In practice, however, insufficient access to information on international prices, which change by the day, means that the floor price set by the Government (revised every three months) when the international market price is high is often higher than the international price, as it is changed only infrequently, while fishermen in reality sell at a price lower than the international market price. This acts as a disincentive for the fishing industry to export. With conditions as they currently stand, therefore, fishing businesses have no alternative but to either export more than they are allowed in collaboration with some government officials, or to export produce of a quality in excess of that approved for export (A) at a lower price as level A.

A further serious problem until June 2002 was the problem of foreign exchange. When exporting, for example, fishing businesses were forced to exchange 15% of their earnings on a FOB basis at a rate of 250 kyats when they exported. This system was extremely unpopular with fishermen, and was abolished in 2002. Export tax totaling 10% must also be paid. As a result of a very recent change, moreover, export licenses must now be obtained on each occasion from the Ministry of Commerce in Yangon. Fishing businesses outside Yangon have to complete this procedure each time in Yangon, leading to export delays. The price recommendation of the Myanmar Fisheries Department is also required when acquiring an export license, and checks are made regarding whether the FOB price is below the government-set price. Exporting is normally only possible if the price applied for is 10-20% lower. The conditions pertaining to the issuing of export licenses, including location, timing and application procedures, therefore need to be simplified.

2.2.5 Activities of Private Company in Mineral Resources Sector

According to historical records, minerals of gemstones, gold, silver, amber, etc., have been produced in Myanmar since the fifteenth century and Myanmar has been known for the precious rubies found at Mogok. During the British colonial rule, the government granted mining leases mainly to British private companies for producing lead, zinc, silver, tin, gemstones and gold.

After Myanmar gained independence in 1948, government entered into joint ventures with the British companies in the early fifties and continued the mining activities. All private companies were nationalized in the sixties following socialist economy. SOEs were set up in all sectors and mining was carried out mainly by the State since then and only certain mining activities were permitted for the cooperatives and private individuals.

After 1989, foreign investments in the mineral sector are welcomed following the promulgation of foreign investment law in 1989. Myanmar Mines Law was promulgated in mid 1994 and the Myanmar Mines Rules in 1996. It adopts the existing right of state ownership of all minerals. All naturally occurring minerals found either on or under the soil of any land and in the continental shelf is deemed to be owned by the State. With this law, all mining activities are administered by the Ministry of Mines through the mining SOEs under

the control of the Ministry of Mines.

The government is found to emphasize more on production of copper, gold, lead, zinc, silver and tin and foreign participations in exploration and exploitations of these resources are welcome.

Private sector is granted with mining permits for the small-scaled and large-scaled production of gold, industrial minerals and coal. Subsistence mining (Artisanal mining) permits are also issued to individuals to carry out gold mining. Myanmar Gemstones Law and Rules were promulgated in 1995. Regarding gemstones, the present policy is not to permit foreign companies to do gem mining but to allow foreign companies to invest in jewelry manufacturing business only.

The geological history of Myanmar ranges from pre-cambrian to recent and morphologic and tectonic features trend north-south. Myanmar could generally be divided into four parallel north-south trending geotectonic belts that are from east to west, the eastern highlands, the central belt, the western ranges and the Rakhine coastal belt.

The estimated reserves of major minerals in Myanmar could be seen in the following table.

Table 2-40 The Estimated Reserves of Major Minerals in Myanmar

Million tons unless otherwise stated

	Estimated reserves		
Mineral	**Probable reserve**	**Possible reserve**	**Potential reserve**
Gold	39.15 ton	1,985.4 ton	-
Tin-tungsten	520.47	0.45	2.26
Lead/Zinc	15.22	1.28	0.007
Copper	1,626.002	13.1574	0.0027
Antimony	-	0.04	0.16
Nickel	70	0.55	84
Chromite	0.0004	0.26	-
Iron	318.18	107.75	1.87
Manganese	-	0.88	7.12
Bauxite	-	3	-
Graphite	0.03	-	-
Coal	41.56	518.26	134.54
Limestone	811.81	1,183.92	671.05
Gypsum	18.63	10.8	-
Barytes	0.68	0.19	-
Granite	7,247.05	2,746	34,991

Source: Ministry of Mines

(1) Mineral resources in Mining sector

Mineral resources sector in Myanmar is mostly controlled by five SOEs under the Ministry of Mines.

Mining enterprise 1 is concerned with production of non-ferrous metal, Lead, Zinc,

Silver, Copper and by-products of Antimonial Lead, Copper Matte and Nickel-species.

Mining enterprise 2 undertakes production of Tin Concentrates, Wolfram Concentrates and Tin Wolfram Scheelite mixed Concentrates as well as refined-Gold, reined-Tin and rough-Diamonds. As part of privatization scheme some of the deposits including gold, diamond, tin and tungsten are being worked on joint venture basis with local and foreign groups.

Mining enterprise 3 is responsible for the production of iron and steel, coal, chromites, antimony, manganese and various industrial minerals such as limestone, barite, gypsum, clay, etc. It is also planning to go into production of dimension stones for construction works.

Myanmar gems enterprise is responsible for granting mining permits for gemstones, rubies, sapphires and various colored gems. It also arranges gems, jade and pearl emporium annually. Ruby, sapphire, semi-precious stones, imperial jade, commercial jade, utility jade and pearl are put up for competitive bidding in over a thousand lots.

Myanmar pearl enterprise produces cultured pearls from naturally occurring Pinctada mixima, mother of pearls oysters found in Myanmar sea. It also has begun producing the artificially-bred oysters used in pearl production. Pearl production sites are in Taninthari division, which is the southern part of Myanmar. The harvested pearls, from this enterprise and joint-ventures are collected and formed into lots according to their size, shape, color and luster. The pearl lots are sold annually by auction at gem emporium.

The major deposits in Myanmar under the control of the Ministry of Mines are as follows.

- Bawdwin deposit (lead, zinc and silver)
- Mawchi deposit (tin-tungsten scheelite)
  Letpadaung deposit (copper)
- Tagaungtaung deposit (nickel-Chromite)
- Gemstone tracts of Mogok and Mongshu.

Bawdwin has been mined since the fourteenth century and it is the underground mine with the dept of 1,700 feet. An open-pit operation has been carried out to mine the low grade near surface oxide ores. There also is a rich zinc carbonate deposits at Longkheng where drilling has indicated 0.23 million tons of smithsomite containing an average of 35% zinc. The principal zinc mineral sphlerite occurs in association with galena at Bawdwin, Mahochaung and Huelong deposits where silver occurs together with lead.

Mawchi deposit has been famous for the production of tin-tungsten. Heinda mine, Hermyingyi mine and Kanbauk mine in the Taninthari division also play an important role in production of tin/tungsten.

Letpadaung deposit has been famous for copper. Myanmar Ivanhoe copper company (JV company with Ivanhoe of Canada) has been conducting the drilling work near the present Letpadaung deposit and has proved the existence of 1.3 billion tones of copper ore with average copper content of 0.5%. There are more than 50 occurrences of copper in Myanmar

out of which Kyesintaung, Sabetaung deposits near Monywa is now being exploited by Myanmar Ivanhoe. Copper mineralization is also found at Nankesan in Kachin state and at Shangalon area in the Wuntho region.

Tagaungtaung nickel deposit is of oxide ore commonly called nickel laterites. Choromite ores are also found and there are 44 occurrences at Tagaungtaung. Other significant nickel deposits in Myanmar are Mwetaung deposit which is a nickeliferous laterite ore deposits and is situated in Chin state. Another deposit is located in Thabeitkyin township in Mandalay division. Chromite ores are found at Hinthada, Mindon, Thayetmyo, Mindat-Kanpetlet, Saw.

In Mogok stone tract, rubies and sapphires of the finest quality are found. They are also found in Mongshu, Pyinlon and Namsakha stone tract in the Shan state. Jade of the highest purity and emerald green color is found in the Lonekhin Phakant jade tract in northern Myanmar that is about 150 km from Myitkyina in Kachin state.

The production of major mineral commodities in Myanmar for the last three years could be seen in the following table.

Table 2-41 Production of Major Mineral Commodities in Myanmar

Major mineral commodity	1999	2000	2001
Jade (Kilograms)	1,256,466	5,242,914	4,730,017
Rubies/Sapphires/Spinels (carats)	9,229,184	8,703,426	9,149,463
Tin concentrate (M.ton)	114	131	244
Tungsten concentrate (M.ton)	7	7	
Tin, Tungsten and Scheelite mixed concentrate (M.ton)	339	292	265
Nickel speiss (M.ton)	31	77	60
Refined Lead (M.ton)	1,855	1,716	1,200
Zinc concentrate (M.ton)	1,236	507	1,960
Copper matte (M.tons)	58	142	125
Refined Silver (Troy 000' oz)	117	90	65
Coal (000' tons)	31	42	51
Gold (Fine ounces)	5,523	6,145	3,619
Pearl (Mommi)	7,910	10,012	5,990
Crude oil (000' US barrel)	3,378	3,480	4,137
Natural gas (million cuft)	119,983	219,399	299,388

Source: Ministry of Mines, Ministry of Energy, CSO

Out of these production, some portion of precious and semi-precious minerals (that include jade, rubies, sapphires, spinals, gold, silver and pearl), base metal and ores (that include tin-tungsten, lead, copper, etc.) and natural gas are exported.

It is found that the exports of mineral resources account for 15% of total exports from Myanmar.

The joint venture companies under the Ministry of Mines are Myanmar Ivenhoe Copper Co., Ltd., for production of cathode copper, Myanmar VES Co., Ltd., for the manufacturing of jewelry and Myanmar ECI Co., Ltd., for production of Barite Powder. There are two local

joint ventures and three foreign joint ventures working on production sharing basis for artificial breeding and culturing of pearls and a Thai company for production of tin from Heinda Mines. Cornerstone Resources from Australia is also involved in feasibility study for Longkeng zinc deposit.

(2) Mineral resources in Energy sector

In mineral resource sector, production of crude oil and natural gas are also important. Thus the activities of the Ministry of Energy, which controls the production of crude oil and natural gas, also plays important role. Production of oil and natural gas could be categorized into three as follows;

- In-land oil and gas production fields run by the State
- Off-shore oil and gas joint venture projects with foreign companies
- In-land oil and gas joint venture projects with foreign companies

As of September 2002, there are 18 new oil and gas fields and 47 old fields currently run by the State. Production of oil and gas from these fields throughout Myanmar could be seen as follows.

Table 2-42 Production of Oil and Gas in Myanmar

Oil & gas fields	Daily production	
	Natural gas (cu.ft in mil)	Crude oil (barrals)
Nyaungdon field	12.123	213
Myanaung/Shwepyithar field	2.6494	27
Pyay fields	2.582	39
Htauksharpin fields	4.0573	357
Man fields	-	173
Yaynanchaung fields	-	65
Thargyitaung/Sapai fields	6.929	608
Letpanto fields	0.709	47
Kyaukkhwet fields	-	4
Indaw test field	4.345	-

Source: Ministry of Energy

There are 5 off-shore oil and gas projects being implemented in Myanmar with production sharing agreement with foreign companies as follows.

- Yadana natural gas project
- Yedagun natural gas project
- Off-shore exploration project (A-1)
- Off-shore exploration project (M-15, M-16, M-17, M-18)

Yadana project is undertaken by TOTAL of France, Unocal of USA and PTTEP of Thailand joint-venturing with Myanma Oil and Gas Enterprise which is the SOE under the Ministry of Energy. TOTAL is currently responsible for transmission of gas through Metering

Station and Pipeline Center and their maintenance, maintenance of Service Track and others. Exports of natural gas to PTTEP Thailand is found to be 131,103 million cu.ft from January to August 2002 amounting to US$ 326 million. Since July 1998, 684,190 million cu.ft have been exported to Thailand until August 2002 amounting to US$ 1,674 million and the SOE under the Ministry of Energy is entitled to get US$ 538 million as its share.

Yedagun project is undertaken by Premier of Britain, Nippon Oil of Japan, PTTEP of Thailand and Patronas of Malaysia together with Myanma Oil and Gas Enterprise (MOGE), which is the SOE under the Ministry of Energy. Out of this project, 89684 million cu.ft of natural gas have been exported to Thailand amounting to US$ 246 million from January to August 2002. Since May 2000, 120,327 million cu.ft of natural gas have been exported to Thailand until August 2002 amounting to US$ 419 million and out of that MOGE (SOE under the Ministry of Energy) is entitled to get US$ 141 million as its share.

Off-shore exploration project (A-1) is being undertaken by Daewoo of Korea (on production sharing basis) which has entered into second exploration period since July 2001. It plans to start drilling the test wells in 2003. 10% of its shares have been transferred to Kogas of Korea, 20% to ONGC Videsh Ltd., of India and 10% to Gas Authority of India Ltd. Off-shore exploration projects (M-15, M-16, M-17, M-18) are being undertaken by Petronas of Malaysia (on production sharing basis).

(3) Supporting industry in mineral sector and activities of private company

Major supporting industry in mineral sector is refinery. Mineral refineries are conducted by the State sector in large scale. Some foreign companies are involved in this sector by making joint venture agreements either with the Ministry of Mines or the Ministry of Energy for the extraction and processing of minerals. Since the major processing of mostly all kinds of minerals are controlled by the State sector, private sector participation is not significant. Private sector involvement is found to be quite significant in Jewelry industry which is one of the major industries in mineral sector.

Precious stones, gold, silver, etc., are major minerals popularly available in Myanmar. Hence gold casting, gemstone cutting and polishing industries are important supporting industries in Jewelry industry that is the major industry in mineral resource sector.

Firstly we shall overview the gold industry where private sector is actively involved. Private participations are allowed for the production of gold. Ministry of Mines has been working with private sector for the extraction and processing of gold around several areas throughout Myanmar under the production sharing basis. Free gold are available in some areas.

In some other areas, oxidized, semi-oxidized and sulphide types of gold are available. Since cyanitation is allowed only in one area, Kyaukpahtoe in middle part of country, it is quite difficult to have efficient production of sulphide type of gold. Some people use cyanide stealthily for the processing of gold at the gold mines. Thus processing of gold by private

sector could be found in many areas in Myanmar although large and inefficient government owned gold mines and gold processing plants are also available.

The partially processed gold are extracted from different areas in Myanmar and are normally brought through unrefined gold traders to major cities like Yangon and Mandalay for reprocessing. The reprocessing market is still not very large in Myanmar. Some reprocessing centers buy these gold after the reprocessing but some are sold to refined gold traders who are in contact with these reprocessing centers.

Then these reprocessed refined gold are channeled to gold shops. Gold shops give subcontract to gold casters or gold smiths for making jewelry and gold products. Gold smiths normally charge not in terms of cash but in gold for casting. Cash transaction could be found when gold traders buy gold from extractors and when refined gold traders buy from unrefined gold traders after the refinery at reprocessing centers and also when these refined gold are again purchased by the gold shops. There is no cash transaction for the gold casting since gold smiths charge in gold for casting.

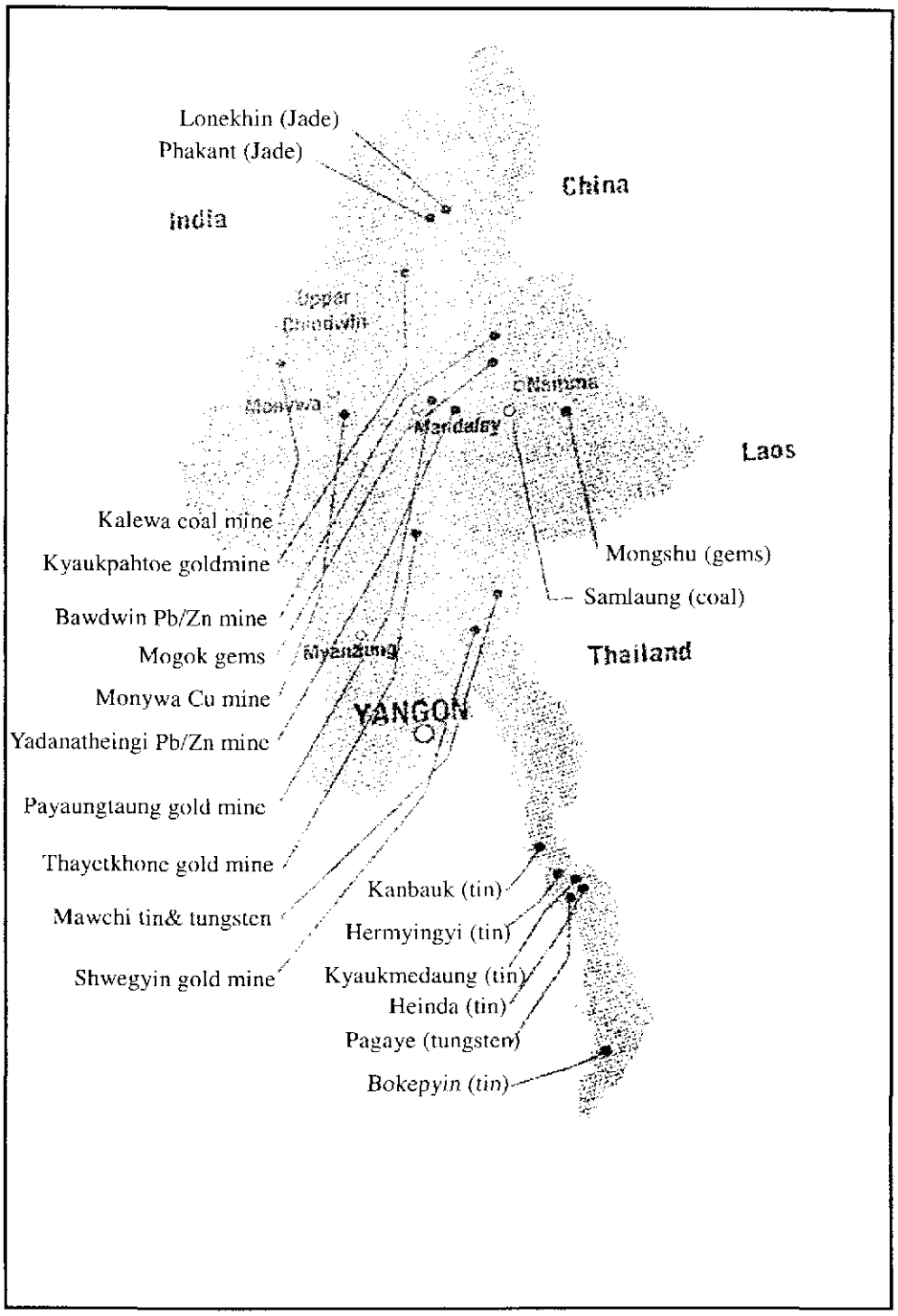
Regarding the gemstones industry, there are only 3 joint venture companies operating under the Ministry of Industry 1, the Ministry of Mines and Union of Myanmar Economic Holding Limited (UMEHL). The said industry in private sector is widely available in Myanmar as small scaled industries. These small-scaled businesses are dispersed around major cities like Yangon and Mandalay as well as around the areas where these gemstones are extracted. These small-scaled industries are mainly for domestic distributions and sales. Some of them are sold at gems emporiums arranged by the government for sales in US$. Some are sold on auction basis.

It should be noted that it is said significant amount of Myanmar gemstones especially jades and rubies are directly exported to China and Thailand illegally through borders. Cutting and polishing of these gemstones are done either in China or Thailand and are re-exported to different parts of the world. This is due to the lack of state-of-the-art knowledge of gemstones cutting and polishing technology and also due to the lack of sufficient international networks.

With the view to develop precious mineral resource sector and gemstones cutting & polishing industry, measures should be taken to invite foreign experts to provide proper trainings to local businesses involved in this industry. Government often arranges short-term gemology trainings with the cooperation of some local experts. This type of trainings is also important but it is more important to provide proper training on how to cut and polish gemstones to internationally acceptable level with the assistance of foreign experts.

Then government supports are required in terms of financing as well as other forms of encouragements to allow local small-scaled gemstones cutting and polishing industries grow into medium and large-scaled ones with proper technology and equipments. One of the effective forms of government support could be the introduction of leasing activities for the lease of gemstones cutting and polishing machinery and equipment to private sector at the subsidized rates.

Figure 2-13 Major Mines in Myanmar



Source: Ministry of Mines